دانشگاه صنعتی امیرکبیر
( پلی تکنیک تهران )

بیست و یکمین کنفرانس بین المللی مهندسی برق

انجمن علوم مهندسی برق ایران
مجوز ۱۳۹۰

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**سی و یکمین کنفرانس بین‌المللی مهندسی برق**

**۱۹ الی ۲۱ اردیبهشت ماه ۱۴۰۲**

**31st International Conference on Electrical Engineering**

**May 9-11/2023 –Tehran, Iran**

# برنامه زمانبندی

# ارائه مقالات

## به همراه چکیده های مقالات

نکته: زمان ارایه شفاهی برای هر مقاله ۱۲ دقیقه می باشد و ۳ دقیقه زمان برای پرسش و پاسخ درنظر گرفته شده است.

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| سه شنبه ۱۹ اردیبهشت ماه ۱۴۰۲ ساعت ۱۴:۳۰ الی ۱۶:۰۰ | | |
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| | دکتر اصغر اکبری ازیرانی | دانشگاه صنعتی خواجه نصیرالدین طوسی |

**ICEE-1264**

**Designing a Suitable Antenna and Simple Receiver for Detection of Partial Discharge in the UHF Band**

*Seyed Hossein Kasaei- Mohammad Hamed Samimi

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**ICEE-1189**

**Gray Box High-Frequency Modeling of Transformer using Particle Swarm Optimization**

*Mehdi Shamsodini Lori- Mohammad Hamed Samimi- Jawad Faiz

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**ICEE-1246**

**مدل جامع مدیریت انرژی الکتریکی ریزشبکه مسکونی با استفاده از کنترل پیش‌بین مبتنی بر مدل**

*سینا رودنیل - سعید قاسم‌زاده - کاظم زارع - امیر امین‌زاده قوی فکر

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**ICEE-1488**

**A New Approch on Condition Assessment of MV Switchgear based on Thermal Evaluation**

*Mohsen Taghizadeh Kejani- Seyed Hamid Khalkhali- Ali A. Razi-Kazemi

**ICEE-1299**

**طبقه‌بندی خطاهای ترانسفورماتورهای قدرت توسط روش خوشه‌بندی K-means با استفاده از آنالیز گازهای محلول در روغن**

*ناصر کیانی‌مهر- حامدزین‌الدینی میمند

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**ICEE-1484**

**Ambient Temperature Effect On $SF_6$ Circuit Breakers Coil Current**

*Masoume Maghfourian- Ali Asghar Razi-Kazemi

**Paper Code: ICEE-1264**

# Designing a Suitable Antenna and Simple Receiver for Detection of Partial Discharge in the UHF Band

Seyed Hossein Kasaei- Mohammad Hamed Samimi

University of Tehran- University of Tehran

Abstract

Partial discharge (PD) in power transformers is one of the major problems that causes transformer failure. The monitoring of PD can help to detect a failure in its early stage. The online monitoring of the PD can fulfill this task. Knowing the location of PD also speeds up the process of repair. Standard IEC 60270 states procedures to measure partial discharge, but this method is not capable of online monitoring and localization directly. Therefore, the electromagnetic and acoustic methods are introduced in IEC 62478 to provide these two options. The electromagnetic method receives electromagnetic waves in UHF, VHF, and HF bands through a sensor. The sensor for the UHF band is an antenna covering frequencies between 0.3 GHz to 3 GHz. An oscilloscope with a high sampling rate is needed to measure these high-frequency signals, which is an expensive equipment. In this paper, three different types of UHF antenna are designed and compared, and a cheap measurement procedure for PD UHF is introduced. This procedure consists of a receiver and a low-cost oscilloscope. One of these antennas that is the most proper for power transformers is selected. The advantage of the proposed receiver and the improvement of sensitivity are shown using experiments. The results show a 67% and 330% increase in the sensitivity detection of PD in a small bandwidth around 0.68 GHz and 2.2 GHz, respectively, with respect to the base band measurement.

**Paper Code: ICEE-1189**

# Gray Box High-Frequency Modeling of Transformer using Particle Swarm Optimization

Mehdi Shamsodini Lori- Mohammad Hamed Samimi- Jawad Faiz

University of Tehran- University of Tehran- University of Tehran

Abstract

The gray box model of transformer provides the terminals voltages and currents as well as the internal distribution of internal voltages and currents. This is the reason that it is one of the most suitable high frequency models for transformers. The model can be used in examining and interpreting the results of the frequency response analysis (FRA) test. This paper presents a gray box model using the particle swarm optimization method. Generally, the most existing models are applicable for a single winding, but the presented model here is built for a single-phase transformer with two windings. The predicted results using the model are compared with the experimental results. The ultimate goal was to achieve closer agreement between the transfer function of the model and the experimental results. The optimization algorithm is implemented separately for three different connections of the FRA test including end-to-end open-circuit, capacitive inter-winding, and inductive inter-winding. The results of the three tests are modeled and analyzed. Moreover, the possibility of creating a model based on one of the test connections and then using it to produce the frequency response of other tests is investigated.

کد مقاله: ICEE-1246

# مدل جامع مدیریت انرژی الکتریکی ریزشبکه مسکونی با استفاده از کنترل پیش‌بین مبتنی بر مدل

سینا رودنیل - سعید قاسم‌زاده - کاظم زارع - امیر امین‌زاده قوی فکر

دانشگاه تبریز- دانشگاه تبریز- دانشگاه تبریز- دانشگاه تبریز-

چکیده

در این مقاله، مدل جامعی برای مدیریت ریزشبکه مسکونی با جزئیات دقیق و با برنامه پاسخ به تقاضا ارائه شده است. در این مدل، پارامترهای مربوط به استهلاک باتری‌ها، هزینه انرژی الکتریکی مصرفی، تولید انرژی الکتریکی توسط انرژی‌های تجدیدپذیر و محدودیت‌های عملیاتی در نظر گرفته می‌شود. مدل پیشنهادی می‌تواند ضمن کاهش مصرف برق و استهلاک باتری‌ها و خرید بهینه‌ی انرژی الکتریکی از شبکه، باعث صرفه‌جویی اقتصادی در ریزشبکه شود. برای مشاهده عملکرد این مدل، یک ریزشبکه مسکونی با مدل کنترلی پیشنهادی و توربین‌های بادی به عنوان منابع انرژی تجدیدپذیر شبیه‌سازی شده است. از کنترل پیش‌بین مبتنی بر مدل با الگوریتم بهینه‌سازی ازدحام ذرات به منظور بهینه‌سازی تابع هدف در نظر گرفته شده، استفاده شده است. اهداف مدل پیشنهادی استفاده بهینه و اقتصادی از مقدار انرژی تولید شده توسط شبکه اصلی، انحراف کمتر وضعیت شارژ باتری‌های سیستم ذخیره‌سازی از مقدار مرجع تعیین شده توسط سازنده است که باعث افزایش عمر مفید باتری‌ها و کاهش استهلاک سیستم ذخیره سازی انرژی الکتریکی خواهد شد.

**Paper Code: ICEE-1488**

# A New Approch on Condition Assessment of MV Switchgear based on Thermal Evaluation

Mohsen Taghizadeh Kejani- Seyed Hamid Khalkhali- Ali A. Razi-Kazemi

K.N. Toosi University of Technology Tehran- K.N. Toosi University of Technology Tehran- K.N. Toosi University of Technology Tehran

Abstract

The increase in load demand in the power system, distribution switchgears result in more attention from the thermal point of view. In this article, a 3D model of the connection of the circuit breaker to the switchgear (plum contact) of the VD4 CB of ABB Company has been simulated through COMSOL software. The heat has been recorded in its different parts. Subsequently, variations in temperature have been observed under different currents and ambient temperatures. Finally, according to the simulations, the temperature slope variable has been investigated at different ambient temperatures and it has been introduced as an independent diagnosis index to the ambient temperature.

**کد مقاله: ICEE-1299**

# طبقه‌بندی خطاهای ترانسفورماتورهای قدرت توسط روش خوشه‌بندی K-means با استفاده از آنالیز گازهای محلول در روغن

ناصر کیانی‌مهر- حامدزین‌الدینی میمند

دانشگاه کرمان- دانشگاه کرمان

چکیده

طبقه‌بندی و خوشه‌بندی خطاهایی که در ترانسفورماتورهای قدرت در مرحله اولیه رخ می‌دهد یک فرایند حیاتی برای سلامت ترانسفورماتورهای قدرت و همچنین عملکرد کلی سیستم‌های انرژی است. آنالیز گازهای محلول در روغن، اطلاعاتی در مورد ماهیت خطاهایی که باعث تغییر شکل در مواد عایق ترانسفورماتورها می‌شوند. را ارائه می‌دهند. تحلیل صحیح گازهای محلول در روغن جهت سالم و معیوب بودن ترانسفورماتورها و در صورت معیوب بودن، تشخیص خطای دقیق باعث می‌شود که اقدام اصلاحی به موقع و مناسب را تسهیل کند. به همین منظور، در این مقاله جهت طبقه‌بندی سالم و معیوب بودن ترانسفورماتورها از استاندارد IEC60599 و تشخیص انواع خطاهای ترانسفورماتورهای قدرت از روش k-means برای خوشه‌بندی استفاده شده است. با استفاده از الگوریتم بهینه‌سازی ملخ (GOA)، مراکز خوشه‌ها مشخص شده و با استفاده از داده‌های بدست آمده از ترانسفورماتورهای قدرت، عملکرد روش پیشنهادی در موارد مختلف ارزیابی و مقایسه می‌شود.

**Paper Code: ICEE-1484**

# Ambient Temperature Effect On $SF_6$ Circuit Breakers Coil Current

Masoume Maghfourian- Ali Asghar Razi-Kazemi

K. N. Toosi University of Technology Tehran- K. N. Toosi University of Technology Tehran

Abstract

As high Voltage circuit breakers (CBs) are one of the most critical components in power grids, their proper operation is of vital importance. So real time monitoring of them is important to detect faults before undesirable interruption. CB coil is one of the main parts and also the source of many faults of it. Therefore, coil current signal can be used to diagnose a variety of circuit breaker faults in different parts of it, such as damper, power supply and coil winding, latch and auxiliary contacts. These faults shift the current curve compared to no-fault state, so in this way contribute to diagnosis of CB faults and detection of their source. Considering the importance of this matter, detecting the factors that affect the proper function curve of CBs can improve fault detection algorithms performance and decrease possibility of their failure. The environmental factors and operating conditions of CBs, and most importantly the ambient temperature is among the factors that affect their function. Thus, in the present paper a 72.5 kV SF6 circuit breaker coil is simulated in COMSOL software in order to investigate the effect of ambient temperature changes the coil function (as the factor that directly affects the temperature of electromagnetic coils).

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| عنوان نشست: **مخابرات (سیستم)۱**- مخابرات نوری | | |
| **روسای نشست** | دکتر جواد صالحی | دانشگاه صنعتی شریف |
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| | دکترامیر زارع بیرانوند | دانشگاه صنعتی امیرکبیر |

## ICEE-1198

## Modulation Classification with Convolutional Neural Network based Deep Learning in Elastic Optical Network

* Ehsan Varasteh - Seyed Sadra Kashef - Morteza Valizadeh - Mehdi Ranjbar Zefreh

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## ICEE-1240

## Conserving Power Consumption in Elastic Optical Networks using Deep Learning

* Fatemeh Dehrouyeh - Sina Tavakolian - Lotfollah Beygi

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## ICEE-1252

## On the Interaction Between Meteorological Conditions and Performance Optimization in MISO Free-Space Optical Communication

* Meysam Ghanbari- Mahdis Saghaee Jahed- Seyed Mohammad Sajad Sadough

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## ICEE-1267

## Bit Error Rate Analysis for a Mixed Underwater OWC-FSO Relaying System in the Presence of Pointing Error

*Mahdis Saghaee Jahed - Meysam Ghanbari - Seyed Mohammad Sajad Sadough

**ICEE-1368**

# A Practical ACO-OFDM Link with an Efficient Timing Recovery Pattern

*Maryam Sadeghi - Masoud Johar - Mahdi Shabany

**Paper Code: ICEE-1198**

# Modulation Classification with Convolutional Neural Network based Deep Learning in Elastic Optical Network

Ehsan Varasteh - Seyed Sadra Kashef - Morteza Valizadeh - Mehdi Ranjbar Zefreh

Urmia University- Urmia University- Urmia University- Politecnico di Torino

Vimercate

Abstract

In this paper, the modulations are classified by six types of deep learning (DL) methods in Elastic Optical Network (EON). In EON, flexible coherent transceivers are applied that can demodulate received signals in different modulations. Here, DL-based methods are proposed for modulation classification in flexible receivers. Three Transfer Learning (TL) methods as AlexNet, GoogleNet, and InceptionV3, are applied, and three convolution neural networks based on different structures (3, 4, and 5 layers) are proposed to show that DL-based methods are practical to identify the usual modulation formats. The performance is evaluated in EON, which includes five different modulation types in four different symbol rates. The total number of studied scenarios are 248, with various link in terms of fiber, power, and span number. In practical scenarios, the numerical results show that, Modulation classification can be done with 99% accuracy.

**Paper Code: ICEE-1240**

# Conserving Power Consumption in Elastic Optical Networks using Deep Learning

Fatemeh Dehrouyeh - Sina Tavakolian - Lotfollah Beygi

Lakehead University- K. N. Toosi University of Technology, Tehran- K. N. Toosi University of Technology, Tehran

Abstract

The power consumption issue in elastic optical networks is a prominent topic of widespread attention and concern nowadays. The wasteful on-and-off transitions of the networking components including transponders, optical cross-connects, and amplifiers are one of the major power consumers in elastic optical networks. Turn-on transitions may result in power consumption spikes that are more than 4 times the needed amount when they are active. Most currently employed power control strategies are not designed to handle this significant power consumption. To solve this problem, in this paper, the number of active lightpaths crossing an element within a short period of time is predicted using the long short-term memory technique. This knowledge is used to avoid the frequent deactivation and activation of the components. Using numerical simulations, we demonstrate that our proposed scheme substantially improves the average power consumption in NSFNET and USNET topologies.

**Paper Code: ICEE- 1252**

# On the Interaction Between Meteorological Conditions and Performance Optimization in MISO Free-Space Optical Communication

Meysam Ghanbari- Mahdis Saghaee Jahed- Seyed Mohammad Sajad Sadough

Shahid Beheshti University- Shahid Beheshti University- Shahid Beheshti University

Abstract

In this paper, we investigate the effect of meteoro- logical conditions on the performance of a multiple-input single- output (MISO) free-space optical (FSO) communication system. First, by taking into account the effect of pointing error and turbulence, we derive an analytical channel model. Second, we derive a closed-form expression for the outage probability and the average link availability. We further analyze the complexity- performance trade-off and then we propose two beamwidth optimization methods to maximize the overall availability of the system in different weather conditions. We show that a significant performance improvement is achieved by using optimum adap- tive beamwidth or by increasing the number of transmitters. The efficiency of the proposed method is validated through simulations using realistic meteorological data of Tehran, Iran. Index Terms—Free-space optical, atmospheric turbulence, multiple-input single-output, meteorological conditions.

**Paper Code: ICEE- 1267**

# Bit Error Rate Analysis for a Mixed Underwater OWC-FSO Relaying System in the Presence of Pointing Error

Mahdis Saghaee Jahed - Meysam Ghanbari - Seyed Mohammad Sajad Sadough

Shahid Beheshti University- Shahid Beheshti University- Shahid Beheshti University

Abstract

In this paper, we analyze the performance of a dual- hop mixed underwater optical wireless communication (UOWC)- multiple aperture free-space optical (FSO) relaying system by taking into account the effect of strong turbulence under pointing error (PE). To this end, we first derive a statistical channel model for the considered UOWC link alongside with the closed-form expression for its average bit error rate (BER). Then, we address the end-to-end average BER of the considered setup and we discuss the impact of PE in the UOWC link and the number of deployed receivers in the FSO link on different performance indicators. Simulation results are also included to validate the accuracy of our analysis.

**Paper Code: ICEE- 1368**

# A Practical ACO-OFDM Link with an Efficient Timing Recovery Pattern

Maryam Sadeghi - Masoud Johar - Mahdi Shabany

Sharif University of Technology- Amirkabir University of Technology- Sharif University of Technology

Abstract

In this paper, to increase the accuracy of estimat- ing timing offset for asymmetrically-clipped optical orthogonal frequency division multiplexing (ACO-OFDM) systems, we intro- duced a new frame synchronization pattern, where repetition in the time domain is used to build the new training pattern. Sim- ulation results prove that the suggested frame synchronization provides an exact approximation of the symbol timing.

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## ICEE-1079

## A 30dB and 250µW High Linear Variable Gain Amplifier with Employing Gm-boosting and Common Mode Feedforward Techniques

* Mehdi Shahabi

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## ICEE-1237

## High PSRR, 0.7nW MOSFET-Only Subthreshold Voltage Reference

* Mohammad Rashtian- Mahdi Shahpasandi

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## ICEE-1443

## Ultra-Low Power Current-Mode ASK Demodulator for Contactless Smart Cards

* Somayeh Yousefi- Mohsen Jalali

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## ICEE-1556

## A novel CMRR Enhancement technique in fully-differential Class-AB OTAs

* Amirhossein Sabour - Mahsa Ramezan Pour - Mohammad Yavari

ICEE-1559

# طراحی و شبیه‌سازی مبدل کاهنده دو مرحله‌ای با کنترل‌کننده زمان روشن-خاموش تطبیقی

*نوید گودرزی- حسین پاک‌نیت- نوید یثربی

**Paper Code: ICEE-1079**

# A 30dB and 250µW High Linear Variable Gain Amplifier with Employing Gm-boosting and Common Mode Feedforward Techniques

Mehdi Shahabi

University of Tabriz

Abstract

This paper presents a low power, high linear variable gain amplifier (VGA) for wireless sensor network (WSN) applications in the 0.18 µm CMOS technology. The circuit is based on **gm** -boosting technique to achieve high linearity performance and uses Common-Mode Feed-Forward (CMFF) technique to suppress the input common mode signals at the output with a minimum cost of area and power consumption. This makes double the transconductance of the circuit and further reduce the power needed to achieve a good performance in terms of gain and input referred noise. The circuit consumes only 250 µW under a 1.8 V supply voltage and the differential output swing is around 600 mVp-p. The voltage gain is in the range between 0 dB to 30 dB in steps of 6 dB and the minimum 3 dB bandwidth is 4.7 MHz with capacitive loadsof 4.5 pF. The input-referred noise (IRN) voltage is12.75 **nV** √**Hz**⁄ at high gain and third input intercept point(IIP3) of proposed VGA is 22 dBm at low gain.

**Paper Code: ICEE-1237**

# High PSRR, 0.7nW MOSFET-Only Subthreshold Voltage Reference

Mohammad Rashtian- Mahdi Shahpasandi

Aviation Electronics Civil Aviation Technology College- Aviation Electronics Civil Aviation Technology College

Abstract

This paper presents a high power supply ripple rejection (PSRR) sub-nano-Watt voltage reference (VR). It utilizes a self-current biasing circuit to reduce the voltage dependency of the output voltage to the power supply. All the transistors work in the subthreshold region for low voltage and power operation. Simulation results using a standard 0.18 µm CMOS process shows a nominal output voltage of 0.150 V with a power supply ripple rejection (PSRR) of -81.5466 dB at Vdd = 1V. The average temperature coefficient (TC) is about 16.51 oC/ppm over a temperature range of 0 oC to 120 oC where the proposed VR consumes 0.72 nW at room temperature. An average line sensitivity (LS) of 0.072 %/V is achieved for the supply voltage range from 0.5 V to 1.8 V.

**Paper Code: ICEE-1443**

# Ultra-Low Power Current-Mode ASK Demodulator for Contactless Smart Cards

Somayeh Yousefi- Mohsen Jalali

Shahed University- Shahed University

Abstract

A fully CMOS current-mode ASK demodulator for contactless smart cards is proposed. The power consumption of the ASK demodulator has been reduced to 7μW utilizing a dc- current removal technique. Due to this technique, only the ac component of the envelope signal is amplified by the current amplifier to drastically reduce power consumption. The results reveal a modulation index of 5% with a data rate of 800kbps is supported by the ASK demodulator.

**Paper Code: ICEE-1556**

# A novel CMRR Enhancement technique in fully-differential Class-AB OTAs

Amirhossein Sabour - Mahsa Ramezan Pour - Mohammad Yavari

Amirkabir University of Technology- Amirkabir University of Technology- Amirkabir University of Technology

Abstract

In this paper, a novel method of improving the CMRR and SR of OTAs has been proposed. Our scheme suggests the elimination of the biasing current source of class-A OTAs with the goal of SR enhancement and proposes a novel and intuitive CMRR enhancement technique to counteract the negative effect of the eliminated biasing current source. One major advantage of our proposed scheme is its ability to be easily incorporated into various OTA architectures. Circuit-level simulations have been carried out using 180nm CMOS technology with HSPICE. Our simulation results show that the resulting OTA from our technique exhibits a 2.38-time increase in SR and a 30dB CMRR enhancement compared to the initially considered class-A OTA, while maintaining approximately the same values in other metrics.

**کد مقاله: ICEE-1559**

# طراحی و شبیه‌سازی مبدل کاهنده دو مرحله‌ای با کنترل‌کننده زمان روشن-خاموش تطبیقی

نوید گودرزی- حسین پاک‌نیت- نوید یثربی

دانشگاه شیراز- دانشگاه شیراز- دانشگاه شیراز

چکیده

در این مقاله به طراحی و شبیه‌سازی مبدل DC به DC کاهنده دومرحله‌ای (Double Step Down(DSD)) با کنترل‌کننده تطبیقی زمان-روشن-خاموش سریع (Fast Adaptive ON-OFF Time) که ولتاژ ۴۸ ولت را به ولتاژ ۱ ولت تبدیل می‌کند، پرداخته شده است. طراحی انجام شده دارای تحمل بالا در برابر تغییرات بار خروجی است به گونه‌ای که زمانی که بار از ۰/۱ آمپر به ۲ آمپر و یا برعکس به صورت آنی تغییر می‌کند، ولتاژ خروجی تنها به ترتیب ۱۰۵ و ۱۰۳ میلی ولت کاهش و افزایش می‌یابد و در زمان نشست ۴/۴ و ۳/۷ میکروثانیه مجدداً به مقدار نهایی ۱ ولت باز می‌گردد.

سی و یکمین کنفرانس بین‌المللی مهندسی برق

۱۹ الی ۲۱ اردیبهشت ماه ۱۴۰۲

**31st International Conference on Electrical Engineering**

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| سه شنبه ۱۹ اردیبهشت ماه ۱۴۰۲ ساعت ۱۴:۳۰ الی ۱۶:۰۰ | | |
| عنوان نشست: **کنترل ۱**- کنترل بهینه | | |
| **روسای نشست** | دکتر حمید خالوزاده | دانشگاه صنعتی خواجه نصیرالدین طوسی |
| | دکتر امیرابوالفضل صورتگر | دانشگاه صنعتی امیرکبیر |
| | دکتر ابوالفضل یغمایی | ؟؟؟؟؟؟؟؟؟ |

## ICEE-1033

## ردیابی اهداف کوچک مادون قرمز مبتنی بر فیلتر کالمن بهینه‌شده با الگوریتم نهنگ و ازدحام ذرات

*نازنین بهمن جو - سعید خان‌کلانتری

## ICEE-1044

## Model Predictive Control for Optimal Drug Administration of Cancer Chemotherapy

*Zahra Hosseinpour - Amirhossein Nikoofard - Erfan Nejabat

## ICEE-1047

## A reinforcement learning-based control approach for tracking problem of a class of nonlinear systems: Applied to a Single-Link Manipulator

*Farshad Rahimi - Sepideh Ziaei - Reza Mahboobi Esfanjani

**ICEE-1107**

**انتخاب سبد سهام بهینه در بورس تهران با استفاده از تقریب تصادفی انحراف همزمان**

*زینب گدازگر، سجاد ازگلی

**ICEE-1167**

**Optimal Bidding Strategy with Smooth Budget Delivery in Online Advertising**

*Mohammad Afzali - Keykhosro Khosravani - Maryam Babazadeh

**ICEE-1375**

**Design of Optimal Iterative Learning Control AutoPilot for Landing Fixed-Wing Aircraft**

*Ali Raddanipour - Masoud Shafiee

کد مقاله: ICEE-1033

# ردیابی اهداف کوچک مادون قرمز مبتنی بر فیلتر کالمن بهینه‌شده با الگوریتم نهنگ و ازدحام ذرات

نازنین بهمن جو - سعید خان‌کلانتری

دانشگاه صنعتی خواجه نصیرالدین طوسی- دانشگاه صنعتی خواجه نصیرالدین طوسی

چکیده

ردیابی اهداف یکی از مهمترین مسائل روز در حوزه بینایی ماشین است که در سال‌های اخیر مورد توجه قرار گرفته است. یکی از مهمترین چالش‌هایی که در این فرآیند می‌بایست مدنظر قرار گیرد، مقاومت روش پیشنهادی در ردیابی اهدافی است که در برخی از فریم‌های آن هدف محو و یا جابجایی شدید خواهد داشت. در این مقاله با استفاده از آستانه‌بندی اُتسو و فیلتر کالمن بهینه، روشی نوین برای ردیابی اهداف کوچک در دنباله‌های ویدیویی مادون قرمز پیشنهاد شده است. آستانه‌بندی اُتسو یک الگوریتم شناخته شده و کارآمد در یافتن آستانهٔ مناسب برای بخش‌بندی تصویر به دو ناحیه پس‌زمینه و پیش‌زمینه می‌باشد. در روش پیشنهادی برای دستیابی به تخمین دقیق‌تری از موقعیت هدف، با بکارگیری الگوریتم‌های بهینه‌سازی نهنگ و ازدحام ذرات، ساختار فیلتر کالمن بهینه شده است تا در نهایت هدف با بهترین دقت در شرایط نویزی ردیابی شود. در واقع این بهبود با بهینه‌سازی ضرایب مورد استفاده در تقریب نویز اندازه‌گیری و فرآیند، که منجر به فراهم‌سازی بهترین بستر ممکن برای تخمین موقعیت بعدی هدف می‌شود، همراه است. دستیابی به درصد خطای تخمین پایین ۱/۶۵ بر روی داده واقعی، عملکرد موفق روش پیشنهادی را در مقایسه با سایر روش‌ها نشان می‌دهد.

**ICEE-1044**

# Model Predictive Control for Optimal Drug Administration of Cancer Chemotherapy

Zahra Hosseinpour - Amirhossein Nikoofard - Erfan Nejabat

University of K. N. Toosi- University of K. N. Toosi- University of K. N. Toosi

Abstract

Tumor chemotherapy is one of the most effective ways to improve cancer treatment. However, it is important to design an effective treatment plan that can optimize chemotherapy to reduce its imminent side effects. In this work, a model predictive control strategy for a nonlinear dynamic model of the cancer chemotherapy system is presented. This paper, first deals with parametric uncertainties. The appearance of uncertain parameters in the nonlinear system is proposed to define the negative effect of drug tolerance and delay in the mentioned system. Also, a hybrid cost function is considered for this model, which reduces the length of the treatment period. The simulation results show that the proposed control structure satisfactorily overcomes the negative effect of parameter uncertainties. Cancer cells can be eradicated in a very short period of time by minimizing the amount of drugs using optimal treatment administration.

ICEE-1047

# A reinforcement learning-based control approach for tracking problem of a class of nonlinear systems: Applied to a Single-Link Manipulator

Farshad Rahimi - Sepideh Ziaei - Reza Mahboobi Esfanjani

Sahand University of Technology- Sahand University of Technology- Sahand University of Technology

Abstract

This paper introduces a reinforcement learningbased tracking control approach for a class of nonlinear systems using neural networks in the presence of adversarial attacks. This approach incorporates a simultaneous tracking and optimization process. It is necessary to be able to solve the Hamilton-JacobiBellman equation (HJB) in order to obtain optimal control input, but this is difficult due to the strong nonlinearity terms in the equation. In order to find the solution to the HJB equation, we used a reinforcement learning approach. In this online adaptive learning approach, three neural networks are simultaneously adapted: the critic neural network, the actor neural network, and the adversary neural network. Ultimately, simulation results are presented to demonstrate the effectiveness of the introduced method on a manipulator

**کد مقاله: ICEE-1107**

# انتخاب سبد سهام بهینه در بورس تهران با استفاده از تقریب تصادفی انحراف همزمان

زینب گدازگر، سجاد ازگلی

دانشگاه تربیت مدرس- دانشگاه تربیت مدرس

چکیده

انتخاب سبد بهینه، شیوه‌ای مناسب جهت دستیابی به بازده بیشینه و به‌طور همزمان کمینه‌سازی ریسک ست، که در آن مقدار ثابتی سرمایه به مجموعه‌ای از دارایی‌ها تخصیص می‌یابد. در عمل، مجموعه‌ای از قیود اساسی برای این مسئله وجود دارند که محدودیت‌هایی از جمله سرمایه‌گذاری در تعداد معینی از دارایی‌ها را به‌دنبال خواهندداشت. افزون بر این محدودیت‌ها، سنجه‌های ریسک که توابعی مشتق ناپذیر و غیرمحدب اند، ایجاب می‌کنند از ابزار مناسب جهت بهینه‌سازی بهره‌جست. روش‌های متعددی برای حل این مسئله ارائه شده‌اند که به دلیل محدودیت‌ها و پیچیدگی مساله، تنها به ابزاری تحقیقاتی تبدیل گشته‌اند که برای یافتن پاسخ، ناچار به پذیرش ساده‌سازی بسیار اند. بنابراین لازم است روشی کارآمد برای یافتن حل‌های نزدیک به بهینه، با هزینه‌های محاسباتی منطقی که برای افراد در کاربردهای عملی نیز قابل استفاده باشد، ارائه‌گردد. در این مقاله پیش‌بینی سبد سهام بهینه با درنظر گرفتن قیود اساسی، برای نخستین بار با استفاده از تقریب تصادفی انحراف همزمان در بورس تهران، ارائه‌شده‌است. هدف از این بهینه‌سازی غیرمحدب، دستیابی به حداکثر ارزش سبد سهام و حداقل ریسک ممکن با معیار اندازه‌گیری ارزش در معرض ریسک مشروط می‌باشد. نتایج عددی بیانگر آن‌ست که، روشی قدرتمند با بازده محاسباتی مناسب به منظور انتخاب و پیش‌بینی سبد سهام بهینه ارائه-گردیده‌است.

ICEE-1167

# Optimal Bidding Strategy with Smooth Budget Delivery in Online Advertising

Mohammad Afzali - Keykhosro Khosravani - Maryam Babazadeh

McMaster University- Sharif University of Technology- Sharif University of Technology

Abstract

In this paper, the optimal bidding strategy with smooth budget delivery in a real-time bidding (RTB) platform is addressed. Feedback control theory plays an essential role in the performance enhancement of ad campaigns in online advertising industry. The objective is to determine the optimal bidding prices as control signals such that (i) the total number of clicks by visiting users is maximized, and (ii) the campaign budget in every episode is smoothly delivered without a premature finishing of the campaign budget or excessive spending rates. In this paper, the advertisers are regarded as the agents in a Markov decision process, where the rewards are chosen according to the main campaign objectives. An advertiser is supposed to select a sequence of bidding actions in terms of a control policy such that a long-term accumulation of the rewards is maximized. It is shown that the smooth bidding with real-time adaptation fits into the framework of reinforcement learning with dynamic programming. Accordingly, an approximation algorithm is proposed to solve the corresponding Bellman optimality equation. The results are utilized to form the bidding strategy with smooth budget delivery. Simulation results on a real-world dataset confirm that the proposed approach outperforms the state-of-the-art bidding strategies, by sustainable participation in the auctions, and maximizing the number of user clicks.

ICEE-1375

# Design of Optimal Iterative Learning Control AutoPilot for Landing Fixed-Wing Aircraft

Ali Raddanipour - Masoud Shafiee

Amirkabir University of Technology- Amirkabir University of Technology

Abstract

In this paper general longitudinal dynamic of a fixed-wing airplane is presented then the challenges of the landing phase are described. Next, an optimal iterative learning control (ILC) is introduced and an optimal ILC-based autopilot is proposed to control the aircraft in the landing phase. Finally, the presented autopilot is simulated by applying a linear and nonlinear model of General Aviation as a fixed-wing aircraft model.

دانشگاه صنعتی امیرکبیر
( پلی تکنیک تهران )

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| | دکتر حسین فیروزه | دانشگاه صنعتی اصفهان |

## ICEE-1118

## Development of a Compact Linearly Polarized Wideband Hybrid Antenna Using Semi-Elliptical SIW Resonator and Patch Radiator

* Behzad Hosseinitalab - Mohammad Hassan Neshati

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## ICEE-1129

## Broadband Two Layers 1-Bit Metal-Only Transmitarray with Polarization Conversion Technique

* Majid Karimipour- Iman Aryanian

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## ICEE-1160

## Effect of Physical Characteristics on Artificial Neural Network Error Reduction for Indoor Propagation Modeling

* SeyedehMounes Eslami- Amir Ahmad Shishegar

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## ICEE-1179

## Analysis of the RCS of Luneburg Reflector in Bistatic Mode

* Mohammad Amin Abdollahi- Gholamreza Moradi

**ICEE-1181**

**A Novel Ultra Wide-Band Antenna for the Array with Shaped Beam Radiation Pattern**

* Shima Amirinalloo- Zahra Atlasbaf

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**ICEE-1183**

**A compact 5G-MIMO antenna with reduced mutual coupling**

* Marziyeh Amiri- Ali Ghafoorzadeh-Yazdi- Abbas-Ali Heidari

**Paper Code: ICEE-1118**

# Development of a Compact Linearly Polarized Wideband Hybrid Antenna Using Semi-Elliptical SIW Resonator and Patch Radiator

Behzad Hosseinitalab - Mohammad Hassan Neshati

Ferdowsi University of Mashhad- Ferdowsi University of Mashhad

Abstract

A novel linearly polarized (LP) wideband hybrid antenna using semi-elliptical substrate integrated waveguide (SIW) cavity and a patch radiator is proposed. The cavity is tuned at its fundamental resonant frequency, which excites the patch radiator in such a way that the resonant frequencies of the two resonators are merged to provide broadband operation. The hybrid antenna is simulated using High Frequency Simulation Structure (HFSS) and the results including reflection coefficient, impedance bandwidth, co- and cross-polarization patterns, Half Power Beam width (HPBW), and the variation of gain versus frequency is reported. It is shown that the proposed hybrid antenna provides 10.9% fractional impedance bandwidth (FBW) with gain of 6.55 dB.

**Paper Code: ICEE-1129**

# Broadband Two Layers 1-Bit Metal-Only Transmitarray with Polarization Conversion Technique

Majid Karimipour- Iman Aryanian

Arak University- ICT Research Institute

Abstract

A novel broadband two layers 1-bit metal-only transmitarray based on multi-frequency phase distribution synthesis is introduced in this paper. The proposed element for the antenna is composed of two identical double C-shaped slots etched on two metallic top and bottom plates with 90° differences between their orientations to guarantee the polarization conversion for the transmitted wave. The phase state of the transmitted wave is simply varied by 180° by only rotating the bottom metallic layer equal to 180°. Four posts are placed between the two metallic screens to not only further improve the frequency bandwidth behavior of the element but also enhance the robustness of the structure mechanically. The simulation results showed that the x-polarized transmitted wave has an amplitude larger than 0.9 from 12.5 GHz to 17.3 GHz when the y-polarized wave is illuminated to the structure. To achieve a flat gain response within the band, the optimum phase distribution of the array is obtained using a multi-frequency synthesis method based on reference phase optimization for different frequencies. To this end, the variance of the gain level of the antenna is considered as the cost function in the optimization algorithm. A 17.5 cm× 17.5 cm (25×25 element) transmitarray is designed and simulated and the results showed that the pattern has a flat gain response and the 1-dB gain bandwidth is 13.5 GHz-18 GHz (28.57%).

**Paper Code: ICEE-1160**

# Effect of Physical Characteristics on Artificial Neural Network Error Reduction for Indoor Propagation Modeling

SeyedehMounes Eslami- Amir Ahmad Shishegar

Sharif University of Technology- Sharif University of Technology

Abstract

In this paper, we examine the effect of physics-based input data in artificial neural network (ANN) for indoor propaga- tion. Our prior knowledge of electromagnetic propagation forms, enables us to predict path loss for a specified geometry. There is a good agreement between ANN predicted output and ray-tracing results for a simple room and the error reduces notably compared to related works. Additionally, we explore feature extraction for more complex scenarios.

**Paper Code: ICEE-1179**

# Analysis of the RCS of Luneburg Reflector in Bistatic Mode

Mohammad Amin Abdollahi- Gholamreza Moradi

Amirkabir University of Technology- Amirkabir University of Technology

Abstract

Luneburg reflector is a spherical passive microwave reflector usually used for RCS enhancement. Luneburg reflector has three modes: monostatic, bistatic, and equatorial. The main idea of this paper is to study and analyze the RCS of the Luneburg reflector and increases its angle of aperture in bistatic mode. The electromagnetic behavior of this reflector is analyzed with the Mie-Lorentz theory. Also, the experimental test results are used in this analysis. The effective parameters of this reflector, such as reflector radius, cap radius, operating frequency band, and permittivity of the reflector, are studied in this work. The Luneburg reflector pattern is presented in both the azimuth constant and elevation constant to determine the proper orientation of the reflector toward a target. This is crucial when maximizing the RCS is needed. Last but not least, challenges with designing of Luneburg reflector for operating in bistatic mode are discussed, and a reflector is designed to operate at the mm-wave range.

**Paper Code: ICEE-1181**

# A Novel Ultra Wide-Band Antenna for the Array with Shaped Beam Radiation Pattern

Shima Amirinalloo- Zahra Atlasbaf

Tarbiat Modares University- Tarbiat Modares University

Abstract

In this paper, a linear Ultra-Wideband (UWB) antenna array with the shaped beam radiation pattern is studied for wireless communication and target detecting applications, respectively, operating in the frequency band of 0.8-4.18GHz. The Array consists of 16 Ultra-Wide Band Antenna Elements with an elliptical radiator and a U-shaped slot on the Ground for bandwidth (BW) enhancement, in size of 104.9×104.9 mm2. The return loss of the antenna in the whole frequency band is less than -10 dB. In addition, the synthesis methods of the shaped beam radiation patterns are based on Woodward-Lawson superposition principle, and modified-Taylor method for controlling the shaped beam's side lobe level (SLL)beam. The antenna E-plane (2D) radiation pattern shows agreement to array design with shaped beam radiation pattern. Also, the fidelity factor of the antenna element is studied.

**Paper Code: ICEE-1183**

# A compact 5G-MIMO antenna with reduced mutual coupling

Marziyeh Amiri- Ali Ghafoorzadeh-Yazdi- Abbas-Ali Heidari

Yazd university- Yazd university- Yazd university

Abstract

In this paper, a compact 2×4 rectangular MIMO array antenna is proposed for the 3.45 GHz operating frequency with relative low mutual coupling and high isolation between its elements. The dimension of the structure is 116 mm × 74 mm. The isolation is enhanced up to 17 dB by using the spiral defected ground structure (DGS), neutralization line and resistive loading of the antenna elements. In compared to the reference paper, the area of the array antenna is reduced 24% and the isolation between its elements is increased 2-5 dB. The proposed structure seems to be suitable for 5G smartphone applications.

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**ICEE-1182**

**Efficiency Estimation Methods of In-Service Induction Motors-A Review**

* Moslem Geravandi - Hassan Moradi CheshmehBeigi

**ICEE-1058**

**Optimization of a three-phase Induction Motor for Electric Vehicles Based on Hook-Jews Optimization Method**

* Arash Mousaei - Naghi Rostami - Mohammad Bagher Bannae Sharifian

**ICEE-1094**

**Design and Electromagnetic Analysis of Brushless Salient Pole Switching Flux Synchronous Generator with DC Auxiliary Field Winding for Wind Energy Converter Systems**

* Seyed Hamed Bibak - Mohammad Hossein Mousavi - Moslem Geravandi

**ICEE-1185**

**Stator Windings Resistance Estimation Methods of In-Service Induction Motors-A Review**

* Moslem Geravandi - Hassan Moradi CheshmehBeigi

**ICEE-1250**

**An Optimized Speed Controller for Brushless DC motor using Hybrid Genetic-Fuzzy Controller Technique**

* Mohammad Mahdi Marzban

**ICEE-1233**

**تحلیل دینامیکی ماشین سنکرون مغناطیس دائم با آهنربای جانبی و تحلیل خطای اتصال کوتاه داخلی و ضعیف شدن آهنربا**

*آزیتا فتحی - پیمان نادری

**ICEE-1512**

**Low power SRAM using an optimal number of split bit lines and single-ended sensing**

* Mahdie Nazemian - Sayed Masoud Sayedi

ICEE-1182

# Efficiency Estimation Methods of In-Service Induction Motors-A Review

Moslem Geravandi - Hassan Moradi CheshmehBeigi

University of Razi- University of Razi

Abstract

A large part of motors in the industry are induction motors (IMs). By carefully determining the efficiency of IMs, it is possible to avoid wasting a significant amount of electrical energy. Measuring the efficiency of IMs using international standards is very intrusive due to the need to perform various tests to measure the efficiency and cannot be used to determine the efficiency of in-service IMs. Considering that determining the efficiency of in-service IMs should be nonintrusive as much as possible, various methods have been introduced in the literature to estimate the efficiency of IMs. Therefore, regarding the importance of accurate estimation of the efficiency of IMs, in this paper, different efficiency estimation methods are introduced and reviewed. In the following, by comparing the existing efficiency estimation methods in terms of accuracy and intrusiveness, the most suitable method for efficiency estimation of in-service IMs is introduced.

ICEE-1094

# Design and Electromagnetic Analysis of Brushless Salient Pole Switching Flux Synchronous Generator with DC Auxiliary Field Winding for Wind Energy Converter Systems

Seyed Hamed Bibak - Mohammad Hossein Mousavi - Moslem Geravandi

Razi University-

Razi University- Razi University

Abstract

Due to the depletion of fossil resources, employing renewable energies has been increased and experienced significant growth in recent years. Among these long-lasting sources, wind energy is one of the best sources for energy supply in the entire world due to its availability and continuity. The specific generators used in wind turbines, such as doubly-fed generators, have dominated wind turbines due to their low cost. But the main issue associated with these types of generators is their sensitivity to voltage drop. In fact, with the occurrence of faults within the grid and the resulting voltage drop, the current on the stator side increases and due to the connection between the stator and the rotor, this current is transferred to the rotor leading to utilizing complex and expensive electronic power converters. In this paper, the design and electromagnetic analysis of brushless salient pole induction generator with direct current auxiliary field winding is investigated. On the proposed stator structure, in addition to the phase windings, there are also field windings while there are no windings placed on the rotor. The proposed structure can easily manage the flux through the simple control of the direct current of the field winding. This way, generator output voltage is effectively controlled. The analysis and simulation results guarantee the suggested structure.

**ICEE-1185**

# Stator Windings Resistance Estimation Methods of In-Service Induction Motors-A Review

Moslem Geravandi - Hassan Moradi CheshmehBeigi

University of Razi- University of Razi

Abstract

To estimate the efficiency of induction motors (IMs), it is necessary to determine the exact value of the stator windings resistance (SWR). Measuring the SWR of IMs requires opening the IM supply connections, which is very intrusive. Considering that determining the SWR value of inservice IMs should be as non-intrusive as possible, various methods have been introduced in the literature to estimate the SWR of IMs. Therefore, according to the necessity of determining the SWR value in the in-service IMs in a nonintrusive way, in this article, different methods of determining SWR are introduced and reviewed. In the following, by comparing the existing methods of estimating the SWR value in terms of accuracy and intrusiveness, the most suitable method for estimating the SWR value in the in-service is introduced. The effectiveness of the chosen method is verified by the simulation of a 4 kW IM in MATLAB software and by comparing the results obtained from the SWR estimation by the chosen method and the actual SWR value.

ICEE-1250

# An Optimized Speed Controller for Brushless DC motor using Hybrid Genetic-Fuzzy Controller Technique

Mohammad Mahdi Marzban

Saba Power Plant Operation and Maintenance Company

Abstract

This paper presented the hybrid auto-tuning technique for the brushless direct current motor speed control combining fuzzy logic controller and genetic algorithm (GA). Based on the combination of Genetic algorithm (GA) that belongs to the larger class of evolutionary algorithms with Fuzzy logic controller that operates based on the database rules and intelligent decision making, an optimized speed controller is proposed. In this control framework, the GA-Fuzzy controller contains current feedback loop which is to adjust the torque of the motor and the fuzzy logic controller loop whose control rules are optimized off-line and parameters are adjusted based on the genetic algorithm. The simulation results can proved that the proposed technique has better performance than conventional PID controller

ICEE-1233

# تحلیل دینامیکی ماشین سنکرون مغناطیس دائم با آهنربای جانبی و تحلیل خطای اتصال کوتاه داخلی و ضعیف شدن آهنربا

آزیتا فتحی - پیمان نادری

دانشگاه تربیت دبیر شهید رجایی- دانشگاه تربیت دبیر شهید رجایی

چکیده

تجزیه و تحلیل عملکرد ماشین سنکرون با آهنربای جانبی (**ST-PMSM**)در این مقاله بررسی شده است. عملکرد ماشین در حالت‌های سالم و معیوب مورد تجزیه و تحلیل قرار گرفته و خطاهای اتصال کوتاه داخلی (**IT**) و ضعیف شدن آهنربا (***PD***) توسط یک مدل منحصر به فرد در نظر گرفته شده است. علائم جریان استاتور (**SCSA**) برای تشخیص عیب استفاده و روشی برای تشخیص عیوب فوق و جداسازی آن‌ها پیشنهاد شده است. با منظور کردن اثر غیرخطی هسته، از مدار معادل مغناطیسی منعطف (**MEC**) با دقت قابل تنظیم به دلیل انعطاف پذیری بیشتر و زمان پردازش کوتاه‌تر در مقایسه با روش اجزای محدود (**FEM**) برای تحلیل استفاده شده است. چگالی طیفی توان (**PSD**) جریان برای تشخیص خطا استفاده شده و اعتبار سنجی از طریق روش اجزای محدود، اثربخشی مدل و روش تشخیص پیشنهادی را اثبات کرده است.

ICEE-1512

# Low power SRAM using an optimal number of split bit lines and single-ended sensing

Mahdie Nazemian - Sayed Masoud Sayedi

Isfahan University of Technology- Isfahan University of Technology

Abstract

In the proposed SRAM architecture in this work, the power is reduced by partitioning the structure into different blocks and also applying some power reduction techniques on the cells. The structure not only reduces power consumption but also increases the reading speed. For a read operation, by having an output line connected to the blocks, instead of the cells, it is possible for any given memory size to have an optimal number of blocks to decrease the power, without creating extra capacitive effects on the output lines. By reducing the power consumption in the inactive cells and reducing the capacitive load on the bit lines, both the power consumption and speed parameters have been improved . The memory structure is implemented by using the SKILL language to automatically implement any given memory size with an optimal number of blocks for minimum power consumption

دانشگاه صنعتی امیرکبیر
( پلی تکنیک تهران )

انجمن علوم مهندسی برق ایران
مجوز ۱۳۹۰

**سی و یکمین کنفرانس بین‌المللی مهندسی برق**

**۱۹ الی ۲۱ اردیبهشت ماه ۱۴۰۲**

**31st International Conference on Electrical Engineering**

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| عنوان نشست: **قدرت (انرژی ) ۲**- شبکه‌های توزیع | | |
| **روسای نشست** | دکتر مسعود علی اکبر گلکار | دانشگاه صنعتی خواجه نصیرالدین طوسی |
| | دکتر امیر خرسندی | دانشگاه صنعتی امیرکبیر |
| | دکتر محسن کلانتر | دانشگاه علم و صنعت ایران |

## ICEE-1014

## A Novel Two-level Energy Storage Planning to Increase the Resilience of Distribution Networks

***** Sina Samadi Gharehveran- Saeid Ghassem Zadeh- Naghi Rostami

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## ICEE-1310

## Research on Sectionalizing Switches Placement Problem of Distribution System Automation Based on Multi-Objective Optimization Analysis

*Selma Cheshme Khavar- Arya Abdolahi

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## ICEE-1254

## بررسی تاثیر اعمال پوشش مش متال در مقاومت حرارتی و خوردگی سیم فولادی استحکام بالا بعنوان مغزی هادی‌های پرظرفیت ACSS

*فائزه راد- مهرنوش طاهرخانی- ناصر میرشاه ولایتی- عبداله جواهری

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## ICEE-1333

## Service Restoration in Distribution Networks Based on a Two-stage Power Flow Model

* Saman Armand- Jalal Heidary- Eli Shirazi

**ICEE-1479**

# تعیین نقشه راه مناسب شرکت‌های توزیع کشور در زمینه مدیریت سمت تقاضا

*محمدرحیم محمدی

**Paper Code: ICEE-1014**

# A Novel Two-level Energy Storage Planning to Increase the Resilience of Distribution Networks

Sina Samadi Gharehveran- Saeid Ghassem Zadeh- Naghi Rostami

University of Tabriz- University of Tabriz- University of Tabriz

Abstract

This paper proposes a two- level energy storage system planning to enhance the resiliency of the system under extreme conditions. For this purpose, a conditional value at risk-based model is proposed to model the uncertainty of weather events and then an optimization based on stochastic scenarios is performed to allocate the energy storage and the different types of distributed generation units. Finally, the proposed model is applied to the IEEE 33-node system, and various case studies are analyzed and presented to illustrate the performance of the model. The results received from simulations affirm the effectiveness of our mathematical version in improving the resilience of distribution networks against severe failures.

**Paper Code: ICEE-1310**

# Research on Sectionalizing Switches Placement Problem of Distribution System Automation Based on Multi-Objective Optimization Analysis

Selma Cheshme Khavar- Arya Abdolahi

Amirkabir University of Technology- Amirkabir University of Technology

Abstract

Achieving high distribution-reliability levels and concurrently minimizing operating costs can be considered as the main issues in distribution system optimization. Determination of the optimal number and location of automation devices in the distribution system network is an essential issue from the reliability and economical points of view. To address these issues, this paper develops a multi-objective model, wherein the primary objective, optimal automation devices placement is implemented aiming at minimizing the operating costs, while in the second objective the reliability indices improvement is taken into account. So, modified non dominated sorting genetic algorithm, is developed and presented to solve this multi-objective mixed-integer non-linear programming problem. The feasibility of the proposed algorithm examined by application to two distribution feeders of the Tabriz distribution network containing the third feeder of the Azar substation with a distributed generation unit and first and third feeders of ElGoli substation which form a double feed feeder.

**کد مقاله: ICEE-1254**

# بررسی تاثیر اعمال پوشش مش متال در مقاومت حرارتی و خوردگی سیم فولادی استحکام بالا بعنوان مغزی هادی‌های پرظرفیت ACSS

فائزه راد- مهرنوش طاهرخانی- ناصر میرشاه ولایتی- عبداله جواهری

صنایع مفتولی زنجان

چکیده

استفاده از هادی های پرظرفیت آلومینیومی فشارقوی ACSS (هادی آلومینیومی حمایت شده با فولاد) در سالهای اخیر به عنوان یک راه حل مطمئن و اقتصادی برای افزایش ظرفیت خطوط انتقال و توزیع بدون نیاز به تغییر و تقویت دکلها و همچنین بدون نیاز به احداث خطوط جدید مطرح شده است. امروزه هادی های ACSS با مغزی فولادی MA ( مغزی فولادی با پوشش مش متال) به دلیل مزیتهای بیشتری که در مقایسه با مغزی فولادی GA (مغزی فولادی با پوشش گالوانیزه) دارا بوده، بسیار مورد توجه قرار گرفته است. یکی از مزیت های مهم استفاده از این هادی های پرظرفیت با پوشش مش متال، قابلیت کار در دماهای بالا تا ۲۵۰ درجه سانتیگراد و همچنین مقاومت به خوردگی تا ۳ برابر بیشتر در محیط های خورنده و مرطوب می باشد. در این مقاله بررسی تاثیرات اعمال پوشش مش متال بر روی مغزی های فولادی در مقاومت به خوردگی و مقاومت به حرارتی آنها در مقایسه با پوشش گالوانیزه معمولی مورد مقایسه قرار گرفته است.

**Paper Code: ICEE-1333**

# Service Restoration in Distribution Networks Based on a Two-stage Power Flow Model

Saman Armand- Jalal Heidary- Eli Shirazi

Iran University of Science and Technology- Amirkabir University of Technology- University of Twente

Abstract

The steady-state power flow equations are the basis for every computational problem related to power systems. One of these problems is the service restoration problem, which should be solved to reenergize out-of-service loads. In this paper, a two-stage power flow model is presented for electrical distribution systems. The two-stage power flow model can be applied to solve the service restoration problem in electrical distribution systems based on any heuristic or meta-heuristic method generating the state of switches and zones as a sequence of binary digits. Moreover, to minimize the number of non-faulted out-of-service zones and nodes while considering technical constraints, each topology generated by a heuristic or meta-heuristic method is evaluated and ranked using the proposed two-stage power flow model. Therefore, the highest-ranked topology is selected as the optimum topology. Finally, a meta-heuristic method is used to address the restoration problem on a 44-node test system, demonstrating the effectiveness and practicality of the proposed method.

**کد مقاله: ICEE-1479**

# تعیین نقشه راه مناسب شرکت‌های توزیع کشور در زمینه مدیریت سمت تقاضا

محمدرحیم محمدی

شرکت توزیع نیروی برق تهران بزرگ

چکیده

علی رغم اثبات اثرات مثبت روشهای مدیریت سمت تقاضا در کنترل بار پیک و انرژی شبکه، اجرای عملی این روشها بسیار چالش برانگیز خواهد بود. از طرفی دسته متنوعی از بار با خصوصیات فنی و اقتصادی متفاوت در شبکه وجود دارد و از طرف دیگر برنامه‌های مدیریت سمت تقاضا نیز بسیار متنوع هستند. در کنار این دو مورد، خصوصیات بار تحت سرویس در یک شبکه توزیع با همان بار در شبکه دیگر به دلیل شرایط اقلیمی، آب و هوایی و حتی فرهنگی می‌تواند متفاوت باشد. علاوه بر این، اگر هزینه‌های هنگفت مالی برای طراحی و اجرای برنامه‌های پاسخگویی بار نیز در نظر گرفته شود، مشخص می‌شود یک مسئله چند مؤلفه‌ای و مبهم برای استفاده از برنامه‌های مدیریت سمت تقاضا وجود دارد که از این لحاظ قدم برداشتن در این راه بدون داشتن یک نقشه راه ممکن نخواهد بود. این مقاله، با توجه به امکانات و دارایی های موجود در شرکتهای توزیع مدلی را ارائه می نماید که با به کار گیری آن می توان فرایند مناسب برای اولویت بندی و تشخیص برنامه های مناسب و موثر مدیریت سمت تقاضا در هر شبکه را به صورت عملی تعیین نمود. مدل ارائه شده، محدودیتهای موجود برای بکارگیری برنامه های مدیریت سمت تقاضا توسط شرکتهای توزیع مانند الزامات توانیر، امکانات شبکه و سایر موارد تاثیرگذار را در نظر گرفته و چارچوب مناسب برای تدوین برنامه ها را به روشنی معین می نماید.

دانشگاه صنعتی امیرکبیر
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| عنوان نشست: **مخابرات (سیستم )۲**- پردازش سیگنال‌های دیجیتال | | |
| **روسای نشست** | دکتر علی آقاگل‌زاده | دانشگاه تبریز |
| | دکتر حمیدرضا امین‌داور | دانشگاه صنعتی امیرکبیر |
| | دکتر علی الفت | دانشگاه تهران |

**ICEE-1021**

**DOA Estimation of Acoustic Signals Using Stacked Products of Cross-Correlations and Coherence Factor**

***** Mojtaba Amiri- Amir Akhavan- Ahmad Tavakol- Ehsan Rouhani

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**ICEE-1049**

**مشاهده‌پذیری در فرآیندهای گراف محدود باند بدون‌جهت و جهت‌دار با استفاده از تعداد محدودی از مشاهدات**

* حمیدرضا خسرویان- محمود کریمی

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**ICEE-1306**

**A Novel CNN-Based FSK Demodulator With Efficient FPGA Implementation**

* AmirHossein Sadough - Sina Rezaeeahvanouee

**ICEE-1378**

**بهبود نمونه برداری از سیگنال روی گراف  مبتنی بر نظریه دوایر گرشگورین**

* مهدیه صادقیان- حمید سعیدی سورک

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**ICEE-1008**

**SWOT Analysis of the Mega Constellation Technology and Satellite Internet**

* Mohammad Bod- Parvin Sojoodi- Leila Mohammadi

**Paper Code: ICEE-1021**

# DOA Estimation of Acoustic Signals Using Stacked Products of Cross-Correlations and Coherence Factor

Mojtaba Amiri- Amir Akhavan- Ahmad Tavakol- Ehsan Rouhani

University of Tehran- Isfahan University of Technology- Engineering, Isfahan University of Technology- Engineering, Isfahan University of Technology

Abstract

Direction of arrival (DOA) estimation of acoustic signals has been studied extensively by many researchers. Improving the performance of the DOA estimation methods is a hot topic in array signal processing. In this study, an application of the coherence factor, which is widely applied in medical ultrasound imaging, is extended to DOA estimation of wideband acoustic signals. The advantage of applying different coherence factors in tracking acoustic sources is illustrated by a cross correlation-based DOA estimation. In order to evaluate the performance of the proposed method both simulated data and narrowband and wideband recorded signals are utilized. Simulation results reveal that combining the coherence factors with the cross-correlation DOA estimator lead to resolution improvement for both narrowband and wideband acoustic sources.

**کد مقاله: ICEE-1049**

# مشاهده‌پذیری در فرآیندهای گراف محدود باند بدون‌جهت و جهت‌دار با استفاده از تعداد محدودی از مشاهدات

حمیدرضا خسرویان- محمود کریمی

دانشگاه شیراز- دانشگاه شیراز

## چکیده

یکی از زمینه‌های چالش برانگیز در پردازش سیگنال گراف (GSP)، پردازش سیگنال‌های گرافِ محدود باند است. منظور از سیگنال گراف محدود باند، سیگنال گرافی با تبدیل فوریه تُنُک می‌باشد. مطالعاتی که تا کنون در این زمینه انجام شده است عموماً متمرکز بر سیگنال‌های گراف محدود باندِ بدون جهت و بدون درنظر گرفتن روند تکامل در طول زمان بوده است. در این مقاله با درنظر گرفتن روند تکامل در یک سیگنال گراف که از این پس فرآیند گراف نامیده می‌شود، مساله مشاهده پذیری فرآیند گراف برای هر دو نوع فرآیندهای گراف جهت‌دار و بدون جهت، حل شده و حالت اولیه اینگونه فرآیندهای گراف استخراج خواهد شد. علاوه بر آن، آنالیز ریاضی دقیق روش پیشنهادی به همراه تاثیر پارامترهایی همچون ساختار گراف، عرض باند فرآیند گراف و تعداد نمونه‌های مشاهده شده بر روی جواب نهایی نیز بررسی خواهد شد. در انتها با اعمال روش پیشنهادی به داده‌های واقعی، عملکرد روش پیشنهادی ارزیابی و راستی آزمایی خواهد شد.

**Paper Code: ICEE-1036**

# Microwave Modes of Epsilon-Negative Metamaterial above Grounded Dielectric Substrate

Afshin Moradi- Mohammed M. Bait-Suwailam

Kermanshah University of Technology- Sultan Qaboos University

Abstract

In this paper, we study the propagation of transverse electric (TE) and transverse magnetic (TM) microwave modes of a planar epsilon-negative (ENG) metamaterial medium above a grounded dielectric slab within the framework of classical electrodynamics. The ENG layer is composed of a periodic array of metallic wires (as an effective homogeneous medium with respect to the macroscopic field) with negative effective permittivity. The general expressions of dispersion relations are derived analytically and solved numerically for the microwaves with the TE and TM modes, respectively, by solving Maxwell equations in conjunction with appropriate boundary conditions. The findings from this study showed that the behaviors of the guided TE and TM modes are very similar, while also TM surface waves are supported by the system under consideration. Furthermore, numerical results show that all the guided TE and TM modes have cutoff frequencies, while the cutoff frequency of TM surface mode is zero.

**کد مقاله: ICEE-1378**

# بهبود نمونه برداری از سیگنال روی گراف مبتنی بر نظریه دوایر گرشگورین

مهدیه صادقیان- حمید سعیدی سورک

دانشگاه یزد- دانشگاه یزد

چکیده

پیشرفت روبه‌رشد حوزه‌ی ارتباطات و دسترسی به پایگاه‌های داده‌ی پیچیده و با ابعاد بالا، باعث احساس نیاز به روش‌های جدیدی برای تحلیل داده شده است. پردازش سیگنال روی گراف، یکی از ابزارهای مهم برای پردازش این نوع داده‌ها در بستر شبکه است که در آن، تلاش‌های قابل توجهی برای تعمیم مفاهیم و ابزارهای پردازش سیگنال کلاسیک به سیگنال روی گراف انجام شده است. از مباحث مهم در پردازش سیگنال روی گراف، قضیه‌ی نمونه‌برداری است. نمونه‌برداری برپایه‌ی تنظیم صفحه‌ی گرشگورین یکی از روش‌های جدید نمونه‌برداری است که می‌توان بدون تجزیه‌ی ویژه به مجموعه رئوس نمونه‌برداری مطلوب دست یافت. از آن‌جا که پیچیدگی محاسباتی این روش به تعداد یال‌ها وابسته است، رویکردی برای بهبود عملکرد این روش با استفاده از مفهوم درخت فراگیر به منظور کاهش تعداد یال پیشنهاد می‌شود. روش پیشنهادی ضمن کاهش پیچیدگی محاسباتی، باعث بهبود قابل‌قبولی در خطای بازسازی و نیز زمان اجرای الگوریتم نمونه‌برداری در حضور اغتشاش خواهد شد. نتایج شبیه‌سازی نیز عملکرد مناسب این رویکرد را تأیید می‌کنند.

**Paper Code: ICEE-1008**

# SWOT Analysis of the Mega Constellation Technology and Satellite Internet

Mohammad Bod- Parvin Sojoodi- Leila Mohammadi

Shahid Rajaee Teacher Training- ICT Research Institute- ICT Research Institute

Abstract

Satellite mega constellations such as Starlink already provide broadband service around the world from space with thousands of low earth orbit (LEO) satellites. This new technology has several advantages such as increasing network coverage, providing service in disasters, reducing latency, increasing reliability, etc. In addition, this technology has disadvantages such as increased interference, reduced sky visibility, reduced monitoring of national networks, and security vulnerabilities. Different opportunities and threats will also arise in terms of this technology for countries, communities, and industries. This paper reviews the latest state of the mega constellation technology and satellite internet and analyzes the Strengths, Weaknesses, Opportunities, and Threats (SWOT) of this technology. The presented SWOT analysis is based on various news, numerous articles of experts, and follow-up groups around the world, and in a way, all the positive and negative aspects of mega constellation technology and satellite internet will be reviewed in the paper. Finally, suggestions will be provided to deal with this new technology.

دانشگاه صنعتی امیرکبیر
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| عنوان نشست: **الکترونیک ۲**- مبدل داده‌ها | | |
| **روسای نشست** | دکتر امید شعاعی | دانشگاه تهران |
| | دکتر حسین شمسی | دانشگاه صنعتی خواجه نصیرالدین طوسی |
| | دکتر محمد یاوری | دانشگاه صنعتی امیرکبیر |

## ICEE-1316

**مبدل زمان پیوسته دلتا سیگما با پهنای باند 200k-28M مناسب برای گیرنده های باند پایه 3G,4G**

* فائزه جسور قره باغ- مرتضی موسی زاده

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## ICEE-1345

**Design and Analysis of Three-Step Cyclic Vernier Time-to-Digital Converter**

*Sara Mansouri- Hamidreza Rezaee-Dehsorkh- Nassim Ravanshad

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## ICEE-1423

**Implementation of a 14-Channel Real-time Compact Data Logger for Structure and Mechanical Engineering Laboratories**

*Keivan Sadeghinezhad - Esmaeil Najafiaghdam - Sara Dezhakam - Ali Sadeghinezhad

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## ICEE-1498

**A Low-Power Cyclic Vernier Time-to-Digital Converter for In Pixel Applications**

* Mohammad Hasan Pass - Sayed Masoud Sayedi - Seyed Amir Reza Ahmadi Mehr

ICEE-1331

# ادغام حسگرهای رادار، لیدار و دوربین به منظور بهبود عملکرد در تشخیص اهداف برای کاربرد خودروهای خودران

*سید مسعود معصومی زاده - محمد سجادی - طاها محقق - منصور نادرپور - صادق شاه سنایی - محمد علی مددی - زهرا کاوه وش - علی فتوت احمدی

**کد مقاله: ICEE-1316**

# مبدل زمان پیوسته دلتا سیگما با پهنای باند 200k-28M مناسب برای گیرنده های باند پایه3G,4G

فائزه جسور قره باغ- مرتضی موسی‌زاده
دانشگاه ارومیه- دانشگاه ارومیه

چکیده

این مقاله یک مدولاتور زمان پیوسته مرتبه سه دلتا سیگما را به همراه فیلتر های دیجیتال برای حذف سیگنال های فرکانس بالا برای مبدل آنالوگ به دیجیتال گیرنده ارایه میکند. این مدولاتور با استفاده از یک مبدل داخلی نه سطحی طراحی شده است و با کمک فیلتر های دیجیتال پیاده سازی شده می توان به یک مبدل دوازده بیتی دست یافت. این مبدل برای پهنای باند ۱۰ مگاهرتز بانرخ کلاک۴۹۱ مگاهرتز در فناوری ۶۵ نانومتر پیاده سازی شده ولی با تغییرات اعمالی و سوییچ های مختلف قابل ارتقا تا ۲۸ مگاهرتز با نرخ کلاک ۶۴۰ می باشد که قابل استفاده در گیرنده های ایستگاه پایه است . مقدار سیگنال به نویز داخل باند دراین پهنای باند ۷۰ دسیبل می باشد.

**Paper Code: ICEE-1345**

# Design and Analysis of Three-Step Cyclic Vernier Time-to-Digital Converter

Sara Mansouri- Hamidreza Rezaee-Dehsorkh- Nassim Ravanshad

Sadjad University- Sadjad University- Sadjad University

Abstract

Time-to-digital converters are one of the main and most important blocks of time-domain circuits. They are used to convert the time interval into the corresponding digital code. In this article, after an overview of the TDCs, the three-step cyclic vernier time-to-digital converter is discussed. This TDC measures the time in three steps: coarse, fine, and residue. The coarse and fine steps are performed using two digital-controlled ring oscillators. The residue step is implemented with vernier and pulse shrinking techniques. To improve the resolution and reduce the measurement error, a residue quantizer block is proposed. This block is implemented with the same vernier and pulse shrinking technique, but it has a simpler structure and smaller area. The TDC is simulated in a 180 nm CMOS process with a 1.8 V supply voltage. This TDC is configured in four modes with resolution of 14, 27, 40, and 53 ps and a dynamic range of 156.5 ns.

**Paper Code: ICEE-1423**

# Implementation of a 14-Channel Real-time Compact Data Logger for Structure and Mechanical Engineering Laboratories

Keivan Sadeghinezhad - Esmaeil Najafiaghdam - Sara Dezhakam - Ali Sadeghinezhad

Sahand University of Technology- Sahand University of Technology - University of Tabriz- University of Tabriz

Abstract

This research is based on the need to measure signals from different sensors used in Structure and Mechanical engineering laboratories in real-time mode; therefore, a 14- channel data logger is proposed and implemented on a single board and common platform. It is seen as a very compact device for data acquisition, data analysis, and graphing of results. The data logger is developed using an STM32F407VGT6 microcontroller and different drivers or front-end parts for various types of sensors. The system can collect real-time data, which are stored on a microSD memory card, and then be transferred to a PC via the USB connection. In addition, the device contains a keypad and a 7-segment displayer to add the offline mode capability when there is no server or PC available. The data logger has been successfully implemented to monitor: four channels of 24-bit ADC for the linear variable differential transformer (LVDT), two channels of 24-bit ADC for the load cell, four channels of 12-bit ADC for the strain gauge, two channels of 16-bit accelerometer, two channels of 12-bit temperature sensors, and two channels of 16-bit to convert input voltages up to 3MSPS.

**Paper Code: ICEE-1498**

# A Low-Power Cyclic Vernier Time-to-Digital Converter for In Pixel Applications

Mohammad Hasan Pass - Sayed Masoud Sayedi - Seyed Amir Reza Ahmadi Mehr

Isfahan University of Technology- Isfahan University of Technology- Isfahan University of Technology

Abstract

In this paper, a low power cyclic vernier time-todigital converter (TDC) with a tunable resolution is presented. The structure which includes two ring oscillators performs measurement in three stages of coarse stage, medium stage, and fine stage. The fine stage achieves high accuracy measurement through the use of two ring oscillators. The medium stage measurement is obtained by counting the period of the higher frequency oscillator and using the period difference of two oscillators, and the coarse stage measurement is obtained by counting the period of the lower frequency oscillator. The structure uses a controller circuit that at the end of the measurement, turns off the ring oscillators to reduce power consumption. The proposed TDC is simulated in 65nm CMOS technology. Its resolution is 20ps, its average power consumption is 320µW, and its area is 52×52 µm2 .

**کد مقاله: ICEE-1331**

# ادغام حسگرهای رادار، لیدار و دوربین به منظور بهبود عملکرد در تشخیص اهداف برای کاربرد خودروهای خودران

سید مسعود معصومی زاده - محمد سجادی - طاها محقق - منصور نادرپور - صادق شاه سنایی - محمد علی مددی - زهرا کاوه وش - علی فتوت احمدی

صنعتی دانشگاه- صنعتی دانشگاه- صنعتی دانشگاه- صنعتی دانشگاه- صنعتی دانشگاه- صنعتی دانشگاه صنعتی دانشگاه- صنعتی دانشگاه

چکیده

در این مقاله مفهوم و نحوه‌ی پیاده‌سازی ادغام حسگری برای کاربرد خودروی خودران مورد بررسی قرار خواهد گرفت. انواع حسگرهای مورد استفاده در خودروهای خودران معرفی و نقاط قوت و ضعف آن‌ها با هم مقایسه خواهند شد. بعد از آن در مورد اهمیت کالیبراسیون داده‌ها صحبت می‌شود. سپس از مجموعه‌داده‌ی nuScenesبرای پردازش تصویر، لیدار و رادار استفاده خواهد شد. در این مقاله روش Yolo3 و Yolo5 برای تشخیص اهداف مقایسه و نقشه‌ی فاصله و سرعت با استفاده از داده‌های جمع‌آوری شده توسط حسگر راداری AWR1843ترسیم و نتایج آن بررسی خواهد شد. در نهایت نیز جمع‌بندی در مورد اهمیت ادغام حسگری و چالش‌های آن برای افزایش قابلیت اطمینان در خودروهای خودران در تمامی شرایط آب و هوایی و روز و شب مورد بررسی قرار می‌گیرد.

دانشگاه صنعتی امیرکبیر
( پلی تکنیک تهران )

انجمن علوم مهندسی برق ایران
مجوز ۱۳۹۰

**سی و یکمین کنفرانس بین‌المللی مهندسی برق**

**۱۹ الی ۲۱ اردیبهشت ماه ۱۴۰۲**

**31st International Conference on Electrical Engineering**

**May 9-11/2023 –Tehran, Iran**

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|---|---|---|
| سه شنبه ۱۹ اردیبهشت ماه ۱۴۰۲ ساعت ۱۶:۱۵ الی ۱۷:۴۵ | | |
| عنوان نشست: **کنترل ۲**- رباتیک و کنترل صنعتی | | |
| **روسای نشست** | دکتر احمد افشار | دانشگاه صنعتی امیرکبیر |
| | دکتر محمد اعظم خسروی | دانشگاه صنعتی امیرکبیر |
| | دکتر مهدی طالع ماسوله | دانشگاه تهران |

**ICEE-1063**

**A 2D Geometry Based Grasping Pose Generation Algorithm for a Two-finger Robot Hand**

* Arash Akbari - Arman Akbari - Mehdi Tale Masouleh

**ICEE-1080**

**Secure Control System Using Iterative Secret Sharing**

* Younes Esmaeili - Mohammad Haeri - Saeed Adelipour

**ICEE-1186**

**Experimental Study on the Pick-and-Place Operation of a 3-DOF Delta Parallel Robot**

* Amirreza Nouri - Soheil Davoudi - Sina Vali - Arvin Mohammadi - Ali Ravari - Ehsan Akhavan Saraf - Mehdi Tale Masouleh

**ICEE-1258**

**An Event-Triggered Robust Data-Driven Predictive Control with Transient Response Improvement**

* Amir Mehrnoosh - Mohammad Haeri

**ICEE-1312**

**Optimal Path Planning of Mobile Robots using IsoCost-Based Dynamic Programming**

* Fatemeh Alvankarian - Ahmad Kalhor - Mehdi Tale Masouleh

**ICEE-1504**

**برنامه ریزی مسیر حرکت ربات در بین عابران پیاده با پیش‌بینی حرکت عابران**

*ملیکا رضوانی - سمانه حسینی

ICEE-1063

# A 2D Geometry Based Grasping Pose Generation Algorithm for a Two-finger Robot Hand

Arash Akbari - Arman Akbari - Mehdi Tale Masouleh

University of Tehran- University of Tehran- Human and Robot Interaction Laboratory

Abstract

Robot grasping is of paramount importance in industrial and service robotics. In recent years, various datadriven algorithms have been proposed to solve the problem of grasp detection and a part of them are based on reinforcement learning (RL) approaches. In a variety of proposed algorithms, random key points are being employed which will make the learning process inefficient and time-consuming. In this paper, a geometry-based algorithm is presented which can find grasp poses based on the geometry of the unknown object and propose the ones which may lead to successful grasping. For the grasp contacts computation part, the presented algorithm produces a finite number of key points based on the 2D shape of the object from a specific point of view. Afterward, it will narrow down the candidate points and output a finite number of successful grasp poses based on three grasp quality metrics for various unknown objects. Three approaches are proposed in order to achieve center points which can describe different parts of a 2D shape. Then, the obtained points are used as the center of circles which are tangent to the 2D shape contour. Also, a new grasp quality metric is proposed. The time of the grasp and the amount of object disorientation after grasping are considered as a metric to evaluate the successfulness of the grasp. Simulation results demonstrate that the proposed algorithm for unknown object grasping can find a finite number of successful grasp poses for different seen or unseen objects without using any random point.

ICEE-1080

# Secure Control System Using Iterative Secret Sharing

Younes Esmaeili - Mohammad Haeri - Saeed Adelipour

Sharif University of Technology- Sharif University of Technology - Sharif University of Technology

Abstract

Using the public network for distributed computations compromises the immunity of control loops to cyberattacks such as data manipulation and eavesdropping. These risks have forced control system engineers to find solutions to protect control systems against these dangers. Encrypted control studies these dangers and tries to propose new modified control systems to increase the immunity of the control systems. Secret sharing is one of the tools used in the encrypted control field. In this paper, we modify this tool to propose an algorithm to design a secure control system. This scheme while guarantees the security of the control systems, can attenuate the measurement noise as well. To achieve resilience against measurement noise, we can iteratively use secret sharing while adding white noise with suitable variance to the shares of our data. Increased security, secure distributed computation, and measurement noise attenuation are some of the results of using this control system scheme compared to the conventional control systems.

ICEE-1186

# Experimental Study on the Pick-and-Place Operation of a 3-DOF Delta Parallel Robot

Amirreza Nouri - Soheil Davoudi - Sina Vali - Arvin Mohammadi - Ali Ravari - Ehsan Akhavan Saraf - Mehdi Tale Masouleh

Amirkabir Univerisity of Technology- Tavan Resan Co- University of Tehran- University of Tehran- Tavan Resan Co- Tavan Resan Co- University of Tehran

Abstract

This paper presents kinematic analysis, verification, and workspace determination for the trajectory planning purpose of a 3-DOF Delta parallel robot. The under study Delta robot is the result of an academic collaboration between the Human and Robot Interaction Laboratory and the Tavan Resan Company. The dimension of the robot is obtained by using an algorithm for obtaining the optimal dimension of a Delta robot for a prescribed workspace defined from the outset. Analytical solutions for the forward and inverse kinematic problems of the under study robot are provided and verified in Simscape simulation. The workspace is determined using a discretization algorithm, in which joint limits and mechanical interference are taken into account to the end of obtaining a practical workspace. The robot's singular loci are determined, and visual inspection reveals that the robot entails a singularity-free workspace by considering joint limits, which can be regarded as a definite asset in practice. Finally, a 4-5-6-7 trajectory planning technique is implemented in order to make the manipulator's end-effector movement as smooth as possible for pick-and-place operations. Furthermore, experimental tests were executed to observe the robot's behavior and validate the kinematic equations experimentally.

ICEE-1258

# An Event-Triggered Robust Data-Driven Predictive Control with Transient Response Improvement

Amir Mehrnoosh - Mohammad Haeri

Sharif University of Technology- Sharif University of Technology

Abstract

We develop a data-driven model predictive control (MPC) design procedure to control unknown linear timeinvariant systems. This algorithm only requires measured input-output data to drive the system to the reference signal. We add filters on desired inputs and outputs in the cost function to improve the transient response. Moreover, the Hankel matrices are updated online based on a multi-step event-triggered MPC scheme to deal with the uncertainties. This also reduces the computational cost and balances it with the closed-loop performance. Simulation results illustrate effectiveness of the proposed approach.

ICEE-1312

# Optimal Path Planning of Mobile Robots using IsoCost-Based Dynamic Programming

Fatemeh Alvankarian - Ahmad Kalhor - Mehdi Tale Masouleh

University of Tehran- University of Tehran- University of Tehran

This paper proposes an optimal local path planning algorithm for mobile robots by means of the so-called IsoCost-based dynamic programming. This algorithm explores and finds the optimal paths to the goal point from different start points in the environment of the robot while avoiding arbitrary numbers and forms of obstacles. The concept of IsoCost HyperSurface (ICHS) is first explained and it is shown that with a certain cost value, the ICHS corresponding to optimal path planning surrounds all other ICHSs corresponding to non-optimal path planning algorithms. Based on this geometric property, agents are initiated and planned to explore and reveal the optimal ICHSs using dynamic programming. The optimality of the proposed method is proved and the results of this method are compared with those of Modified Potential Field and Bug2 algorithms, indicating that the proposed method surpasses the other two algorithms in terms of the optimality of path length and execution time.

ICEE-1504

# برنامه ریزی مسیر حرکت ربات در بین عابران پیاده با پیش‌بینی حرکت عابران

ملیکا رضوانی - سمانه حسینی

دانشگاه صنعتی اصفهان- دانشگاه صنعتی اصفهان

چکیده

امروزه وجود ربات‌ها در بین انسان‌ها و انجام بخشی از کارها توسط ربات‌ها رشد چشمگیری داشته است، به همین علت نیاز به یک الگوریتم برنامه‌ریزی مسیر برای یافتن مسیرهای امکان‌پذیر، ایمن و بدون برخورد در میان انسان‌ها با توجه به سایر عوامل و محیط برای ربات‌ها احساس می‌شود. این مقاله الگوریتمی برای برنامه‌ریزی حرکت یک عامل (ربات) در بین عابران پیاده ارائه می‌دهد که عامل مورد نظر در هر مرحله، گام بعدی خود را با استفاده از پیش‌بینی حرکت عابران‌پیاده انتخاب می‌نماید بدین صورت که با توجه به موقعیت آینده عابران، نیرویی به عامل وارد می‌گردد تا حرکت آن در گام بعدی مشخص شود. آزمایشات انجام شده نشان‌دهنده عملکرد مثبت این الگوریتم و تولید مسیرهایی بهتر و بهینه‌تر نسبت به حالتی که از پیش‌بینی استفاده نمی‌شود، دارد.

سی و یکمین کنفرانس بین‌المللی مهندسی برق

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| عنوان نشست: **مخابرات (میدان) ۲**- آنتن و انتشار امواج | | |
| **روسای نشست** | دکتر جلیل راشد محصل | دانشگاه تهران |
| | دکتر محمدحسن نشاطی | دانشگاه فردوسی مشهد |
| | دکتر اسفندیار مهرشاهی | دانشگاه شهید بهشتی |

## ICEE-1204

## Novel Wideband Dual-Polarized Base-Station Antenna

* Farzad Alizadeh - Changiz Ghobadi - Javad Nourinia - Keyhan Hosseini - Bahman Mohammadi

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## ICEE-1239

## طراحی آنتن سرآتش پهن باند مبتنی بر پلاسمون پلاریتون‌های سطحی جعلی

*فرشاد ارغنده - بیژن عباسی آرند - مریم حصاری شرمه

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## ICEE-1247

## Holographic Technique Inspired Multi-Beam Cylindrical Leaky-Wave Antenna

***** Mohammad Amin Chaychi Zadeh - Nader Komjani - Sajjad Zohrevand

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## ICEE-1385

## RCS Calculation of a Symmetrical Microstrip Array Using Discrete Bodies of Revolution Method

***** Hossein Mohammadzadeh - Abolghasem Zeidaabadi Nezhad - Zaker Hossein Firouzeh

**ICEE-1406**

**A Simple Method for Continuous Beam-Steering in SIW based Leaky Wave Antenna**

*Sina Rezaeeahvanouee - AmirHossein Sadough

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**ICEE-1238**

**A novel wideband low profile Fabry-Perot cavity antenna using single-layer partially reflective surface**

* Mahtab Ghanbari - Bijan Abbasi arand - Maryam Hesari shermeh

**Paper Code: ICEE- 1204**

# Novel Wideband Dual-Polarized Base-Station Antenna

Farzad Alizadeh - Changiz Ghobadi - Javad Nourinia - Keyhan Hosseini - Bahman Mohammadi

Urmia University- Urmia University- Urmia University- University of Kurdistan- Urmia University

Abstract

This paper proposes a new dual-polarized wideband base-station antenna. The designed antenna includes four slotted diamond-shaped patches and two coaxial feed lines. Additionally, the antenna is backed by a box-shaped reflector that is employed to ensure a more stable radiation characteristics over the operating bandwidth. Simulated result demonstrates a wideband impedance bandwidth of 93% (1.68- 4.60 GHz, 2.92 GHz) with high matching performances. Having wider bandwidth while maintaining a stable far-field characteristics over this considerably capacious bandwidth provides the antenna with the ability to cover multiple frequency bands that exist within sub-6 GHz frequency spectrum. Details of the characteristic mode analysis (CMA) design procedure, simulated and measured gain and radiation pattern characteristics will be presented at the conference.

**کد مقاله: ICEE-1239**

# طراحی آنتن سرآتش پهن باند مبتنی بر پلاسمون پلاریتون‌های سطحی جعلی

فرشاد ارغنده - بیژن عباسی آرند - مریم حصاری شرمه

دانشگاه تربیت مدرس- دانشگاه تربیت مدرس- دانشگاه تربیت مدرس

چکیده

در این مقاله یک آنتن سرآتش پهن‌باند جدید مبتنی بر پلاسمون پلاریتون‌های سطحی جعلی پیشنهاد شده است. به دلیل محصور شدن  قوی میدان در موجبر پلاسمون پلاریتون‌های سطحی جعلی و عملکرد انتقال بالای آن، از آن به عنوان خط انتقال استفاده شده است. نوارهای دندان اره‌ای ایجاد شده به عنوان خط انتقال پلاسمون پلاریتون‌های سطحی جعلی انتخاب شده‌اند. در این طراحی نوارهای باریک شده[1] مستطیلی شکل برای انعکاس استفاده شده است، که این امر باعث ایجاد تشعشع سرآتش و همچنین منجر به افزایش پهنای باند آنتن می‌شود. نتایج شبیه‌سازی نشان می‌دهد که این آنتن می‌تواند به بهره حدود ۹/۴ دسی‌بل و پهنای باند حدود ۹۰ درصد در یک محدوده وسیع از ۷/۵ تا ۲۰ گیگاهرتز دست یابد. بنابراین آنتن سرآتش طراحی شده دارای مزایای پهنای باند وسیع، بهره بالا، راندمان بالا، اندازه فشرده و ساخت آسان می‌باشد.

[1] Tapring

**Paper Code: ICEE- 1247**

# Holographic Technique Inspired Multi-Beam Cylindrical Leaky-Wave Antenna

Mohammad Amin Chaychi Zadeh - Nader Komjani - Sajjad Zohrevand

Iran University of Science & Technology- Iran University of Science & Technology- Iran University of Science & Technology

Abstract

In this paper holographic cylindrical leaky-wave antennas with 2N pencil beams (N=0, 1, 2) are presented. All leaky-wave antennas are designed based on the holographic technique on the sector of a cylinder. Depending on the number of object radiation beams, the length of the cylinders is optimized. MATLAB, CST and HFSS software are used in the design process. The directions of object beams are assumed arbitrary with the linear polarization. The designs have been made in such a way that the beams of each leaky-wave antenna have the same radiation gain at the operating frequency of 17 GHz. Scalar unit cells make up every specified antenna, including square patches printed on a grounded Rogers RO 5880 substrate with a 60 mil thickness. The reference wave is realized by using the edge-fed with the wave port excitation. The gain of the single, dual, and quad beam antennas at the design frequency is achieved 26.8, 24.6, and 22.7 dBi, respectively, for N = 0, 1, 2.

**Paper Code: ICEE- 1385**

# RCS Calculation of a Symmetrical Microstrip Array Using Discrete Bodies of Revolution Method

Hossein Mohammadzadeh - Abolghasem Zeidaabadi Nezhad - Zaker Hossein Firouzeh

Isfahan University of Technology- Isfahan University of Technology- Isfahan University of Technology

Abstract

In this paper, the Radar Cross Section (RCS) of a planar microstrip array with discrete rotational symmetry is obtained. For this purpose, Discrete Bodies of Revolution (DBOR) method has been used compared to the traditional moment method to reduce the amount of required memory and computation time. In this method, for a structure with symmetrical sector Ns, the amount of required memory and the computation time are reduced by the ratios of Ns 2 and Ns 3 , respectively, compared to the traditional moment method. Finally, the numerically results are presented to verify the accuracy and efficiency of the proposed method compared by commercial FEKO software and to show its ability to reduce the computation time and required memory.

**Paper Code: ICEE- 1406**

# A Simple Method for Continuous Beam-Steering in SIW based Leaky Wave Antenna

Sina Rezaeeahvanouee - AmirHossein Sadough

University of Minnesota- Shahid Rajaee Teacher Training University

Abstract

Planar microwave leaky wave antennas as a low-cost component are mostly used for microwave applications. In this paper, we provide a novel method to close the stopband issue in leaky wave antennas. The proposed method uses two radiation mechanisms per unit cell and needs just to optimize the dimension of two radiation mechanisms and the distance between them. The initial value for the optimization process is half of the wavelength for the period and a quarter of the wavelength for the dimensions of the radiation mechanism. The proposed method is useful for various types of LWA to obtain continuous beam steering. To confirm the presented method, an LWA is designed and fabricated. The prototype is SIW-based LWA with two radiation mechanisms (transversal and longitudinal slots) per unit cell. The LWA enables a wide steering range around the broadside direction including backward and forward directions. Nonetheless, with the exception of the frequency shift, the measured and simulated radiation patterns are identical. The measured result of S11 shows an almost perfect impedance matching for the LWA near broadside (around 15.82 GHz). The simulated result illustrates that the total efficiency is about 26% –57%. The prototype confirms the proposed method to overcome of open stopband issue.

**Paper Code: ICEE- 1238**

# A novel wideband low profile Fabry-Perot cavity antenna using single-layer partially reflective surface

Mahtab Ghanbari - Bijan Abbasi arand - Maryam Hesari shermeh

Tarbiat Modares University- Tarbiat Modares University- Tarbiat Modares University

Abstract

In this paper, we present a design for improving the bandwidth of Fabry-Perot cavity antenna (FPCA) employing a single layer partially reflective surface (PRS). A novel two-sided unit cell is suggested for PRS which is composed of a square patch and an H-shaped ring to create a positive reflection phase gradient. The designed antenna works in the X-band and for its feeding source, an aperture-coupled microstrip antenna is utilized. The single layer of PRS enables the advantage of a low profile along with its wide bandwidth. According to the simulation results, a 3dB gain bandwidth of 34.24% is obtained for the antenna in the frequency range of 8.21-11.6 GHz and an impedance bandwidth (S11<-10dB) of 50.17% in the frequency range of 8.72 -14.56 GHz.

دانشگاه صنعتی امیرکبیر
( پلی تکنیک تهران )

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**سی و یکمین کنفرانس بین‌المللی مهندسی برق**

**۱۹ الی ۲۱ اردیبهشت ماه ۱۴۰۲**

**31st International Conference on Electrical Engineering**

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| سه شنبه ۱۹ اردیبهشت ماه ۱۴۰۲ ساعت ۱۶:۱۵ الی ۱۷:۴۵ | | |
| عنوان نشست: **قدرت (ماشین) ۲**- کیفیت توان و ادوات FACTS و خطوط HVDC | | |
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**ICEE-1028**

**Performance Analysis of the Modified FluxCoupling-Type SFCL in VSC-HVDC System**

* Mohammad Khakroei - Ashkan Mirzaei Rajeooni - Mahdi Rahimi Pirbasti - Hossein Heydari

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**ICEE-1212**

**A Multilevel Ac-Ac Converter with Input-series and Output-Parallel as Dynamic Voltage Restorer**

* Seyed mohsen Mortazavi - Reza Beiranvand

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**ICEE-1149**

**A Bidirectional Transformerless Resonant Converter for Capacitive Power Transmission for Electric Vehicle and PowerWall Applications**

* Jasem Shahsevani - Reza Beiranvand

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**ICEE-1388**

**Design of a 2MW Medium Voltage Conventional Hybrid DC Circuit Breaker for Railway Application**

* Seyed Hamid Khalkhali - Mohsen Taghizadeh Kejani - Ali Asghar Razi Kazemi

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**ICEE-1155**

**ملاحظات طراحی مغناطیسی، الکتریکی و حرارتی راکتورهای سری دی‌تیون از نوع خشک رزینی**

*مرتضی اسلامیان

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**ICEE-1105**

**Optimal Operation of Lithium-Ion Batteries Considering Degradation Cost in Vehicle-to-Grid Systems**

* Mahdi Esfandiari - Amin Rafrafi - Abolfazl Pirayesh

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**ICEE-1039**

**A novel protection scheme for HVDC transmission lines based on DC-filter current and DC line current**

* Mohammad Amin Rezaei Gazik - Hossein Kazemi Karegar

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**ICEE-1028**

# Performance Analysis of the Modified FluxCoupling-Type SFCL in VSC-HVDC System

Mohammad Khakroei - Ashkan Mirzaei Rajeooni - Mahdi Rahimi Pirbasti - Hossein Heydari

MAPNA- MAPNA- Iran University of Science and Technology (IUST)- Iran University of Science and Technology (IUST)

Abstract

Although Voltage Source Converters based on HVDC (VSC-HVDC) systems have several advantages, such as renewable energy transmission and long-distance power system connection, they are vulnerable to DC fault currents. Concerning the inherent characteristics of high-temperature superconducting (HTS) material, using HTS in the fault current limiter could be a solution to limit the current in VSC-HVDC. The present paper seeks to provide an elaborately better solution to the problem mentioned above of the fault currents than what has previously been proposed. The object of this paper is a modified flux-coupling-type superconductor fault current limiter (SFCL) to attenuate the DC fault current in VSC-HVDC system. The working principle and operation of the SFCL and VSC-HVDC systems are modeled in detail, involving interplay or synergy between electrical and thermal properties. The simulation results demonstrate that the purposed modified flux-coupling-type SFCL has proper performance in mitigating the DC fault current.

ICEE-1212

# A Multilevel Ac-Ac Converter with Input-series and Output-Parallel as Dynamic Voltage Restorer

Seyed mohsen Mortazavi - Reza Beiranvand

Tarbiat Modares University- Tarbiat Modares University

Abstract

In this paper, a bidirectional multilevel ac-ac converter is presented, which is suitable for high-power applications. The structure of the proposed multilevel converter with series input and parallel output has reduced the input voltage and output current of each level, which reduces the stress on the elements of the proposed converter. Reducing the current and voltage of each level has reduced the dimensions, cost, and losses. Due to the output parallel of the multilevel converter, the ripple of the output current has been reduced. A structure of a multilevel converter as a dynamic voltage restorer (DVR) was proposed which is transformerless. The multilevel converter is examined and analyzed using theoretical relationships in different working modes. Then, to verify the performance of the multilevel converter was simulated as a DVR in Matlab/Simulink and its results were presented. In addition to confirming the performance of the multilevel converter in working modes, the results showed the reduction of voltage and current of each switch for each level.

ICEE-1149

# A Bidirectional Transformerless Resonant Converter for Capacitive Power Transmission for Electric Vehicle and PowerWall Applications

Jasem Shahsevani - Reza Beiranvand

Tarbiat Modares University- Tarbiat Modares University

Abstract

In this paper a transformerless bidirectional converter with two resonant frequencies for EV (Electric Vehicle) charging by capacitive coupling wireless power transfer (CCWPT) and power-wall applications has been proposed. The converter operates in both step-up and down operation modes with soft-switching. There is proper isolation between input and output sides, due to using capacitive coupling technique. The converter efficiency is improved and its volume is decreased, due to its transformerless configuration. Step-up and down operations are obtained by designing the converter between its two resonant frequencies. Both full-bridge and half-bridge operation modes have been used to properly limit the switching frequency. Finally, a 200-1000 W converter with 200-400 V input voltage and 300 V output voltage and 96% peak-efficiency values has been designed and simulated by ORCAD PSPICE under the different conditions to show its good performance.

ICEE-1388

# Design of a 2MW Medium Voltage Conventional Hybrid DC Circuit Breaker for Railway Application

Seyed Hamid Khalkhali - Mohsen Taghizadeh Kejani - Ali Asghar Razi Kazemi
K.N. Toosi University of Technology- K.N. Toosi University of Technology- K.N. Toosi University of Technology

Abstract

Development of DC grids and the increase in industrial and domestic medium voltage applications and faults in transmission lines are possible; therefore, it is critical to have DC Circuit Breakers (DCCB) and increase their reliability. The hybrid switch is one of the DCCBs which has been studied and optimized in various studies. In this paper, a 1.5kV conventional hybrid DCCB is designed. The surge arrester, semiconductors, and the time of sending the opening command are all determined in this design. The performance of the designed hybrid switch is modeled in PSCAD software, and the simulation results will be evaluated. The major results of this simulation are how the current is commutated between different branches, the amount of overvoltage between the switch across terminals and the maximum of short circuit current flowing through the switch.

ICEE-1155

# ملاحظات طراحی مغناطیسی، الکتریکی و حرارتی راکتورهای سری دی‌تیون از نوع خشک رزینی

مرتضی اسلامیان

دانشگاه زنجان

## چکیده

**آلودگی های هارمونیکی شبکه می توانند موجب بروز رزونانس در بانک های خازنی و پیری زودرس و یا خرابی آنها شوند. یکی از راههای ساده و در عین حال موثر برای مقابله با این مشکل، استفاده از راکتور دی تیون به صورت سری با مجموعه بانک خازنی می باشد. این مقاله به توصیف مراحل طراحی راکتور دی تیون خشک رزینی که برای اولین بار در مجموعه ایران ترانسفو ساخته شده می پردازد. با توجه به استفاده از فواصل هوایی در هسته و همچنین استفاده از هادی های فویلی در ساختار سیم پیچ، تحلیل مغناطیسی این راکتور مستلزم استفاده از روش دقیق اجزا محدود می باشد. برای این منظور پروسه محاسبه اندوکتانس و محاسبه تلفات سیم پیچ و هسته با استفاده از روش اجزا محدود شرح داده شده است. همچنین محاسبه توزیع موج ضربه در داخل سیم پیچ از دیگر موارد مورد بحث در این مقاله می باشد. در انتها جزئیاتی در خصوص نحوه تحلیل حرارتی این راکتور به روش *CFD* ارائه شده است. این مقاله حاوی اطلاعات مفیدی برای طراحی این گونه از راکتورها بوده و می تواند توسط طراحان ترانسفورماتور و راکتور مورد استفاده قرار گیرد.**

ICEE-1105

# Optimal Operation of Lithium-Ion Batteries Considering Degradation Cost in Vehicle-to-Grid Systems

Mahdi Esfandiari - Amin Rafrafi - Abolfazl Pirayesh

Shahid Beheshti University- Shahid Beheshti University- Shahid Beheshti University

Abstract

The subject discussed in this article is the degradation of lithium-ion batteries in electric vehicles (EV) in vehicle-to-grid (V2G) applications. As the first step, the V2G program has been explained and the advantages and challenges on the way to its implementation have been investigated. In the following, by using the relationships obtained in previous studies and modifying the model of the number of charge cycles, and considering the difference in the battery degradation coefficient in the charge cycle and the drive cycle, the model of achievable cycle count (ACC) in the battery is designed and subsequently, it is used to calculate the daily wear cost using the relationships in engineering economics to finally get the wear cost per kilowatt hour. By developing the battery wear cost model in the charge/discharge planning problem, the costs imposed on the electric vehicle user are calculated. This optimization problem is implemented in the form of a genetic algorithm and using MATLAB software. Since the actual cost of battery degradation and energy exchange in the charging period are interdependent, an iterative method is proposed to obtain the actual cost of degradation and the optimal charging strategy. Finally, according to the analysis performed on the case study, the effectiveness and application of the proposed model on the charge/discharge Scheduling problem in EV with V2G capability is investigated.

ICEE-1039

# A novel protection scheme for HVDC transmission lines based on DC-filter current and DC line current

Mohammad Amin Rezaei Gazik - Hossein Kazemi Karegar

Shahid Beheshti University- Shahid Beheshti University

Abstract

HVDC effectively transmits large amounts of electrical energy using DC (direct current) over long distances by overhead transmission lines, underground cables, and submarine cables. HVDC system is also used to connect separate power systems with different characteristics and frequencies in which AC transmission is impossible [1]. HVDC transmission line protection is essential for the safety and reliability of the power grid due to the extensive use of the HVDC transmission line. Various faults can occur in the HVDC system, such as AC, internal converter, and DC faults. Failure may occur due to insulation failure due to short circuits, switching, and lightning, which imposes new challenges to protecting the HVDC transmission line. To address these challenges, a new protection scheme for HVDC transmission lines is proposed in this paper based on the flow characteristics of DC filters and DC line current. The flow characteristics of DC filters and the current passing through the DC line are theoretically analyzed for internal and external faults in a constant fault period. Moreover, this flow profile is used as a backup protection scheme to identify pole-to-ground faults, the worst of all. A 500 kV HVDC system built in PSCAD/EMTDC is used to verify the validity of the proposed protection scheme. The simulations show that the protection scheme proposed in this paper can not only accurately detect internal and external faults but is not sensitive to the amount of fault resistance and distance.

سی و یکمین کنفرانس بین‌المللی مهندسی برق

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| عنوان نشست: **قدرت (انرژی) ۳**- سیستم‌های حفاظت- قابلیت اطمینان | | |
| **روسای نشست** | دکتر سیدمحمد شهرتاش | دانشگاه علم و صنعت ایران |
| | دکتر محمد رستگار | دانشگاه صنعتی امیرکبیر |
| | دکتر داورپناه | |

**ICEE-1307**

**حفاظت تطبیقی ریزشبکه‌ی DC با به کارگیری تبدیل فوریه‌ی سریع و ماشین بردار پشتیبان**

*امیر داداشی - سید حسین (حسام‌الدین) صادقی

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**ICEE-1122**

**Improving Adaptive Algorithm to Reduce Grounding System Impedance Computing Time**

*Soheil Rahnamayian Jelodar - Seyed Hossein Hesamedin Sadeghi - Reza Rahmani - Mohammad Ali Narooie Dehchil - Hossein Askarian Abyaneh

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**ICEE-1322**

**Reliability-Based Design of Time-Varying Electricity Tariff**

* Mohammad Rastegar - Nima Sarajpoor

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**ICEE-1029**

**بهبود دقت و سرعت روش حداکثر جریان در تشخیص خطاهای آغازین وقایع آبشاری**

*مجتبی فکری - جواد نیکوکار - گئورک قره پتیان

**ICEE-1051**

# An Optimal Investigation into A Preventive Maintenance Scheduling Scheme for Electric Power Transmission Networks

* Seyed Sina Taheri Otaghsara - Masoud Asghari Gharakheili

**کد مقاله: ICEE-1307**

# حفاظت تطبیقی ریزشبکه‌ی DC با به کارگیری تبدیل فوریه‌ی سریع و ماشین بردار پشتیبان

امیر داداشی - سید حسین (حسام‌الدین) صادقی

دانشگاه صنعتی امیرکبیر- دانشگاه صنعتی امیرکبیر

چکیده

تغییرات توپولوژی در ریزشبکه‌های DC منجر به تغییر مشخصه‌ی جریان و ولتاژ خطا و از دست رفتن هماهنگی و ناکارآمدی تنظیمات حفاظتی می‌گردد. از این رو ارائه‌ی یک طرح حفاظت تطبیقی که سرعت و دقت بالایی داشته و در برابر نویز مقاوم باشد از اهمیت ویژه‌ای برخوردار است. در این مقاله برای ارائه‌ی چنین طرحی از تبدیل فوریه‌ی سریع به عنوان روشی برای پردازش سیگنال جریان و ولتاژ در هر دو سمت خط و استخراج مولفه‌های فرکانسی آن‌ها به جهت تشکیل بردار ورودی و از مدل ماشین بردار پشتیبان برای تشخیص خطا استفاده شده است که داده‌ها را در دو گروه با خطا و بدون خطا دسته‌بندی می‌کند. الگوریتم ارائه‌شده توسط شبیه‌سازی یک ریزشبکه‌ی DC روی یک خط توزیع انرژی ارزیابی شده که نتایج نشان دهنده‌ی سرعت و دقت بالای طرح و مقاومت مطلوب آن در برابر نویز است. ضمن اینکه عملکرد طرح ارائه نسبت به سایر روش‌های یادگیری ماشین و نیز سایر روش‌های پردازش سیگنال دقت بهتری داشته و در شرایط نویزی نیز عملکرد بهتری دارد.

**Paper Code: ICEE- 1122**

# Improving Adaptive Algorithm to Reduce Grounding System Impedance Computing Time

Soheil Rahnamayian Jelodar - Seyed Hossein Hesamedin Sadeghi - Reza Rahmani - Mohammad Ali Narooie Dehchil - Hossein Askarian Abyaneh

Amirkabir University of Technology- Amirkabir University of Technology- Amirkabir University of Technology- Shahid Beheshti University- Amirkabir University of Technology

Abstract

The pulse of lightning strike is modeled with its frequency components from zero to several megahertz, where ground impedance in the band is a function of frequency. Different methods for implementing the exact model of the earth system in the electromagnetic transients of electrical equipment are presented. To do this, the admittance matrix from the different ports of the grounding system must be accurately calculated at this frequency band. To achieve this goal, Maxwell equations are solved using numerical methods such as the method of moments (MOM). However, numerical methods for analyzing the grounding system, especially for large earth networks, are very difficult and time consuming. In addition, if programs, such as Electromagnetic Transient Program (EMTP), that model the grounding system accurately to calculate the earth's admittance matrix is not fast enough, it won't be applicable. The purpose of this paper is to reduce the time of calculating earth impedance. To do this, we intend to improve the comparative algorithm to reduce the computational time. The results prove significant superiority of the proposed method compared to existing ones.

**Paper Code: ICEE- 1322**

# Reliability-Based Design of Time-Varying Electricity Tariff

Mohammad Rastegar - Nima Sarajpoor

Shiraz University- University of Calgary Calgary

Abstract

Implementing price-based energy management programs to change the consumption pattern of residential consumers has become an indispensable solution to the operational challenges of smart distribution power systems. However, practical methods to design efficient time-varying prices to improve the reliability and operation of distribution systems have remained scarce. This paper proposes a bi-objective optimization problem to design time-differentiated electricity tariff for residential energy management, where a new reliability evaluation method is employed to evaluate the reliability enhancement caused by load shifting. A set of numerical studies and sensitivity analysis are conducted to investigate the effectiveness of the proposed pricing method.

**کد مقاله: ICEE-1029**

# بهبود دقت و سرعت روش حداکثر جریان در تشخیص خطاهای آغازین وقایع آبشاری

مجتبی فکری - جواد نیکوکار - گئورک قره پتیان

دانشگاه آزاد اسلامی واحد ساوه- دانشگاه آزاد اسلامی واحد ساوه- دانشگاه صنعتی امیرکبیر

## چکیده

خروج‌های آبشاری در سیستم قدرت مجموعه‌ای از رویدادهایی است که در اثر وقوع یک حادثه آغازگر ایجاد می‌شوند و می‌تواند باعث خاموشی گسترده در شبکه شوند. وقوع این حادثه‌های آغازگر می‌تواند ناشی از خرابی تجهیزات قدرت، شرایط بد آب و هوایی، زلزله، برخورد درختان با خطوط انتقال نیرو و غیره باشد. روش پیشنهادی یکی از روش‌های تئوری گراف است و با محاسبه حداکثر جریان عبوری مسیرهای مستقل بین ژنراتور و بار، شاخه‌های مهم و حیاتی شبکه را شناسایی و رتبه‌بندی می‌کند. از این رو با انجام تجزیه و تحلیل مجموعه‌ای از ترکیب‌های پیشامد دوتایی بالقوه خطرناک توسط روش اعتبارسنجی یکایک شماری، شاخه‌های مستعد با پتانسیل ایجاد حادثه‌های آغازگر استخراج می شوند. روش پیشنهادی در شبکه استاندارد ۱۱۸ شینه IEEE پیاده‌سازی و نتایج بدست آمده، کارایی روش پیشنهادی را از نقطه نظر دقت و سرعت نسبت به سایر روش‌ها نشان می‌دهد.

**Paper Code: ICEE- 1051**

# An Optimal Investigation into A Preventive Maintenance Scheduling Scheme for Electric Power Transmission Networks

Seyed Sina Taheri Otaghsara - Masoud Asghari Gharakheili

Islamic Azad University Qaemshah- Islamic Azad University Qaemshah

Abstract

Since electric power systems are the beating heart of modern lives, maintenance strategies are employed to improve these networks' reliability, decrease costs, and prevent blackouts. Therefore, preventive maintenance planning has become one of the most crucial operation principles in electricity industries and power networks.

Without considering this issue, most undesirable network outages will occur, which could result in massive blackouts. In this paper, the authors propose an optimal time-based preventive maintenance strategy for power transmission networks taking economic constraints into consideration, based on reliability with Monte Carlo simulation. This can help utility asset managers to decrease costs and network outages appropriately by utilizing the IEEE 24-bus reliability test system. Analyzing the obtained results, the operator can determine which maintenance scheduling scheme offers the maximum value according to the facilities, available forces, or weather conditions.

دانشگاه صنعتی امیرکبیر
( پلی تکنیک تهران )

**سی و یکمین کنفرانس بین‌المللی مهندسی برق**

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| عنوان نشست: **مخابرات (سیستم) ۳**- مخابرات سیار و بدون سیم ۱ | | |
| **روسای نشست** | دکتر کمال محامدپور | دانشگاه صنعتی خواجه نصیرالدین طوسی |
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| | دکتر جواد امیدی | دانشگاه صنعتی اصفهان |

## ICEE-1045

**STAR-RIS Secrecy Rate Analysis in the Presence of Energy Harvesting Eavesdroppers**

*Mohammad Reza Kavianinia - Mohammad Javad Emadi

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## ICEE-1112

**Low Complexity Receiver Based on Switched Linear Modulation Models for M-ary CPM Signals**

* Hamed Bastami - Mehdi Taherkhani - Hamid Behroozi

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## ICEE-1123

**Sum Rate Maximization in STAR-RIS Assisted D2D Communications**

* Mohammad Reza Kavianinia - Mohammad Javad Emadi

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## ICEE-1188

**تخمین کانال موج میلیمتری با وضوح و سرعت بالا به کمک الگوریتمESPRIT**

*حسین رشیدی - حسین خالقی

**ICEE-1260**

# FGM Copula based Analysis of Outage Probability for Wireless Three-User Multiple Access Channel with Correlated Channel Coefficients

* Mona Sadat Mohsenzadeh - Ghosheh Abed Hodtani

**Paper Code: ICEE- 1045**

# STAR-RIS Secrecy Rate Analysis in the Presence of Energy Harvesting Eavesdroppers

Mohammad Reza Kavianinia - Mohammad Javad Emadi

Amirkabir University of Technology- Amirkabir University of Technology

Abstract

The purpose of this paper is to investigate a wireless system based on the simultaneous transmission and reflection of a reconfigurable intelligent surface (STAR-RIS), in which insecure energy-harvesting nodes eavesdrop legal signals. The achievable sum rate of secrecy and harvested energy for multicast communication are calculated as functions of the STAR-RIS transmission and reflection coefficients (TARCs). Consequently, the nonconvex optimization problem is employed to optimize the secrecy rate while fulfilling the minimum energy-harvesting constraints. The Dinkelbach transformation and semi-definite relaxation approach were used to convert the optimization problem into a convex problem. Finally, numerical results are provided to highlight the consequences of enlarging STAR-RIS and optimizing its TARCs elements to enhance the sum rate of secrecy and satisfy the energy-harvesting constraints.

**Paper Code: ICEE- 1112**

# Low Complexity Receiver Based on Switched Linear Modulation Models for M-ary CPM Signals

Hamed Bastami - Mehdi Taherkhani - Hamid Behroozi

Sharif University of Technology- K. N. Toosi University of Technology- Sharif University of Technology

Abstract

In this paper we propose a low complexity re- ceiver based on switched linear modulation model developed for continuous phase modulation (CPM) signals. we develop a low complexity and non-coherent Viterbi-based maximum likelihood sequence detection (NC-VB-MLSD) over additive white Gaussian noise (AWGN) channel. Furthermore, a simple timing and frequency recovery scheme is proposed through a decision directed (DD) maximum likelihood (ML) algorithm via simple closed-form expression. It is shown that the performance of the proposed algorithms are close to that theoretical modified Cramer Rao bound (MCRB) at moderate signal-to-noise ratios (SNRs) and are free of false lock points. We simulate the performance of the simplified NC-VB-MLSD algorithm along with the timing and frequency recovery algorithms. The bit error rate results of proposed method demonstrates near ideal synchronization performance for low SNRs.

**Paper Code: ICEE- 1123**

# Sum Rate Maximization in STAR-RIS Assisted D2D Communications

Mohammad Reza Kavianinia - Mohammad Javad Emadi

Amirkabir University of Technology- Amirkabir University of Technology

Abstract

This paper investigates wireless communication based on a simultaneous transmission and reflection of a re- configurable intelligent surface (STAR-RIS), in which device- to-device communication is established using STAR-RIS near cellular users. The sum rate of multicast downlink commu- nication is calculated using the STAR-RIS transmission and reflection coefficients (TARCs). In order to maximize the sum rate while fulfilling the minimum quality-of-service requirements, the nonconvex optimization problem is investigated. The successive convex approximation technique and iterative approach are utilized to transform the optimization problem into a convex problem. Finally, numerical results are presented to demonstratehow increasing the size of STAR-RIS and optimizing its TARCs elements affects the system's sum-rate.

**کد مقاله: ICEE-1188**

# تخمین کانال موج میلیمتری با وضوح و سرعت بالا به کمک الگوریتمESPRIT

حسین رشیدی - حسین خالقی

دانشگاه صنعتی مالک اشتر -دانشگاه صنعتی مالک اشتر

چکیده

امواج میلیمتری به دلیل پهنای باند بالایی که در اختیار قرار می‌دهند، به عنوان یکی از قابلیت‌های موجود به منظور پاسخ به نیاز نرخ بالای درخواست داده در نظر گرفته می‌شوند. تخمین کانال در این فرکانس‌ها به دلیل افزایش تعداد آنتن‌ها و هچنین بالا بودن فرکانس تفاوت‌های اساسی با فرکانس‌های زیر ***6GHz*** دارند. در این تحقیق، با در نظر گرفتن شبکه‌ی سلولی و حالت چندکاربره که درآن ایستگاه پایه و کاربران مجهز به ساختار ***MIMO*** از نوع ترکیبی هستند، روش تخمین کانالی ارائه داده شده است که در مقایسه با روش‌های موجود پیچیدگی محاسباتی کم‌تری دارد و در نتیجه باعث کاهش تاخیر فرایند تخمین کانال می‌شود. در این روش، ابتدا با پردازش سیگنال‌های دریافتی، بیم‌هایی که در آن سیگنال وجود دارند تعیین و سپس به کمک الگوریتم ***ESPRIT*** زوایای ورود و خروج محاسبه می‌شوند. در ادامه پس از محاسبه بهره‌ی هر مسیر بین فرستنده و گیرنده، کانال به کمک مدل ***Saleh–Valenzuela*** تخمین زده می شود. نتایج شبیه‌سازی روش ارائه داده شده و مقایسه‌ی آن با روش‌های قبلی نشان می‌دهد که تخمین کانال زمانی که ***SNR*** بالایی در دسترس است دقت بهتری ارائه می دهد. همچنین در مقایسه با روش پایه، پیچیدگی محاسبات با نسبت تعداد بیم هایی که در آن سیگنال وجود ندارد کاهش می یابد.

**Paper Code: ICEE- 1260**

# FGM Copula based Analysis of Outage Probability for Wireless Three-User Multiple Access Channel with Correlated Channel Coefficients

Mona Sadat Mohsenzadeh - Ghosheh Abed Hodtani

Ferdowsi University of Mashhad- Ferdowsi University of Mashhad

Abstract

In wireless communication channels, the channel coefficients are dependent on each other, leading to constructive or destructive effects on communication performances. Therefore, investigating the performance metrics of wireless communication systems under the influence of the correlation of channel coefficients is essential. One of the powerful tools for modeling the dependence between random variables is copula functions the well-known family of which is the Farlie-Gumbel-Morgenstern (FGM) copula. In this paper, we consider a wireless three-user multiple access channel (MAC) with Rayleigh fading and investigate the effect of the correlation coefficients on the outage probability (OP), as an important performance metric of wireless communication, by using FGM Copula function. The results show that the outage probability improves under the influence of negative correlation between the fading channel coefficients compared to the uncorrelated state. Conversely, positive correlation increases the outage probability compared to the uncorrelated state. Numerical illustrations confirm our theoretical results.

دانشگاه صنعتی امیرکبیر
( پلی تکنیک تهران )

انجمن علوم مهندسی برق ایران
مجوز ۱۳۹۰

**سی و یکمین کنفرانس بین‌المللی مهندسی برق**

**۱۹ الی ۲۱ اردیبهشت ماه ۱۴۰۲**

**31st International Conference on Electrical Engineering**

**May 9-11/2023 –Tehran, Iran**

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| چهارشنبه ۲۰ اردیبهشت ماه ۱۴۰۲ ساعت ۹:۰۰ الی ۱۰:۳۰ | | |
| عنوان نشست: **الکترونیک ۳**- مدارهای مجتمع فرکانس رادیویی ۱ | | |
| **روسای نشست** | دکتر محمد یاوری | دانشگاه صنعتی امیرکبیر |
| | دکتر مسعود مقدادی | دانشگاه شهیدبهشتی |
| | دکتر صمد شیخائی | دانشگاه تهران |

## ICEE-1065

## A K-Band Ultra-Low-Power High-Linearity Down-Conversion Mixer in CMOS Technology

* Kayvan Qolami - Javad Yavand Hasani

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## ICEE-1265

## Modeling of A low-Noise Amplifier With a Recurrent Neural Network

* Mostafa Noohi - Fatemeh Charoosaei - Ali Mirvakili - Sayed Alireza Sadrossadat

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## ICEE-1425

## A High Linearity Wideband Low-Noise Amplifier Using Capacitor Cross-Coupled Common-Gate Structure

* Abolfazl Rajaiyan - Fahimeh Rahimi - Mehdi Saberi

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## ICEE-1072

## Optimal Application of Trajectory Optimization by Travel Profile for Electric Train in an Electrical Transportation System

* Mohsen Davoodi - Mohsen Tamaddon

ICEE-1290

# Switchable Chain Configurable RO PUF for Enhancing Hardware Security of IoT Devices

* Niloufar Sayadi - Mohammad Eshghi

**Paper Code: ICEE- 1065**

# A K-Band Ultra-Low-Power High-Linearity Down-Conversion Mixer in CMOS Technology

Kayvan Qolami - Javad Yavand Hasani

Iran University of Science and Technology- Iran University of Science and Technology

Abstract

This paper presents an ultra-low-power down- conversion CMOS mixer in 22-32 GHz frequency band. In the proposed mixer, gm boosting amplifiers are used in the fully differential source-driven topology. The transconductance stage is switched by a local oscillator (LO) signal applied differentially crosswise to the sources of the MOS devices. In this way, the output voltage swing, and therefore the linearity of the mixer will be increased. In addition, through this method, the minimum required supply voltage can be reduced. Thus, with lower supply voltage and power consumption, high IIP3 can be achieved. To further reduce current and power consumption, MOS devices are biased in the weak inversion region. Due to the small third-order nonlinearity coefficient of transconductance in the weak inversion region, the possibility of obtaining a larger IIP3 is realized. The presented mixer was designed and simulated using a 0.18-µm RF CMOS process. The post-layout results show a maximum conversion gain of 13.1dB, a minimum noise figure of 15.1dB, a maximum IIP3 of 17.4dBm, and better isolation of 42dB while consuming only 33µW of DC power from a 1V supply.

**Paper Code: ICEE- 1265**

# Modeling of A low-Noise Amplifier With a Recurrent Neural Network

Mostafa Noohi - Fatemeh Charoosaei - Ali Mirvakili - Sayed Alireza Sadrossadat

Yazd University- Yazd University- Yazd University- Yazd University

Abstract

Macromodelling of nonlinear circuits particularly hose operating at RF frequencies is of importance and interest specifically in systems where the total simulation time is constrained. Recurrent neural network (RNN) can be considered as a viable approach for generating this modeling. Indeed, with having such a model at hand, the circuit designers have the potential to grasp the system level verification way faster than the conventional simulators. In this paper, a low-noise amplifier (LNA) is used as the nonlinear circuit, and a RNN is designed to generate the model. The LNA is configured in LTSPICE, and its simulation data is used as the input of the RNN model via Python programming. Using RNN, it is possible to train directly using theinput-output waveform samples of the main nonlinear circuit without knowing the details. The obtained RNN-based model has the same accuracy compared to the original nonlinear circuit and is also able to extend the dynamic behavior of nonlinear circuits.In addition, models based on recurrent neural networks are much faster than models based on conventional simulation tools such as LTSPICE. It is worth mentioning that this modeling approach can be extended to a variety of applications, including medical, to have a quick prediction of the vital signals.

**Paper Code: ICEE- 1425**

# A High Linearity Wideband Low-Noise Amplifier Using Capacitor Cross-Coupled Common-Gate Structure

Abolfazl Rajaiyan - Fahimeh Rahimi - Mehdi Saberi

Ferdowsi University of Mashhad- Ferdowsi University of Mashhad- Ferdowsi University of Mashhad

Abstract

A high linearity wideband Low-Noise Amplifier (LNA) that uses Capacitor Cross-Coupled Common-Gate structure is proposed in this paper. The proposed design uses a differential topology with a common-source stage and a Capacitor Cross-Coupled Common-Gate (CCC-CG) amplifier to increase the linearity of the circuit. Moreover, it uses a current reused feed-forward noise cancellation technique. Standard 0.18-µm CMOS technology has been used for designing and simulating the proposed LNA. According to the findings of the circuit-level simulation, the voltage gain and bandwidth of the proposed LNA are 17.68 dB and 3.34 GHz (from 1.59 GHz to 4.93 GHz) respectively. The Noise Figure (NF) of LNAs is one of the most important parameters and the minimum NF of the proposed structure is 3.76 dB. Also, at an input frequency of 4.93 GHz, Third-Order Input Intercept Point ($IIP_3$) of the proposed LNA is maximum, which is -1.43 dBm.

**Paper Code: ICEE- 1072**

# Optimal Application of Trajectory Optimization by Travel Profile for Electric Train in an Electrical Transportation System

Mohsen Davoodi - Mohsen Tamaddon

Politecnico di Milano Milano- echnical and Vocational University (TVU)

Abstract

Increasing greenhouse gas (GHG) emission is one of the most important concerns of world decision-makers. The considerable part of it belongs to the transportation systems. As a solution, the world is going to use urban electrical transportation systems, and thus designing optimal methods and novel strategies is essential nowadays. Indeed, reducing the amount of consumed electrical energy and having optimum and efficient energy management for electrical means of transport requires several vital elements. Designing a travel profile is one of the most crucial parts of these methods. A travel profile for the fully electric train ET245 with three stations is designed and analyzed in Milan, Italy, as a case study in this paper. As thefirst step, route data are acquired by the Google Maps tool. Then, the train data is collected from the manufacturer's catalogues and datasheets. Finally, computations were performed by Excel spreadsheets. The results indicate that the designed path in the proposed travel profile is covered by a commercial speed and requires reasonable electrical energy, which is considered economical and advantageous.

**Paper Code: ICEE- 1290**

# Switchable Chain Configurable RO PUF for Enhancing Hardware Security of IoT Devices

Niloufar Sayadi - Mohammad Eshghi

Shahid Beheshti University- Shahid Beheshti University

Abstract

Physical Unclonable Function (PUF) is a hardware security primitive that acts like a fingerprint of a device and extracts the intrinsic characteristics of a chip. The PUF provides a secure approach for key generation and authentication. One of the efficient categories of silicon PUFs is Ring Oscillator PUFs. The field programmable gate arrays (FPGAs) are proper platforms for implementing flexible PUF designs such as config- urable ring oscillators. In this work, we present a flexible and compact ring oscillator as SCCRO (Switchable Chain Config- urable Ring Oscillator), which could generate a high number of CRPs (Challenge Response Pairs) compared to its occupied area. The resistance of our proposed PUF is evaluated using logistic regression (LR) as a powerful machine learning attack technique. The experimental results are gained using Xilinx Spartan-6 FPGA boards and show satisfactory uniformity, uniqueness, and reliability for the SCCRO PUF.

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## ICEE-1052

## Stability Analysis for the Non-linear Model Predictive Control of a Flexible Joint Manipulator with Dynamics Uncertainties

* Mohamadreza Satvati - Hossein Karimpour - Keivan Torabi - Mohammad Motaharifar

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## ICEE-1142

## Second-Order Sliding Mode Design Based on the Integration of Proportional-Integral and Nonlinear $\mathcal{H}_\infty$ Controllers for Load Frequency Control

* Behrad Samari - Mohammad Javad Yazdanpanah

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## ICEE-1146

## An Improved Nonlinear Observer-Based Integrated Guidance and Control for Hypersonic Flight Vehicle with Angle Constraints

* Seyedeh Mahsa Zakipour Bahambari - Saeed Khankalantary

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## ICEE-1180

## Introduce a novel approach to orbital maintenance in CRTBP

* Amirreza Kosari - Ehsan Abbasali - Jamileh Hamzei - Majid Bakhtiari

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دانشگاه صنعتی امیرکبیر
( پلی تکنیک تهران )

## ICEE-1500

# Nonlinear Observer Design via Emulation Method for Sampled-data Teleoperation Systems

* Ali Firouzi Abriz - Amir Aminzadeh Ghavifekr - Ashkan Safari

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## ICEE-1551

# Global Finite-Time Nonlinear Observers for a Class of Nonlinear Systems Subjected to Mismatched Uncertainties

* Ali Abooee - Saeed Amiri - Mohammad Hadi Rezaei

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ICEE-1052

# Stability Analysis for the Non-linear Model Predictive Control of a Flexible Joint Manipulator with Dynamics Uncertainties

Mohamadreza Satvati - Hossein Karimpour - Keivan Torabi - Mohammad Motaharifar

University of Isfahan- University of Isfahan- University of Isfahan- University of Isfahan

Abstract

In this research, the problem of controlling a onelink robot with joint flexibility by the non-linear model predictive control method (NMPC) is considered. The issue concerning the input-to-state stability (ISS) of the NMPC has been considered. Through using the cost function of the NMPC problem in order to play the role of the Lyapunov function, the ISS stability of the system in the presence of disturbances and uncertainties, such as robot joint flexibility, is reached. Two modeling examples for a single-link robot have been investigated, which include unmeasurable variables as a portion of the system state variables. These unmeasured states are representative of the unmodeled dynamics, standing for either the flexibility at the joint or the link itself. In the first example, the control input is the actuation torque, and in the second one, the voltage to the motor. Simulation results demonstrate the effectiveness and stability of the proposed approach in the presence of disturbances and system uncertainties.

ICEE-1142

# Second-Order Sliding Mode Design Based on the Integration of Proportional-Integral and Nonlinear $\mathcal{H}_\infty$ Controllers for Load Frequency Control

Behrad Samari - Mohammad Javad Yazdanpanah

University of Tehran- University of Tehran

Abstract

This article addresses the load frequency control (LFC) problem of control-area-partitioned power networks. An equivalent generator with second-order turbine-governor dynamics is utilized to model each control area, and power flows establish nonlinear couplings between control areas. As a consequence of the integration of the proportional-integral (PI) controller and the nonlinear H∞ controller, a novel suitable sliding manifold for enhancing dynamic performance is first proposed. Then, a decentralized second-order sliding mode (SOSM) controller is designed for LFC in power networks, which regulates the frequency and sustains the net inter-area power flows at the predetermined values. The simulation results demonstrate the efficacy of the proposed control strategy.

ICEE-1146

# An Improved Nonlinear Observer-Based Integrated Guidance and Control for Hypersonic Flight Vehicle with Angle Constraints

Seyedeh Mahsa Zakipour Bahambari - Saeed Khankalantary

K.N. Toosi University of Technology- K.N. Toosi University of Technology

Abstract

In this paper, an improved integrated guidance and control (IGC) design method for nonlinear uncertain hypersonic flight vehicle (HFV) with angle constraints is presented based on adaptive block dynamic surface control scheme, backstepping method, and a multivariable nonlinear disturbance observer (NDOB) in three-dimensional space. Initially, the six degree of freedom (6DOF) integrated guidance and autopilot dynamic model is organized using the combination of HFV dynamic model and HFV-target relative motion model whereas the aerodynamic and model uncertainties, the cross-coupling effects, and disturbances are considered. In order to apply the nonlinear disturbance observer-based control (NDOBC) method, a multivariable chattering free NDOB is used to estimate the lumped uncertainties in the established integration and autopilot model. It should be noted that an adaptive block dynamic surface control approach in combination with a backstepping method is presented to achieve the high performance in the target interception, state regulation, and regulation of azimuth and elevation angles related to the line of sight (LOS). Closed- loop stability, estimation errors convergence to zero, and state regulation are proven based on the Lyapunov theory. Finally, the simulation results confirm the effectiveness of presented NDOBC not only in closed-loop stability but also in highperformance target interception using the smooth control input.

ICEE-1180

# Introduce a novel approach to orbital maintenance in CRTBP

Amirreza Kosari - Ehsan Abbasali - Jamileh Hamzei - Majid Bakhtiari
University of Tehran- University of Tehran- University of Tehran- Iran University of Science and Technology

Abstract

This paper presents a novel approach to designing an orbital maintenance strategy for the periodic Lyapunov orbits in the Circular Restricted Three-Body Problem. Since the position and velocity vector change simultaneously in the moment of non-periodic behavior, a short low-thrust maneuver must be established to return the satellite to the periodic orbit. The low-thrust trajectory is a TwoBoundary Value Problem (TBVP) and requires a particular solving approach. Previous investigations exploited numerical optimal control methods such as Non-Linear Programming (NLP). NLP implementation was hard, and the run time was too long. Hence the current paper utilizes Multi-Objective Particle Swarm Optimization (MOPSO) to design orbital maintenance missions. The following are three sequential steps for implementing the proposed method. It is first necessary to identify the first non-periodic moment of the satellite in the periodic Lyapunov orbit and its state vector. This step determines the criteria for non-periodic behavior through sensitivity analysis. As a groundbreaking idea, the desired state vector ( the state vector to which the satellite needs to transfer to continue its periodic behavior) is considered as the corresponding point of the non-periodic starting point at the first period. Due to the characteristics of the Lyapunov orbits, this selection allows the satellite to continue its periodic motion. In the third step, the thruster components and their duration of working time are nominated as design variables. Two objective functions are suggested in this step and minimized by applying MOPSO to recognize the design variables: The first objective function is guaranteed that the state vector is converted from the first

non-periodic moment state vector to the desired state vector by applying thruster components. Since the fuel consumption in the deep space mission is vital, the second objective function minimizes fuel consumption by minimizing the thrust magnitude. The Sun-Earth system is regarded as a system of interest, and the proposed method is simulated. The obtained result indicates that the proposed method, in addition to the significant reduction of calculations, will lead to the minimization of fuel consumption in orbital maintenance missions in the CRTBP.

ICEE-1500

# Nonlinear Observer Design via Emulation Method for Sampled-data Teleoperation Systems

Ali Firouzi Abriz - Amir Aminzadeh Ghavifekr - Ashkan Safari

University of Tabriz- University of Tabriz- University of Tabriz

Abstract

In this paper nonlinear observers have been designed for the sampled-data teleoperation systems. The proposed approach can be utilized for continuous-time systems which are implemented by digital computers and sample and hold devices. Continues-time design (CTD) estimation procedure will be presented for nonlinear sampled-data teleoperation systems. Assumptions and input to state stability conditions will be provided to facilitate the observers to converge to the actual states at each sampling interval in a semiglobal practical sense. The exact sampled-data form of the teleoperator will be approximated by utilizing the refined Euler model and incorporating observer parameters with sampling intervals. Simulation results demonstrate that the proposed emulation-based scheme guarantees the input-to-error stability of the system in terms of the linear matrix inequalities.

ICEE-1551

# Global Finite-Time Nonlinear Observers for a Class of Nonlinear Systems Subjected to Mismatched Uncertainties

Ali Abooee - Saeed Amiri - Mohammad Hadi Rezaei

Yazd University- Yazd University- Yazd University

Abstract—In this paper, two different types of global finitetime nonlinear observers are designed for a class of nonlinear systems in the presence of matched and mismatched uncertainties. The considered class of nonlinear systems, which is a chain of interconnected second order subsystems, covers many practical plants such as robot manipulators and unmanned aerial vehicles. Therefore, the proposed observers are applicable to a wide group of real-world nonlinear systems. Based on finite-time stability's lemmas, it is mathematically proven that estimated states precisely reach state variables within finite times. More, it is demonstrated these mentioned convergence times are finite and their upper bounds depend on initial conditions and arbitrary parameters of proposed nonlinear observers. Finally, two types of the finite-time observers are simulated onto a 2-DOF robot manipulator to estimate angular velocities of robot's joints.

سی و یکمین کنفرانس بین‌المللی مهندسی برق

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| عنوان نشست: **مخابرات (میدان) ۳**- ساختارهای نوین و فراماده و فراسطح‌های الکترومغناطیسی | | |
| **روسای نشست** | دکتر محمد نشاط | دانشگاه تهران |
| | دکتر زهرا اطلس باف | دانشگاه تربیت مدرس |
| | دکتر فرهاد آزادی | دانشگاه صنعتی امیرکبیر |

## ICEE-1203

## طراحی و شبیه سازی یک فراسطح بازتابی با قابلیت تحقق الگوی تشعشعی هم شار با قطبش های خطی و دایروی در باند X مناسب برای ماهواره سنجشی

* مجید کریمی پور - ایمان آریانیان

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## ICEE-1315

## بررسی کنترل مغناطیسی پاسخ کایرواپتیکی ساختارهای مگنتوکایرال

* کی سیاوش کیکاوسی - حمیده دشتی خویدکی - جواد احمدی شکوه - مجید رشیدی هویه

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## ICEE-1317

## Developing a superlens with High Resolution using Quantum Dot Nano-Particles

*Amin Monemian Esfahani - Leila Yousefi

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## ICEE-1325

## Optical Beam Switching using an Integrated Meta-Surface Device

*Vahid Ghaffari - Leila Yousefi

**ICEE-1332**

# Floquet Model of Spatiotemporally Modulated Graphene Structures

*Mahsa Valizadeh- Leila Yousefi- MirFaez Miri

**کد مقاله: ICEE-1203**

# طراحی و شبیه‌سازی یک فراسطح بازتابی با قابلیت تحقق الگوی تشعشعی هم شار با قطبش‌های خطی و دایروی در باند X مناسب برای ماهواره سنجشی

مجید کریمی پور - ایمان آریانیان

دانشگاه صنعتی اراک- پژوهشگاه ارتباطات و فناوری اطلاعات

## چکیده

در این مقاله یک سطح بازتابی دولایه با قابلیت تحقق الگوی تشعشعی هم شار با قطبش‌های خطی و دایروی در باند X طراحی، پیاده‌سازی و شبیه‌سازی‌شده است. جهت تحقق هر دو قطبش خطی و دایروی به کمک تنها یک فرا سطح، از آنتن تغذیه با قطبش خطی جهت تابش موج به بازتابنده استفاده شده است. برای تعیین توزیع فاز سطح بازتابنده از تکنیک فوریه سریع به همراه الگوریتم هوشمند توده ذرات استفاده شده که کارای و سرعت بالایی دارد. المان فازی دولایه مورداستفاده با ابعاد ۱۸×۱۸ میلی‌مترمربع دارای دو ویژگی مهم است. اولاً توانایی تحقق یک سیکل ۳۶۰ درجه فاز را داشته باشد. ثانیاً نسبت به قطبش موج تابیده شده حساس باشد و رفتار فازی مستقل داشته باشد. این دو ویژگی در کنار هم امکان تحقق الگوهای تشعشعی شکل داده با قطبش‌های خطی و دایروی را میسر می‌کند. نهایتاً یک آنتن شامل ۳۲۴ المان برای ماهواره LEO واقع در ارتفاع ۵۰۰ کیلومتر و شعاع تحت پوشش ۲۸۸ کیلومتری، طراحی و شبیه‌سازی شد که نتایج نشان می‌دهد، هر دو قطبش خطی و دایروی توسط سطح بازتابنده به‌خوبی الگوی هم شار را در ناحیه مدنظر محقق می‌کند.

**کد مقاله: ICEE-1315**

# بررسی کنترل مغناطیسی پاسخ کایرواپتیکی ساختارهای مگنتوکایرال

کی سیاوش کیکاوسی - حمیده دشتی خویدکی - جواد احمدی شکوه - مجید رشیدی هویه

دانشگاه سیستان و بلوچستان- دانشگاه سیستان و بلوچستان- دانشگاه سیستان و بلوچستان

چکیده

در این مقاله چند ساختار کایرواپتیکی متشکل از یک یا چند نانوآنتن ارائه شده که کنترل انتقال کایرالی نور به وسیله اعمال یک میدان مغناطیسی خارجی در آن‌ها ممکن است. ساختارهای پیشنهادی شامل مونومر، دایمر و ترایمر نانوآنتن‌های ذوزنقه‌ای شکل و همچنین ترایمر نانوآنتن‌های مثلثی می‌باشند. فلز پلاسمونی بکار رفته در این ساختارها طلا است. به منظور افزودن تاثیر پذیری مغناطیسی پاسخ کایرواپتیکی در این ساختارها، فلز فرومغناطیسی نیکل مورد استفاده قرار گرفته. نتایج بدست آمده علاوه بر اثبات کایرال بودن تمامی ساختارها نشان داد که کنترل مغناطیسی پاسخ کایرواپتیکی در این ساختارها ممکن است.

**Paper Code: ICEE- 1317**

# Developing a superlens with High Resolution using Quantum Dot Nano-Particles

Amin Monemian Esfahani - Leila Yousefi

University of Tehran- University of Tehran

Abstract

In this paper, a new method is proposed to develop a superlens with ultra-high resolution and neglectable loss capable to produce sub-wavelength images. In this method, silver coated quantum dot nanoparticles are distributed inside a polymer host to achieve a negative effective permittivity . Using CdSe/CdS quantum dots as cores of the nanoparticles compensate the loss of silver shell resulting in a low-loss superlens. The designed superlens is used for sub-wavelength imaging and its resolution is numerically retrieved. The numerical simulations show a high resolution of $\lambda_0/_7$ which is much beyond the diffraction limit.

**Paper Code: ICEE- 1325**

# Optical Beam Switching using an Integrated Meta-Surface Device

Vahid Ghaffari - Leila Yousefi

University of Tehran- University of Tehran

Abstract

An integrated optical beam steering device consisting of a reflective metasurface and five switchable nano-antennas is proposed to operate at the standard telecommunication wavelength of 1550 nm. In the proposed device, the power is entered into a plasmonic hybrid waveguide line and directed to the feeding antennas, where placed in the focal points of the lens. To achieve a good angular accuracy (4o) and the low variation of light intensity (1dB) at the observation angle of 100o, a new analytical method is proposed in which the position of the feeding antennas are optimized to achieve a minimum phase variation on the metasurface. The proposed integrated system can be used for many applications such as inter and intra-chip optical interconnects, optical wireless communication, and low-cost integrated LIDAR systems.

**Paper Code: ICEE- 1332**

# Floquet Model of Spatiotemporally Modulated Graphene Structures

Mahsa Valizadeh- Leila Yousefi- MirFaez Miri

University of Tehran- University of Tehran- University of Tehran

Abstract

an accurate model based on Floquet-Bloch theory is established to analyze periodically modulated graphene waveguides in time and space. This model is applied to a typical spatiotemporally modulated graphene waveguide to exhibit its effects such as directional mode conversion and power exchange between modes. It reveals the nonreciprocal response of spatiotemporally modulated structures. This analytical model is complete and can be used for any spatiotemporal modulated graphene-based waveguides.

دانشگاه صنعتی امیرکبیر
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**سی و یکمین کنفرانس بین‌المللی مهندسی برق**

**۱۹ الی ۲۱ اردیبهشت ماه ۱۴۰۲**

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## ICEE-1231

## A New High Voltage Gain Z-Source Based DC-DC Converter for High-Power DG Applications

*Sakina Bakhshi - Reza Beiranvand

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## ICEE-1437

## A Single-Switch High Voltage Gain DC-DC Converter Using Coupled Inductor and Switched Capacitor-Inductor Techniques

*Mohammad Salehizadeh - Hasan Rastegar - Farid Mohammadi

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## ICEE-1273

## Dual-Input Single-Output High Step-Up DC-DC Converter for Renewable Energy Applications

*Farid Mohammadi - Amir Khorsandi

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## ICEE-1156

## A New High Voltage Gain Full Bridge Resonant Switched-Capacitor Converter

*Sajad AfsharZarandi - Reza Beiranvand

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## ICEE-1318

**A Novel Approach for Improving the LLC Resonant Converter Efficiency over Wide Input Voltage and Load Variation Ranges**

*Jasem Shahsevani - Reza Beiranvand

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**ICEE-1091**

**Ultrahigh Step-Up Non-Isolated DC-DC Converter Based on Quadratic Converter without Coupled Inductor**

*Sajad Rostami - Vahid Abbasi - Masoumeh Parastesh

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ICEE-1231

# A New High Voltage Gain Z-Source Based DC-DC Converter for High-Power DG Applications

Sakina Bakhshi - Reza Beiranvand

Tarbiat Modares University- Tarbiat Modares University

Abstract

In this paper, a new high step-up dc-dc converter is proposed, which provides a new connection way for impedance network to the primary side of a non-isolated interleaved boost converter, that can meet soft-switching ZVS condition for all semiconductor devices by using the PWM control method, which effectively reduces the converter switching losses and the electromagnetic interference issues. Therefore, high switching frequency operation is possible to reduce the passive components volumes such as inductors and capacitors, as well as the input and output filters. Consequently, high efficiency and high-power density is achieved by using the proposed converter, in practice. Also, a new impedance network is introduced, which can be used in an interleaved configuration to achieve this technique benefits. The given Z-source impedances are also smaller than the common Z-source impedance, which greatly reduces the converter volume and improves the power density.

**ICEE-1437**

# A Single-Switch High Voltage Gain DC-DC Converter Using Coupled Inductor and Switched Capacitor-Inductor Techniques

Mohammad Salehizadeh - Hasan Rastegar - Farid Mohammadi

Amirkabir University of Technology- Amirkabir University of Technology- Amirkabir University of Technology

Abstract

In this paper, a single switch non-isolated high voltage gain DC-DC converter using the coupled inductor and switched capacitor-inductor techniques, is suggested for renewable energy applications. Using these techniques, higher voltage gain in the lower duty cycle is achieved. In addition, due to the use of coupled inductors, a smaller voltage stress across the semiconductors such as a switch and diodes is attained. Furthermore, continuous input current and common ground between load and input DC source can be addressed as other advantages of the proposed converter. The operating principles of continuous conduction mode (CCM) are discussed, and the mathematical equations are derived. Under the same conditions, a comparison is conducted to evaluate the performance of the proposed converter. Finally, the proposed converter is designed for 500W with an input voltage of 40V and output voltage of 600V and is simulated in MATLAB/Simulink. The parasitic model is considered to evaluate the theoretical efficiency of the proposed converter. Results are presented to verify the theory mode performance of the converter.

ICEE-1273

# Dual-Input Single-Output High Step-Up DC-DC Converter for Renewable Energy Applications

Farid Mohammadi - Amir Khorsandi

Amirkabir University of Technology- Amirkabir University of Technology

Abstract

This paper presents a dual-input single-output (DISO) non-isolated dc-dc converter capable of extending to several inputs in ports. In addition, bidirectional and unidirectional power flow is feasible. The proposed converter uses the switched-capacitors (SC) technique, resulting in high voltage transfer gain. Although using the SC technique causes the discontinuous input current, this issue has been addressed by embedding an inductor at the input side. The DISO high voltage gain converter provides flexible control options, decreases current and voltage stress on semiconductors, and there is no duty cycle limitation due to the proposed switching methods. In addition, when one input fails, the proposed converter can transfer energy to the load by the other source without interruption. To evaluate the performance of the proposed DISO converter, the converter is compared with the recently presented converters based on the important characteristics. The required tests are also conducted to verify the feasibility and performance of the converter by MATALB/Simulink.

ICEE-1156

# A New High Voltage Gain Full Bridge Resonant Switched-Capacitor Converter

Sajad AfsharZarandi - Reza Beiranvand

Tarbiat Modares University- Tarbiat Modares University

Abstract—A full-bridge resonant switched-capacitor converter (SCC) is introduced here for high-frequency and high-power applications. This structure guarantees low voltage stress on the power MOSFETs, high voltage gain, soft switching operation of the power switches, as well as ZVS turn on and ZCS turn off of all power diodes. Small input/output filters volumes are achieved, because the input current and output voltage waveforms ripples frequencies are twice the switching frequency, due to the symmetrical structure of the converter. A coupled-inductor has been used, which reduces the magnetic components count and volume that improves the converter power density. Also, different common control methods such as phase-shifted, frequency modulation, and PWM can be applied to well adjust the output voltage of the introduced structure, even when wide output load and input voltage variations are used to the topology. The given converter has a good performance above and below its resonant frequency. Therefore, the appropriate frequency region can be chosen according to the application and available power switches. Finally, simulation results are given here to adjust the output voltage at 400 V, when the input voltage and output power are changed in 20-40 V and 50-500 W wide ranges, respectively.

ICEE-1318

# A Novel Approach for Improving the LLC Resonant Converter Efficiency over Wide Input Voltage and Load Variation Ranges

Jasem Shahsevani - Reza Beiranvand

Tarbiat Modares University- Tarbiat Modares University

Abstract—LLC resonant converter is widely used in electric vehicles, TVs, battery chargers, fuel cells and photovoltaic applications, due to its soft-switching operation, low EMI noise, wide input voltage and load variation ranges, high efficiency, and so forth. But, light-load or no-load low efficiency is one of its main drawbacks, which is mainly due to its switching frequency is far from the resonant frequency that increases the circulating currents and conduction losses. Here, a design procedure and control approach are introduced to overcome this issue and improve its efficiency over wide input voltage and load variation ranges. The control algorithm is based on the frequency variation and variable resonant capacitor. In the proposed algorithm the converter is designed to operate between its two resonant frequencies. The converter voltage gain is affected by quality factor between two resonant frequencies. By means of variable quality factor and resonant tank, the converter operates in resonant frequency which provides high efficiency values. Finally, a 180-220 V to 48 V LLC resonant converter is designed and controlled, when wide 50-500 W power is delivered to the load. The simulation results clearly show that efficiency value more than 95% is achieved over this wide operating conditions.

ICEE-1091

# Ultrahigh Step-Up Non-Isolated DC-DC Converter Based on Quadratic Converter without Coupled Inductor

Sajad Rostami - Vahid Abbasi - Masoumeh Parastesh

Kermanshah University of Technology- Kermanshah University of Technology- Kermanshah University of Technology

Abstract

This paper presents an ultrahigh step-up DC-DC converter that is combined of a quadratic boost converter and a multiplier cell. Voltage stress on most of the components is lower than 0.25Vo which causes reduction of cost and volume. Voltage gain of the proposed converter is higher than the compared converters. Slope of the voltage gain curve is higher than the others which makes possibility of higher voltage gains in lower duty cycles. The converter is experimented for voltage gain equal to 27 that shows unique operation of the converter in comparison to the similar ones. In addition, input source supports load with continuous current and there is a common ground between load and the input source. Dynamic and transient responses of the converter during variations are experimented and the results demonstrate appropriate properties of the converter. The converter is analyzed and the obtained equations are utilized to design components and compare the converter with the others. A 140W prototype is implemented to convert 14V-30V of input source to 400V in load side that is suitable for renewable energy applications. The experimental results verify feasibility and performance of the converter and prove capabilities of the converter for being used as an ultrahigh step-up converter.

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**ICEE-1218**

**Decentralized Optimization in Scheduling Virtual Power Plant (VPP)***

**Ehsan Nokandi - Mostafa**

* Amir Hossein Gholami - Amir Abolfazl Suratgar - Mohammad Bagher Menhaj- Mohammad Reza Hesamzadeh

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**ICEE-1187**

**ارائه چارچوب مدیریت بهینه انرژی و انعطاف‌پذیری برای تجمیع‌کننده منابع انرژی پراکنده**

*نیلوفر پورقادری- محمود فتوحی فیروزآباد- معین معینی اقطاعی- میلاد کبیری‌فر

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**ICEE-1281**

**Nash Equilibrium of Joint Day-ahead Electricity Markets and Forward Contracts in Congested Power Systems**

*Mohsen Banaei - Majid Oloomi Buygi - Hani Raouf-Sheybani - Razgar Ebrahimy - Henrik Madsen

**ICEE-1214**

# Bi-level Bidding Strategy of a Wind Power Producer Considering Local Intraday Demand Response Exchange Market

* Ehsan Nokandi - Mostafa Vahedipour-Dahraie - Saeed Reza Goldani

**Paper Code: ICEE- 1218**

# Decentralized Optimization in Scheduling Virtual Power Plant (VPP)*

**Ehsan Nokandi - Mostafa**

Amir Hossein Gholami - Amir Abolfazl Suratgar - Mohammad Bagher Menhaj- Mohammad Reza Hesamzadeh

Amirkabir university Tehran- Amirkabir university Tehran- Amirkabir university Tehran- Stockholm, Sweden

Abstract

The scheduling of virtual power plants (VPPs) has received much attention in the last few years. VPP refers to the integration of several power plant units together, which is considered as a single power plant. In this paper, three VPPs are considered, each of which includes different power plant units and must supply the desired load. Besides supplying the desired load, they should maximize their profit. Decentralized optimization method has been used to optimize these three VPPs. The reason for using decentralized method is to increase network security and also to not need a central computer. On the other hand, using the decentralized optimization method increases the speed of problem solving. Finally, the obtained results have been compared with the centralized method. The simulations show that almost the same result has been obtained by using different optimization methods. These results increase the tendency to use decentralized methods in VPPs.

کد مقاله: ICEE-1187

# ارائه چارچوب مدیریت بهینه انرژی و انعطاف‌پذیری برای تجمیع‌کننده منابع انرژی پراکنده

نیلوفر پورقادری- محمود فتوحی فیروزآباد- معین معینی اقطاعی- میلاد کبیری‌فر

دانشگاه صنعتی شریف- دانشگاه صنعتی شریف- دانشگاه صنعتی شریف- دانشگاه صنعتی شریف

چکیده

این مقاله به ارائه یک چارچوب برای تجمیع‌کننده منابع انرژی پراکنده به منظور شرکت در بازار روز بعد انرژی و انعطاف‌پذیری می‌پردازد. تجمیع‌کننده، منابع انرژی پراکنده شامل واحدهای تولید پراکنده سنتی، سیستم‌های ذخیره‌ساز انرژی، واحدهای خورشیدی و بارهای منعطف را تجمیع و هماهنگ کرده و با مدیریت بهینه انرژی و قابلیت انعطاف‌پذیری این منابع، به کسب سود در بازار می‌پردازد. منابع انرژی پراکنده می‌توانند به ارائه قابلیت انعطاف‌پذیری در هر دو جهت روبه‌بالا و روبه‌پایین بپردازند و تجمیع‌کننده با ارائه این قابلیت‌ها به بازار، انعطاف‌پذیری درخواستی بهره‌بردار شبکه توزیع را تأمین می‌کند. در این مدل، عدم قطعیت در توان خروجی واحدهای خورشیدی و بار مصرفی با استفاده از روش تصادفی در نظر گرفته می‌شود. مدل ارائه شده به صورت مسئله خطی آمیخته به اعداد صحیح فرمول‌بندی شده که حصول جواب بهینه سراسری راتضمین می‌کند. مورد مطالعاتی پیاده‌سازی شده نشان‌دهنده مؤثر بودن مدل در مدیریت انرژی و قابلیت انعطاف‌پذیری منابع انرژی پراکنده برای برآورده کردن نیازهای انعطاف‌پذیری شبکه و کسب سود برای تجمیع‌کننده منابع انرژی پراکنده است.

**Paper Code: ICEE- 1281**

# Nash Equilibrium of Joint Day-ahead Electricity Markets and Forward Contracts in Congested Power Systems

Mohsen Banaei - Majid Oloomi Buygi - Hani Raouf-Sheybani - Razgar Ebrahimy - Henrik Madsen

Technical University of Denmark- Ferdowsi University of Mashhad- Quchan University of Technology
Quchan- Technical University of Denmark Copenhagen- Technical University of Denmark, Copenhagen

Abstract

Uncertainty in the output power of large-scale wind power plants (WPPs) can face the electricity market players with undesirable profit variations. Market players can hedge themselves against these risks by participating in forward contracts markets alongside the day-ahead markets. The participation of market players in these two markets affects their profits and also the prices and power quantities of each market. Moreover, limitations in the transmission grid can affect the optimal behavior of market players. In this paper, a Cournot Nash equilibrium model is proposed to study the behavior of market players in the forward contract market and the day-ahead electricity market in a congested power system with large-scale integration of WPPs. The proposed method is applied to a test system, and the results are discussed.

**Paper Code: ICEE- 1214**

# Bi-level Bidding Strategy of a Wind Power Producer Considering Local Intraday Demand Response Exchange Market

Ehsan Nokandi - Mostafa Vahedipour-Dahraie - Saeed Reza Goldani

Birjand Univarsity- Birjand Univarsity- Birjand Univarsity

Abstract

In this paper, a bi-level stochastic approach has been suggested to optimize the bidding strategy of a wind power producer (WPP) in a day-ahead market. The uncertainties of wind generation and wing unit production have been considered using a stochastic method. To compensate for these uncertainties, the WPP is able to purchase demand response (DR) services from a local market which is held during an intraday period of time. The proposed self-scheduling optimization model is formulated as a bi-level problem in which the upper level maximizes WPP's profit, while the lower level's goal is maximizing the social welfare of demand response providers (DRPs). The bi-level model can be recast as a mixed-integer quadratic problem (MIQP) by applying Karush–Kuhn–Tucker (KKT) condition and strong duality theory which can be optimally solved by commercial solvers like CPLEX. Simulation results demonstrate the applicability and effectiveness of the proposed model.

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## ICEE-1363

## A Lightweight Authentication Protocol For M2M Communication In IIoT Using Physical Unclonable Functions

*Elaheh Kharghani - Saeed Aliakbari - Javad Bidad - Amir masoud Aminian moddares

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## ICEE-1543

## A Lightweight Authentication Protocol For M2M Communication In IIoT Using Physical Unclonable Functions

*Elaheh Kharghani - Saeed Aliakbari - Javad Bidad - Amir masoud Aminian moddares

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## ICEE-1488

## A New Approch on Condition Assessment of MV Switchgear based on Thermal Evaluation

* Mohsen Taghizadeh Kejani- Seyed Hamid Khalkhali- Ali asghar RaziKazemi

**ICEE-1561**

**Average Secrecy Capacity Performance Analysis for SWIPT-Based SIMO Underlay Cognitive Radio**

*Mohammad Javad Saber1- Seyedeh Maryam Mazloum- Seyed Mohammad Sajad Sadough

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**ICEE-1343**

**Wind-Robust Sea-Ice Discrimination from Sentinel-1 Texture Features**

* Parsa Shamsaddini - Ahmad Keshavarz - Stefano Zecchetto

**Paper Code: ICEE- 1363**

# A Lightweight Authentication Protocol For M2M Communication In IIoT Using Physical Unclonable Functions

Elaheh Kharghani - Saeed Aliakbari - Javad Bidad - Amir masoud Aminian moddares

Sadjad University of Technology- Sadjad University of Technology- Sadjad University of Technology- Sadjad University of Technology

Abstract

Machine to Machine (M2M) communication is one of the most important parts of the Industrial Internet of Things (IIoT). In this field, a large number of devices and sensors communicate with each other without human intervention. To establish secure communication, IIoT devices must perform mutual authentication. Besides, not only well-known attacks but physical attacks are also expected in these systems. On the other hand, many IIoT devices (e.g., smart sensors) have limited processing power and memory. Therefore, many of the existing authentication protocols are not appropriate for these systems. To meet this issue, in this paper, a new authentication scheme is presented for M2M communication in IIoT by using lightweight cryptographic functions, such as XOR operation, one-way hash function, and Physically Unclonable Function (PUF). The security analysis demonstrates that the scheme is resistant to both physical attacks and several well- known attacks. Also, the performance evaluation shows that the protocol is efficient in terms of storage, communication, and computation costs. Conclusively, in comparison with the existing protocols, our proposed protocol is more applicable for IIoT.

**Paper Code: ICEE- 1543**

# A Lightweight Authentication Protocol For M2M Communication In IIoT Using Physical Unclonable Functions

Elaheh Kharghani - Saeed Aliakbari - Javad Bidad - Amir masoud Aminian moddares

Amirkabir University of Technology- Amirkabir University of Technology- Amirkabir University of Technology

Abstract

Wearable robots are crucial for helping patients with lower limb diseases, particularly those with trouble walking, since their numbers are rising. These robots assist patients in walking, provide comfort, and aid in recuperation. In this work, the model predictive control by the Lasso regression theory (Lasso−MPC) with the extended Kalman filter (EKF) was used to make a controller that helps the patient walk by adjusting the impedance so that, in addition to regular walking, the patient has to put out the most effort when walking. The simulation results demonstrate the suggested control's incredible effectiveness in robot-assisted rehabilitation.

**Paper Code: ICEE- 1488**

# A New Approch on Condition Assessment of MV Switchgear based on Thermal Evaluation

Mohsen Taghizadeh Kejani- Seyed Hamid Khalkhali- Ali asghar RaziKazemi

K.N.Toosi University of Technology- K.N.Toosi University of Technology- K.N.Toosi University of Technology

Abstract

The increase in load demand in the power system, distribution switchgears result in more attention from the thermal point of view. In this article, a 3D model of the connection of the circuit breaker to the switchgear (plum contact) of the VD4 CB of ABB Company has been simulated through COMSOL software. The heat has been recorded in its different parts. Subsequently, variations in temperature have been observed under different currents and ambient temperatures. Finally, according to the simulations, the temperature slope variable has been investigated at different ambient temperatures and it has been introduced as an independent diagnosis index to the ambient temperature.

**Paper Code: ICEE- 1561**

# Average Secrecy Capacity Performance Analysis for SWIPT-Based SIMO Underlay Cognitive Radio

Mohammad Javad Saber1- Seyedeh Maryam Mazloum- Seyed Mohammad Sajad Sadough

Shahid Beheshti University- Persian Gulf University Busheh - Shahid Beheshti University

Abstract

We address the physical layer security (PHY- security) for an underlay single-input multiple-output (SIMO) cognitive radio network using simultaneous wireless information and power transfer (SWIPT). The considered system model is composed of one primary receiver, one secondary transceiver, and one energy harvesting receiver that may potentially be an eavesdropper. First, the closed-form analytic expression of the average secrecy capacity (ASC) of the considered network is derived. Second, we analyze the network's achievable ASC under Rayleigh fading assumption for all underlying channels. Our results indicate that ASC performance is improved by reducing the number of deployed antennas at the energy receiver or by increasing the number of antennas deployed at the information receiver.

**Paper Code: ICEE- 1343**

# Wind-Robust Sea-Ice Discrimination from Sentinel-1 Texture Features

Parsa Shamsaddini - Ahmad Keshavarz - Stefano Zecchetto

Persian Gulf university Busheh- Persian Gulf university Busheh- Persian Gulf university Padova

Abstract

Sea and ice discrimination and classification in the polar regions from satellite data gained importance in remote sensing and geosciences, essentially because of the undergoing climate change. Synthetic Aperture Radar (SAR) is one of the best instruments in remote sensing for sea-ice discrimination at high spatial resolution (hundreds of m), because it provides im- ages day and night with whatever cloud coverage. The available ice masks are generally at spatial resolution of km, thus not fully suitable to be used with SAR images. This study is to discriminate sea and ice in high resolution (250 m) with good accuracy. The proposed methodology uses fuzzy c-mean clustering on selected Gray Level Co-occurrence Matrix (GLCM) features which are robust against the wind. The obtained results show the proposed method discriminates the ice from sea with the existence of wind.

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**ICEE-1352**

**A New 10 Watt 1.6 GHz Linear Power Amplifier with More than 11 dB Gain**

* Marzieh Chegini - HojjatAllah Nemati - Mahmoud Kamarei

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**ICEE-1289**

**High efficiency Continuous class J/B power amplifier design with 130% Fractional Bandwidth**

* Sara Aghajani - Mahmoud Kamarei - Marzieh Chegini

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**ICEE-1350**

**A New 10 Watt Power Amplifier for GSM 900 MHz base stations with 44% Bandwidth**

* Marzieh Chegini - HojjatAllah Nemati - Mahmoud Kamarei

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**ICEE-1456**

**طراحی و ساخت سیستم تصویربرداری SAR دایروی موج میلیمتری**

*علی آقاکثیری- امیرعلی بنایی کاشانی- علی تاجیک- علیرضا کیایی- هنگامه عزیزی- مهدی عندلیبی سامان غضنفری- محمد فخارزاده

**ICEE-1532**

# T-type L-2L De-Embedding Method for On-Wafer T-model Transmission Line Network

* Milad Seyedi - Nasser Masoumi - Samad Sheikhaei

**Paper Code: ICEE- 1352**

# A New 10 Watt 1.6 GHz Linear Power Amplifier with More than 11 dB Gain

Marzieh Chegini - HojjatAllah Nemati - Mahmoud Kamarei

University of Tehran- Iran University of science and technology- University of Tehran

Abstract

This paper presents the design, implementation and measurement results for a 1.4~1.8 GHz linear Powe  Amplifier, that centered at 1.6 GHz. Design and fabrication  done with CGH40010-F device from Wolfspeed on FR4 PCB. Experimental results with excited CW test, show that the designed PA achieves 14 dB maximum gain, more than 42 dBm output power at 1-dB compression point and also 58% peak Efficiency. Designed power amplifier shows a large signal gain of more than 11 dB in the entire bandwidth.

**Paper Code: ICEE- 1289**

# High efficiency Continuous class J/B power amplifier design with 130% Fractional Bandwidth

Sara Aghajani - Mahmoud Kamarei - Marzieh Chegini

University of Tehran- University of Tehran- University of Tehran

Abstract

In this paper design procedure and electromagnetic simulation results of an ultra-wideband continuous class J/B power amplifier is reported. With the help of SRFT CAD tools in MATLAB and load/source pull capability of advanced design system (ADS), appropriate output and input matching are synthesized along 0.4-2 GHz band. Then by using of CGH40010F device from Wolfspeed, layout equivalent of designed PA is extracted and the circuit is cosimulated on RO4003c substrate model. ±0.8 dB output power flatness with drain efficiency above 58% across more than 130% fractional bandwidth introduce the designed PA as a good candidate for broadband high efficiency applications.

**Paper Code: ICEE- 1350**

# A New 10 Watt Power Amplifier for GSM 900 MHz base stations with 44% Bandwidth

Marzieh Chegini - HojjatAllah Nemati - Mahmoud Kamarei

University of Tehran- Iran University of science and technology- University of Tehran

Abstract

This paper presents the design, implementation and measurement results for a 0.7–1.1 GHz Power Amplifier, that centered at 900 MHz. Design and fabrication done with CGH40010-F device from Wolfspeed on FR4 PCB. SRFT algorithm has been used to design input and output matching networks. Experimental results under CW signal, show that the designed PA achieves more than 42.5 dBm output power at 1- dB compression point and more than 60% drain efficiency in saturation region

**کد مقاله: ICEE-1456**

# طراحی و ساخت سیستم تصویربرداری SAR دایروی موج میلیمتری

علی آقاکثیری- امیرعلی بنایی کاشانی- علی تاجیک- علیرضا کیایی- هنگامه عزیزی- مهدی عندلیبی

سامان غضنفری- محمد فخارزاده

دانشگاه صنعتی شریف- گروه تحقیق و توسعه شرکت فناوری امواج بصیر- دانشگاه صنعتی شریف

چکیده

این مقاله مروری بر مراحل طراحی و ساخت یک سیستم تصویربرداری موج میلی متری SAR دایروی را ارائه می‌دهد. این سیستم با ترکیب اسکن مکانیکی و الکترونیکی، برای تشخیص اشیاء پنهان در زیر لباس، به صورت سه بعدی تصویربرداری می‌کند. اسکن الکترونیکی توسط آرایه‌های آنتن سوئیچ شونده فرستنده و گیرنده و اسکن مکانیکی توسط یک بازو که در دستگاه استوانه‌ای حول بدن فرد می‌چرخد، انجام می‌شود. هر زوج فرستنده و گیرنده با اسکن کردن ۵۰ پله فرکانسی در باند فرکانسی ۲۸ GHz ، مکانیزم SFCW را پیاده سازی می‌نماید. سپس امواج دریافتی توسط آرایه گیرنده به واحد پردازش ارسال شده و تصویر سه بعدی بازسازی می‌گردد. در نهایت با بهره بردن از هوش مصنوعی، اجسام ممنوعه پنهان شده زیر لباس افراد شناسایی می‌گردد. در این مقاله به سخت افزار الکترونیکی سیستم، شامل زنجیره‌های فرستنده و گیرنده و همچنین آرایه آنتن پرداخته شده است. به علاوه، الگوریتم بازسازی تصویر با استفاده از سیگنال‌های دریافتی و روابط مربوط به آن بررسی شده است. کیفیت تصویر حاصل شده پس از بازسازی بیانگر عملکرد مطلوب سیستم است

**Paper Code: ICEE- 1532**

# T-type L-2L De-Embedding Method for On-Wafer T-model Transmission Line Network

Milad Seyedi - Nasser Masoumi - Samad Sheikhaei

University of Tehran- University of Tehran- University of Tehran

Abstract

This paper presents an extensive evaluation for a new type of the L–2L de-embedding method applied to on-chip de-embedding. We derive analytical formulas to discuss and verify the accuracy of the improved and extended method called the T-type L-2L de-embedding. The case study structure to apply the new method consists of a microstrip line combined with two left- and right-side pads. For the simulation of the structures, HFSS 3D electromagnetic (EM) simulator is used. The results show that the T-type L-2L exhibits better accuracy compared with the other on-wafer de-embedding methods for a device under test (DUT).

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## ICEE-1120

## Sampled-data-based Descriptor Observer Design with Aperiodic Measurements for Lithium-ion Batteries in Hybrid Electric Vehicles

* Hamid Reza Ahmadzadeh - Masoud Shafiee

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## ICEE-1131

## Distributed Data Processing for Multi-Agent Systems Via Wave Model

* Saeedreza Tofighi - Masoud Shafiee

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## ICEE-1168

## Modeling and optimal control of the vibration model of constrained buildings based on fractional order singular theory using orthogonal polynomials

* Vahid Safari Dehnavi - Masoud Shafiee

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## ICEE-1465

## Investigation of The Thermal Process Stability Analysis By New BIBO Stability Algorithm of 2-D Discrete Models

* Mehdi Mohammadi - Masoud Shafiee - Mahdi Mirshahi

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## ICEE-1560

## Identifying Singular 2-D Systems Using 1-D Methods

* Masoud Shafiee - Kamyar Azarakhsh

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## ICEE-1466

## Modeling the Cable Bridge Based on Two Dimensional System and Analysing the Stability of Desired Model Based on Wave Advanced Model

* Mehdi Mirshahi - Masoud Shafiee - Mehdi Mohammadi

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**ICEE-1120**

## Sampled-data-based Descriptor Observer Design with Aperiodic Measurements for Lithium-ion Batteries in Hybrid Electric Vehicles

Hamid Reza Ahmadzadeh - Masoud Shafiee

Amirkabir University of Technolog- Amirkabir University of Technolog

The state-of-charge information of lithium-ion batteries plays an important role in the performance of hybrid electric vehicles. Moreover, with the development of digital technologies, systems are implemented on digital platforms. In this paper, we address to sampled-data descriptor observer designing to state estimation for lithium-ion battery in hybrid electric vehicles used to estimate its state-of-charge. To this end, first a descriptor time-delay model with time-varying delay is provided for the dynamics of error estimation. Then based on this model, theory of descriptor systems and Lyapunov-Krasovskii function, sufficient conditions are extracted to guarantee the exponential stability of error dynamics. At the same time, the matrix of observer is designed in terms of linear matrix inequalities (LMIs) solvable by MATLAB software. Finally, the efficiency of proposed observer is illustrated by computer simulation.

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**ICEE-1131**

## Distributed Data Processing for Multi-Agent Systems Via Wave Model

Saeedreza Tofighi - Masoud Shafiee

Amirkabir University of Technolog- Amirkabir University of Technolog

Abstract— a method for modeling and analyzing distributed communications in multi-agent systems (MAS) is presented using the multi-dimensional (m-D) systems theory. Data transactions are modeled using the givone-roesser (GR) model by considering quantization schemes in the in-node and inter-node computations. Then, for processing the distributed data in the network a wave-

like model has been proposed, which can ensure the stability of the entire system. This method, because the location of the nodes in the network is not important, the dimensions of the network can be large, and the real-time processing capability of the network is more than other methods, can be important.

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**ICEE-1168**

**Modeling and optimal control of the vibration model of constrained buildings based on fractional order singular theory using orthogonal polynomials**

Vahid Safari Dehnavi - Masoud Shafiee

Amirkabir University of Technolog- Amirkabir University of Technolog

Abstract— This paper introduces the optimal control of fractional-order singular systems and the application of finitemode systems in modeling practical systems. In this paper, there are only finite modes in the system. The aim is to control fractional order singular systems without using operational matrices using optimal control and virtual calculus of variations. After using orthogonal polynomials, we achieved a formulation to find the answer to the problem. This problem was solved using Legendre, Chebyshev, and Jacobi orthogonal polynomials. Then, the vibration model of two constrained buildings is modeled using the fractional order singular system. The aim is to control the vibration of the constrained buildings against earthquakes. Finally, a comparison was made between different orthogonal polynomials and the number of the polynomial of these functions.

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**ICEE-1465**

**Investigation of The Thermal Process Stability Analysis By New BIBO Stability Algorithm of 2-D Discrete Models**

Mehdi Mohammadi - Masoud Shafiee - Mahdi Mirshahi
Amirkabir University of Technology- Amirkabir University of Technology- Amirkabir University of Technology

Abstract— This paper is concerned with the stability analysis and stabilization of two-dimensional discrete systems exhibited by the model of Fornasini-Marchesini (FM-I). We proposed a condition for the stability of 2D systems. Second, a state feedback controller is considered to stabilize the FM model and achieve stability. Third, a simulation of numerical examples was considered, and at least the thermal process application was proposed to confirm the stability theorem.

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**ICEE-1560**

## Identifying Singular 2-D Systems Using 1-D Methods

Masoud Shafiee - Kamyar Azarakhsh
Amirkabir University of Technology- Amirkabir University of Technology

Abstract— In this paper, we present a new 1-D identification method for the identification of 2-D and singular 2-D systems. The previously introduced 1-D equivalent for 2-D systems which is called the Wave Advanced Model (WAM) suffers from a serious computational disadvantage. In WAM, the system matrices are rectangular and therefore the extensive 1-D literature which exists for systems with regular form square matrices cannot be applied to WAM. Furthermore, since WAM is a structure varying model, it is impossible to define an inputoutput difference equation for it and therefore the identification problem becomes even more complex. To overcome this complexity, here we present a method that allows us to define a 1-D input-output difference equation for Singular WAM (SWAM) and use it to solve the 2-D system identification problem using 1-D methods. In order to show the computational advantages of this method, a numerical example is also studied.

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ICEE-1466

# Modeling the Cable Bridge Based on Two Dimensional System and Analysing the Stability of Desired Model Based on Wave Advanced Model

Mehdi Mirshahi - Masoud Shafiee - Mehdi Mohammadi

Amirkabir University of Technology- Amirkabir University of Technology- Amirkabir University of Technology

Abstract—In this paper the new stability analysis is discussed. the importance of researching about the cable cridge under significant conditions for instance tornados and earthquake which plays a key role due to the wide range of effects that these structures have in human life where any single misunderstanding about the cable bridge cause serious problems. To figure out that structures are suitable to use we must figure out the vital criteria. To understand this information we must use the suitable model to reach a real analysis of the structures. In this article, we use two-dimensional (2-D) modeling analysis to check the stability of structures. By using the 2-D analysis and equations of problem and equilibrium equations of the system we proposed a 2-D model for the system to reach the 2-D state space model we further discussed the stability theorem that was proposed and we check the stability of our proposed model.

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**ICEE-1025**

**Design and Simulation of Ultra High power X-band Rotary Joint with a Matching Choke**

*Mohammad Bod - Seyed mohammad Hashemi

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**ICEE-1035**

**A Low-profile Interdigital Diplexer for LEO Satellites Applications**

* Mojtaba Fallahzadeh - Behzad Ahmadi - Ali Kheirdoost

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**ICEE-1061**

**A Low-cost Waveguide Switch Using Glide-symmetric Holey Electromagnetic Band Gap Technology**

*Mohsen Shafeghati - Elham Sharifi moghaddam - Behzad Ahmadi

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**ICEE-1137**

**A Simplified Computational Method for a Proposed mm-Wave Reconfigurable Intelligent Surface**

* Nima Ahmadi - Forouhar Farzaneh

**ICEE-1190**

# A Band-pass Power Divider Based on Substrate Integrated Plasmonic Waveguide

* Salma Mirhadi - Shamsi Soleimani

**Paper Code: ICEE- 1025**

# Design and Simulation of Ultra High power X-band Rotary Joint with a Matching Choke

Mohammad Bod - Seyed mohammad Hashemi

Shahid Rajaee University- Shahid Rajaee University

Abstract

In this paper, the design and simulation of an ultra-high power rotary joint for X-band frequency are discussed. The proposed rotary joint consists of a mode converter at the beginning and the end, a contactless circular waveguide, and an external choke including ball bearings and impedance-matching stubs in the middle part. At the beginning and the end parts, by converting the $TE_{10}$ mode of a rectangular waveguide to the $TE_{01}$ mode of a circular waveguide, a symmetrical mode is created, which enables successive rotations of the structure without disturbing the electrical current. The use of circular $TE_{01}$ mode in the proposed rotary joint leads to the power handling of 52 megawatts in the structure. The middle circular waveguide consists of choke and stubs for matching the contactless circular waveguide. The simulation results show that the proposed structure has a transmission loss of less than 0.4 dB and a return loss of better than 15 dB in the 10 GHz frequency.

**Paper Code: ICEE- 1035**

# A Low-profile Interdigital Diplexer for LEO Satellites Applications

Mojtaba Fallahzadeh - Behzad Ahmadi - Ali Kheirdoost

K. N. Toosi university of technology- Sattellite Research Institute Iranian Space Research Center- Communication Technology Faculty ICT Research Institute (ITRC)

Abstract

A low-profile diplexer is proposed for satellite telemetry, tracking and command (TT&C) applications in S-band frequency within 2.025-2.110/2.200-2.290 GHz. The diplexer consists of two interdigital band-pass filters and a coaxial power divider. The proposed diplexer has high potential for mass production because there is no need to tune the frequency response after fabrication. Also, the structure is lightweight and low-profile so it could be easily integrated into payload transceivers or antennas in small satellites specially CubeSats. A prototype of the proposed diplexer is fabricated and measured. The measured results are in good agreements with simulations. The measured return loss is lower than -15 dB in all ports, insertion loss is less than 0.7 dB and isolation between output ports is better than 55 dB.

**Paper Code: ICEE- 1061**

# A Low-cost Waveguide Switch Using Glide-symmetric Holey Electromagnetic Band Gap Technology

Mohsen Shafeghati - Elham Sharifi moghaddam - Behzad Ahmadi

Satellite research institute- Satellite research institute- Satellite research institute

Abstract

This paper presents a novel double pole double through (DPDT) waveguide switch based on glide-symmetric holey electromagnetic band gap (EBG) structure. Applying the glide-symmetric holey (EBG) technology in the electromechanical switches prevents the wave leakage to the gap between the inner rotary part and the outer fixed ring of the switch. Construction of the holey EBG structure is easier and less expensive comparing the conventional bed of nails as the perfect magnetic conductor surface of an EBG structure, because drilling is more cost-effective comparing machining periodic tiny pins. The waveguide paths have been surrounded by one row of glide-symmetric holes. Simulation results show that the isolation between adjacent ports in the OFF state is more than 80 dB in the frequency range of 9-15GHz. The reflection coefficient and insertion loss of the switch ports are less than -35dB and 0.05dB, respectively. Comparing traditional gap waveguide switches, presented switch in this paper has wider bandwidth, higher isolation and lower reflection coefficient.

**Paper Code: ICEE- 1137**

# A Simplified Computational Method for a Proposed mm-Wave Reconfigurable Intelligent Surface

Nima Ahmadi - Forouhar Farzaneh

Sharif University of Technolog Sharif University of Technology

Abstract

A Reconfigurable intelligent surface is considered with unit-cells connected to the ground by proper PIN diodes. Through unit-cell design the reflection coefficient of the cells is optimized for the ON and OFF states. The progressive phase between the unit-cells is determined by the analytical phase shift relation of the conventional phased array theory and then discretized to 0 and $\pi$ levels. This way the optimized reflection direction is realized. The numerical results are compared to the analytical ones obtained through conventional two-dimensional phased array approximation.

**Paper Code: ICEE- 1190**

# A Band-pass Power Divider Based on Substrate Integrated Plasmonic Waveguide

Salma Mirhadi - Shamsi Soleimani

Shariaty College- Iran University of Science and Technology Tehran

Abstract

This paper focuses on designing a sharp roll-off band-pass equal power divider based on the concept of the substrate integrated plasmonic waveguide (SIPW). It is composed of a SIPW at the input that splits into two half-mode SIPWs (HSIPW) at the outputs. Both SIPW and HSIPW consist of slots etched on the top metallic layer of substrate integrated waveguide (SIW) and the half-mode SIW, respectively, to support the spoof surface plasmon polariton (SSPP). Low and high cut-off frequencies can be independently tuned by the parameters of the SIW and SSPP sections, respectively. A prototype of the proposed power divider was fabricated and tested to verify the presented design. The simulated and the measured results show that the electromagnetic waves are split equally between output ports within the passband and are prohibited from propagating in the out-of-band rejection with sharp attenuation.

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**ICEE-1020**

**Presenting A Minimal Model of DADs Phenomenon for Ventricular Muscle Cell**

* Soheila Esmaeili Porzani - S.H. Sabzposhan

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**ICEE-1286**

**Low-cost Dielectrophoresis-Based Microfluidic Chip for Label-free Particle Separation With 3D Electrodes**

*Fatemeh Esmaeili - Zeynab Alipour - Mehdi Fardmanesh

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**ICEE-1407**

**40Hz Auditory Entrainment Promotes Synchronization Between Frontal and Parietal Regions of the Brain**

*Mojtaba Lahijanian - Hamid Aghajan

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**ICEE-1253**

**Numerical Study of a Microfluidic-Based Motile Sperm Enrichment Using Sperm Rheotactic Behavior**

*Mohammadjavad Bouloorchi - Saeed Javadizadeh - Aref Valipour - MirBehrad Mousavi - Majid Badieirostami

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**ICEE-1410**

**Designing an Optimal Electrode structure to perform ECIS and EIS tests**

*Ali Monfaredi - Nasrin Hashemi - Mehrdad Saviz

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## ICEE-1163

## The Use of Additive Decomposition and Deep Neural Network for Photovoltaic Power Forecasting

* Fariba Dehghan - Mohsen Parsa Moghaddam - Maryam Imani

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## ICEE-1292

## بررسی و شبیه‌سازی اضافه ولتاژهای صاعقه در نیروگاه خورشیدی برق خراسان و ارائه سیستم حفاظتی مناسب

*هادی علی آبادی - بهزاد کرمانی

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## ICEE-1178

## برنامه ریزی احتمالاتی بهینه فیلترهای پسیو در حضور خودروهای برقی متصل به شبکه با قابلیت جبران‌سازی هارمونیک در شبکه‌های توزیع

*پریسا انجم شعاع - سعید اسماعیلی

**ICEE-1323**

**Optimal Energy Management of EVs in Intelligent Parking lots with Considering Solar Panels**

*Noorallah Yavari - Fatemeh Jahanbani Ardakani - Alireza Sedighi Anaraki

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**ICEE-1472**

**Improving Wind Turbines Blades Damage Detection by Using YOLO BoF and BoS**

*Reza Mohammadi - Saeed Sharifian

**Paper Code: ICEE- 1163**

# The Use of Additive Decomposition and Deep Neural Network for Photovoltaic Power Forecasting

Fariba Dehghan - Mohsen Parsa Moghaddam - Maryam Imani

Tarbiat Modares University- Tarbiat Modares University- Tarbiat Modares University

Abstract

Predict photovoltaic (PV) power production is indispensable for security and reliability of the grid. In this article, a short-term forecasting method, namely trend decomposition two-dimensional convolutional neural network based on additive decomposition and convolution neural network (CNN) is proposed. Firstly, the additive decomposition model is deployed to decompose the PV power generation series to the long-term trend (LT), the seasonal trend (ST), and the random component. Then, three independent two-dimensional convolutional neural networks are designed to extract daily and hourly dependencies among the decomposed components. Finally, the prediction results of these networks are summed for the final forecast. The one-day-ahead forecasting capability of the presented method is evaluated with two case studies using real datasets gathered from Limburg and Luxembourg, Belgium. Analysis of the prediction's results indicates that the proposed method has higher accuracy compared to individual multi-layer perceptron, two-dimensional convolutional neural network, long short-term memory (LSTM), gated recurrent unit, and bidirectional LSTM networks.

**کد مقاله: ICEE-1292**

# بررسی و شبیه‌سازی اضافه ولتاژهای صاعقه در نیروگاه خورشیدی برق خراسان و ارائه سیستم حفاظتی مناسب

هادی علی آبادی- بهزاد کرمانی

شرکت برق منطقه‌ای خراسان- شرکت برق منطقه‌ای خراسان

چکیده

به منظور تحلیل اضافه‌ولتاژهای ناشی از برخورد صاعقه به نیروگاه‌های خورشیدی، می‌بایست کلیه اجزای نیروگاه و خط ارتباطی با پست قدرت بالادست به صورت کامل و دقیق مدل‌سازی شوند. نیروگاه مورد مطالعه در این مقاله، نیروگاه خورشیدی واقع در شرکت برق منطقه‌ای خراسان می‌باشد که به صورت وابسته به فرکانس در محیط نرم‌افزار **EMTP** شبیه‌سازی و اضافه‌ولتاژهای ناشی از برخورد صاعقه در دو سناریو به صورت برخورد صاعقه به خط ارتباطی شبکه بالادست و برخورد مستقیم صاعقه به خود نیروگاه مورد بررسی قرار می‌گیرد. نتایج به دست‌آمده از شبیه‌سازی نشان می‌دهد که اضافه‌ولتاژهای صاعقه در مقایسه با سطح تحمل عایقی تجهیزات حساس نیروگاه مانند اینورترها و پنل‌های خورشیدی می‌تواند منجر به آسیب جدی آن‌ها شود. لذا ارائه یک سیستم حفاظتی مناسب برای کاهش آثار خرابی ناشی از صاعقه برای نیروگاه خورشیدی الزامی می‌باشد.

**کد مقاله: ICEE-1178**

# برنامه‌ریزی احتمالاتی بهینه فیلترهای پسیو در حضور خودروهای برقی متصل به شبکه با قابلیت جبران‌سازی هارمونیک در شبکه‌های توزیع

پریسا انجم‌شعاع - سعید اسماعیلی

دانشگاه شهید باهنر کرمان- دانشگاه شهید باهنر کرمان

چکیده

آثار سوء هارمونیک‌ها منجر به مشکلات زیادی اعم از افزایش تلفات اهمی، کاهش طول عمر تجهیزات، ایجاد خطا در دستگاه‌های اندازه‌گیری و عملکرد نامناسب دستگاه‌های حفاظت می‌شود. استفاده از قابلیت جبران‌سازی مدارات الکترونیک قدرت موجود در پارکینگ‌های خودروهای برقی متصل به شبکه و همچنین تزریق جریان هارمونیکی جهت کاهش اعوجاج هارمونیکی کل در کنار فیلترهای پسیو از جمله مواردی است که در این مقاله به آن پرداخته می‌شود. در این مطالعه محل‌های شارژ خودروهای برقی به دو دسته ایستگاه شارژ و پارکینگ خودرو برقی تقسیم‌بندی شده است. "پارکینگ‌های خودرو برقی" شامل شارژرهای دوطرفه قابلیت شارژ و دشارژ توان و "ایستگاه‌های شارژ" شامل شارژرهای یک‌طرفه، فقط قابلیت شارژ را دارند. در نظر گرفتن ماهیت احتمالاتی ظرفیت پارکینگ‌ها و ایستگاه‌های شارژ در طول شبانه‌روز منجر به دستیابی به نتایج واقعی‌تر از بارهای قطعی در شبکه می‌شود. بنابراین مشارکت خودروهای برقی دو طرفه در بازار هارمونیکی به صورت احتمالاتی با روش مونت کارلو مدل‌سازی و توجیه اقتصادی آن به لحاظ طول عمر باتری از طریق یک الگوریتم نوین ماتریس کوواریانس چندهدفه به نام MOCMA-ES در شبکه نمونه توزیع ۳۳ باسه استاندارد IEEE در نظر گرفته شده و نتایج در دو حالت با و بدون حضور خودروهای برقی با یکدیگر مقایسه می‌شوند.

**Paper Code: ICEE- 1323**

# Optimal Energy Management of EVs in Intelligent Parking lots with Considering Solar Panels

Noorallah Yavari- Fatemeh Jahanbani Ardakani- Alireza Sedighi Anaraki

Yazd University- Yazd University

Abstract

Nowadays, 25 % of greenhouse gas emissions world- wide are from the transportation sector. That has led govern- ments to make and employ electric vehicles (EV). This study presented an optimal intelligent parking lot (IPL) schedule for charging and discharging EV. IPL's recharge prices vary depending on whether EVs have a subscription with an electro- mobility service provider or pay-as-you-go payment. The IPL operator supplies a load of an office using battery storage systems (BESS) and rooftop photovoltaic systems while participating in the day-ahead market. The IPL's operator aims to maximize the total profit by scheduling the charging and discharging of the EVs and BESSs, considering EV owners' preferences. The results demonstrate the presented model's effectiveness for the operator's and EVs' profit.

**Paper Code: ICEE- 1472**

# Improving Wind Turbines Blades Damage Detection by Using YOLO BoF and BoS

Reza Mohammadi- Saeed Sharifian

Amirkabir University of Technology- Amirkabir University of Technology

AbstractIn this study, we introduce a novel wind turbines blade's damage detection framework for reducing inspection time and improving accuracy in comparison with human. With recent developments and improvements in UAVs technology, aerial imagery can be used to achieve high resolution images from blades. The acquired images, can be analyzed by novel deep learning and image processing techniques like YOLO, to detect the failures and damages on surface of blades. But because ofsmall training set and the structure of a damage in a image, we need to use advanced deep learning methods to achieve more accurate analysis than human eyes and also previous works. Theproposed method is found to be effective based on experimental results in terms of suggesting damage locations and types on a surface, the system can achieve a level of precision better than a human-level inspection.

**سی و یکمین کنفرانس بین‌المللی مهندسی برق**

**۱۹ الی ۲۱ اردیبهشت ماه ۱۴۰۲**

**31st International Conference on Electrical Engineering**

**May 9-11/2023 –Tehran, Iran**

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| چهارشنبه ۲۰ اردیبهشت ماه ۱۴۰۲ ساعت ۱۴:۳۰ الی ۱۶:۰۰ | | |
| عنوان نشست: **مخابرات (سیستم) ۵**- پردازش صوت و تصویر ۱ | | |
| **روسای نشست** | دکتر محمدحسن قاسمیان یزدی | دانشگاه تربیت مدرس |
| | دکتر حسن آقائی نیا | دانشگاه صنعتی امیرکبیر |
| | دکتر محمدعلی اخایی | دانشگاه تهران |

## ICEE-1071

**تشخیص انتها به انتها حملات جعل بازپخش صدا به کمک شبکه CNN-ViT جهت بهبود تعمیم‌پذیری**

*حسین حجازی- محمد عسگری

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## ICEE-1090

**Kernel-Based Band Selection for Hyperspectral Image Classification**

* Mehdi Kamandar

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## ICEE-1241

**Fusion of Multi-Level CNN With LBP Features For Facial Emotion Recognition**

* Ehsan Bahmanabady- Maryam Imani- Hassan Ghassemian

**ICEE-1245**

**Unsupervised Change Detection in SAR Images Using a Six-Branch CNN and Adaptive Window Approach**

* Abbas Kakoolvand - Maryam Imani - Hassan Ghassemian

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**ICEE-1372**

**On Spatiotemporal-Aware Deep Neural Networks for Real-Time Video Fire Detection: Empowering Image-Based Models With Temporal and Spatial Features of Video**

* Mahdi Shamisavi - Sahar Eslami - Amir Jahanshahi - Morteza Rajabzadeh

**کد مقاله: ICEE-1071**

# تشخیص انتها به انتها حملات جعل بازپخش صدا به کمک شبکه CNN-ViT جهت بهبود تعمیم‌پذیری

حسین حجازی- محمد عسگری

دانشگاه صدا و سیما- دانشگاه صدا و سیما

## چکیده

با وجود پیشرفت سیستم‌های تایید خودکار گوینده **(ASV)**، این سیستم‌ها در مواجهه با حملات جعل بازپخش که نیازی به مهارت خاص یا سخت‌افزار تخصصی جهت اعمال به سیستم‌های **ASV** ندارند، آسیب‌پذیر هستند. در این مقاله سعی داریم با استفاده از ساختار شبکه‌ی عصبی کانولوشنی (**CNN**) و به دنبال آن ترنسفرمر بینایی (**ViT**)، یک رویکرد جدید یادگیری عمیق برای تشخیص حملات بازپخش صدا ارائه دهیم. با استفاده از این سیستم واحد، نتایج نرخ خطای برابر **(EER)** نشان از بهبود ۲۳/۸۴ درصدی در دادگان توسعه، ۳۰/۰۲ درصدی در دادگان ارزیابی و۳۵/۵ درصدی در تعمیم‌پذیری نسبت به روش‌های پایه موجود در چالش **ASVSpoof2017** دارد.

**Paper Code: ICEE- 1090**

# Kernel-Based Band Selection for Hyperspectral Image Classification

Mehdi Kamandar

University of Advanced Technology Kerman

Abstract

Hyperspectral image classification is a challenging task due to problems such as complex nonlinear structure of data, noisy and redundant spectral bands, and small-sample-size problem. The nonlinear support vector machine (SVM) is an excellent classifier to tackle these challenges. Selecting the most appropriate kernel and tuning its parameters for the data has a vital role in classification performance of the SVM. In this paper, an anisotropic Gaussian kernel is used. Anisotropic Gaussian kernel has a scaling coefficient for each band. The scaling coefficients are tuned by maximizing a classifier independent separability measure with $l_1$ regularization. The separability measure uses within-class and between-class dispersion information in the feature space. Some of the scaling coefficients will be zero after separability maximization due to $l_1$ regularization, that is equivalent to removing corresponding irrelevant bands from classification processes. Therefore, an embedded band selection is done to remove the destructive effect of irrelevant and redundant bands. The results show on average 5% classification accuracy improvement compared to an isotropic Gaussian kernel for classifying Indiana Pin Site hyperspectral image.

**Paper Code: ICEE- 1241**

# Fusion of Multi-Level CNN With LBP Features For Facial Emotion Recognition

Ehsan Bahmanabady- Maryam Imani- Hassan Ghassemian

Tarbiat Modares University- Tarbiat Modares University- Tarbiat Modares University

Abstract

A facial emotion recognition framework is proposed in this work. The convolutional neural network (CNN) has high ability in extraction of hierarchical spatial features from low level texture characteristics to high level contextual features. A simple CNN model with three layers is suggested in this paper where the features extracted in all layers containing multi-level features are activated and used for classification. In addition, the local binary pattern (LBP) descriptor is used to extract discriminative features from the spatial structure of the input image. Therefore, four feature sources are provided by multi levels of CNN and the LBP descriptor. Each feature source is used for facial emotion recognition by applying to the support vector machine (SVM) classier. Finally, the majority voting rule is used for decision fusion to provide the final emotional label of each given face image. The proposed method with 84% overall accuracy, 83% weighted F1-score and 81% kappa coefficient provides the best performance compared to LBP, multi-level CNN and two-dimensional principal component analysis (2DPCA) methods.

**Paper Code: ICEE- 1245**

# Unsupervised Change Detection in SAR Images Using a Six-Branch CNN and Adaptive Window Approach

Abbas Kakoolvand - Maryam Imani - Hassan Ghassemian

Tarbiat Modares University- Tarbiat Modares University- Tarbiat Modares University

Abstract

Change detection is one of the important and hot topics in remote sensing. Adaptive windowing approaches can preserve image details while reduce noise in the process of change detection. In the proposed method, two difference images (DIs) are obtained by using the adaptive window approach. Some fake labels are provided from these DIs. Neural networks have a good performance in image processing. To use this advantage, a six-branch convolutional neural network (CNN) is trained using the fake labels. Using these six branches with utilizing the adaptive windows, the network can preserve image detail while reduce noise. The proposed method based on three criteria (PCC, Kappa, and F1 score) has the best results in two datasets and has results close to the best method in other datasets.

**Paper Code: ICEE- 1372**

# On Spatiotemporal-Aware Deep Neural Networks for Real-Time Video Fire Detection: Empowering Image-Based Models With Temporal and Spatial Features of Video

Mahdi Shamisavi - Sahar Eslami - Amir Jahanshahi - Morteza Rajabzadeh

Amirkabir University of Technology- Amirkabir University of Technology- Amirkabir University of Technology- Quchan University of Technology

Quchan

Abstract

Fire is one of the natural events that has various risks for humans and the environment. Therefore, reliable and early detection of fire could greatly help save lives and prevent disasters. Image-based fire detection methods can be very quick and reliable, unlike, conventional chemical-based fire detectors. Convolutional Neural networks (CNN) have shown relatively impressive accuracy in the field of fire detection in recent years. However, extracting temporal features from images by CNN Networks proves to be the main challenge. In order to introduce temporal features inside CNN, we used motion and color features to improve the accuracy of the CNN. We propose a modified Resnet50 architecture by adding temporal features with the help of a classical image processing algorithm. Our implementation and results show that our improved Resnet50 architecture outperforms original Resnet50 on test images. Our results demonstrate that the performance of Deep Neural Networks (DNNs) can be improved by employing additional temporal features. We use motion and color features to improve the DNNs model (spatiotemporal-aware) to classify fire images more accurately than basic original DNNs without additional temporal features (spatiotemporal-unaware).

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**۱۹ الی ۲۱ اردیبهشت ماه ۱۴۰۲**

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| چهارشنبه ۲۰ اردیبهشت ماه ۱۴۰۲ ساعت ۱۴:۳۰ الی ۱۶:۰۰ | | |
| عنوان نشست: **الکترونیک ۵**- الکترونیک دیجیتال VLSI | | |
| **روسای نشست** | دکتر سید احمد معتمدی | دانشگاه صنعتی امیرکبیر |
| | دکتر مجید شالچیان | دانشگاه صنعتی امیرکبیر |
| | دکتر مسعود سیدی | دانشگاه صنعتی اصفهان |

**ICEE-1023**

**Efficient Full Adders for Approximate Arithmetic Units in the Image Processing Applications**

*Bahram Rashidi

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**ICEE-1220**

**An Investigation of Hardware Implementation of Multi-Valued Logic Using Different Nanodevices**

*Abdolah Amirany - Kian Jafari - Mohammad Hossein Moaiyeri

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**ICEE-1235**

**Low-Cost and Nonvolatile Quaternary Memory Based on Hybrid CNTFET/MTMR-MTJ Logic**

* Motahareh BahmanAbadi - Kian Jafari - Mohammad Hossein Moaiyeri

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**ICEE-1280**

**Using Compressive Sensing Technique in Image Sensing**

*Zahra Sepehri - Seyed Masoud Sayedi - Ehsan Yazdian

**ICEE-1430**

**طراحی و شبیه سازی یک مولد اعداد تصادفی ترکیبی ارتقا یافته در آتوماتای سلولی نقطه‌کوانتومی با به کارگیری ساختارهای فراپایدار**

* سورنا آسیابان جونقانی- نوید یثربی

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**ICEE-1431**

**A Model for Probabilistic Fault Propagation With the Approach of Effective Fanouts in the Logic Circuits**

* Esfandiar Esmaieli sartakhti - Yasser Sedaghat - Ali Peiravi

**Paper Code: ICEE- 1023**

# Efficient Full Adders for Approximate Arithmetic Units in the Image Processing Applications

Bahram Rashidi

Ayatollah Boroujerdi University

Abstract

In this paper, the efficient full adders for approx- imate arithmetic units in image processing applications ar presented. The image processing can be implemented in an error-tolerant mode with acceptable accuracy. The arithmetic operations in digital image processing are performed by using adders and multipliers, which are realized based on full adders. Therefore, three area and delay efficient imprecise full adders are formulated by using the approximation in gate level. The structures are implemented by 2-input NAND and 2-input NOR gates to reduce delay and area. The proposed full adders are compared from hardware and accuracy point of view such as gate count, area-delay product (ADP), error rate (ER), mean error distance (MED), and mean relative error distance (MRED). The efficacy of the proposed full adders in image processing applications such as image Blending and image Sharpening is performed using MATLAB. The results show the proposed approximate full adders are comparable in terms of area, delay, and mean structural similarity index metric (MSSIM) with other works.

**Paper Code: ICEE- 1220**

# An Investigation of Hardware Implementation of Multi-Valued Logic Using Different Nanodevices

Abdolah Amirany - Kian Jafari - Mohammad Hossein Moaiyeri

Shahid Beheshti University- Shahid Beheshti University- Shahid Beheshti University

Abstract

In recent years, multi-valued logic (MVL) has received special attention from scientists. In MVL, unlike binary logic, where each signal has two different states, each signal has more than two states. Increasing the states of each signal in MVL reduces the volume of interconnections and chip pins and increases the density of data stored in memories. The main challenge of MVL is the hardware implementation of MVL circuits. In this paper, two popular nanotechnologies for implementing MVL have been investigated. These two nanotechnologies are carbon nanotube field effect transistors (CNTFET) and FinFETs. Also, in this paper, for the first time, a standard quaternary inverter (SQI) was designed and simulated using FinFET transistors as a commercially available technology for designing and manufacturing integrated circuits.

**Paper Code: ICEE- 1235**

# Low-Cost and Nonvolatile Quaternary Memory Based on Hybrid CNTFET/MTMR-MTJ Logic

Motahareh BahmanAbadi - Kian Jafari - Mohammad Hossein Moaiyeri

Shahid Beheshti university- Shahid Beheshti university- Shahid Beheshti university

Abstract

Unlike a binary logic system, multi-valued logic (MVL) offers many advantages, such as containing more data than binary. Quaternary logic, the most consistent form with binary logic, is a famous MVL system. This paper proposes a low-cost and nonvolatile quaternary memory based on the hybrid carbon nanotube field effect transistor (CNTFET) and multi-tunnel magnetoresistance magnetic tunnel junction (MTMR-MTJ) logic. The proposed memory benefits from the tunable threshold voltage of CNTFET and the nonvolatility feature MTJ. Simulation results indicate that the proposed memory in this paper offers 41% to 72% lower average power consumption than the previous nonvolatile quaternary memories.

**Paper Code: ICEE- 1280**

# Using Compressive Sensing Technique in Image Sensing

Zahra Sepehri - Seyed Masoud Sayedi - Ehsan Yazdian

Isfahan University of Technology- Isfahan University of Technology- Isfahan University of Technology

Abstract

This article presents a new structure of image sensor that compresses the image information based on the compressive sensing (CS) technique and employing a measurement matrix. In the proposed structure to perform compression, the image related voltages on the capacitors in each neighboring pixels are summed in a specific regular pattern. Also, the high sparsity of moving objects images which obtained from the difference images has been exploited and the proposed structure compresses the image information both in the normal and difference modes. Implementation of the measurement matrix and linear combination of the pixel data is done by simple connections between the pixels. The results of 300 images and 30 difference images compressed and recovered through a deterministic measurement matrix show the PSNR values of 26.65 dB and 40.09dB respectively. The results show the effect of applying presented method on the quality of recovered images.

**کد مقاله: ICEE-1430**

# طراحی و شبیه سازی یک مولد اعداد تصادفی ترکیبی ارتقا یافته در آتوماتای سلولی نقطه‌کوانتومی با به کارگیری ساختارهای فراپایدار

سورنا آسیابان جونقانی- نوید یثربی

دانشگاه شیراز- دانشگاه شیراز- دانشگاه شیراز

## چکیده

مولدهای اعداد تصادفی (***RNG***) در بسیاری از کاربردها نظیر ارتباطات ایمن، مورد توجه قرار گرفته اند. در این میان، ساختارهای مبتنی بر ثبات انتقال دارای بازخورد خطی (***LFSR***) به دلیل سادگی ساخت مورد توجه بیشتری قرار گرفته اند. در عین حال، دنباله خروجی این دسته از ساختارها، متناوب و قابل پیش بینی است. در این مقاله با هدف افزایش میزان تصادفی بودن خروجی مولدهای مبتنی بر ***LFSR***، یک ساختار ترکیبی جدید در فناوری آتوماتای سلولی نقطه‌کوانتومی (***QCA***) ارائه شده است. در ساختار مولد اعداد تصادفی پیشنهادی، بخشی از مسیر حلقه بازخورد خطی، در حالت فراپایدار قرار داده شده است. این بخش فراپایدار پس از قرارگیری در یکی از دو منطق اصلی، سبب ایجاد یک خروجی کاملاً تصادفی و غیر متناوب شده است. رفتار ساختار پیشنهادی، با استفاده از نرم افزار ***QCADesigner*** بررسی و شبیه سازی شده است. نتایج نشان می‌دهد که ساختار پیشنهادی در مقایسه با ساختارهای ***RNG*** متداول، علاوه بر اینکه خروجی غیر متناوب و تصادفی‌تری تولید می‌نماید (آنتروپی نزدیک به ۹۹٪ توسط آزمایش آماری NIST)، به سادگی نیز قابل پیاده‌سازی است. ساختار پیشنهادی به صورت تک لایه و با به کار گیری تنها ۲۴۸ سلول پیاده‌سازی شده است و فضایی برابر با ۰/۳۲ $\mu m^2$ اشغال می‌کند.

**Paper Code: ICEE- 1431**

# A Model for Probabilistic Fault Propagation With the Approach of Effective Fanouts in the Logic Circuits

Esfandiar Esmaieli sartakhti - Yasser Sedaghat - Ali Peiravi

Ferdowsi University of Mashha- Ferdowsi University of Mashha- Ferdowsi University of Mashha

Abstract

In today's world, the discussion of component failure in engineering systems is the main challenge in new complex system design because the simultaneous failures in multiple components can degrade the performance of the system. The common motivation and goal of most of the work done in the field of digital circuit reliability are to achieve accurate reliability while providing an efficient method of dealing with the faults in larger circuits. Achieving accurate reliability requires considering several problems, the most important of which are the consideration of convergent paths and the problem of masking error, which play an essential role in the accuracy of calculations This paper presents a novel method for the reliability analysis of logic circuits based on probabilistic computation. This approach introduces a fault propagation matrix, signal probabilities matrix, and effective fanouts to handle the reconverge fanouts and masking error problems. Various simulations have illustrated the accuracy and scalability of the proposed method on the ISCAS 85 benchmark circuit. The results have shown a less than 1% average error for reliability estimation.

دانشگاه صنعتی امیرکبیر
( پلی تکنیک تهران )

**سی و یکمین کنفرانس بین‌المللی مهندسی برق**

**۱۹ الی ۲۱ اردیبهشت ماه ۱۴۰۲**

**31st International Conference on Electrical Engineering**

**May 9-11/2023 –Tehran, Iran**

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| عنوان نشست: **کنترل ۵**- کنترل تطبیقی | | |
| **روسای نشست** | دکتر حیدرعلی طالبی | دانشگاه صنعتی امیرکبیر |
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| | دکتر جواد پشتان | دانشگاه علم و صنعت |

## ICEE-1082

## A Decentralized Nonlinear Control Strategy for a Robust Voltage Regulation in Islanded DC Microgrids with ZIP Loads

* Somayeh Bahrami

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## ICEE-1150

## Output feedback tube-based MPC for an LPV system using inexact scheduling variables

* Nima Naeiji - Ali Akbar Afzalian - Arash Sadeghzadeh

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## ICEE-1313

## طراحی یک کنترل‌کننده غیرخطی تطبیقی غیرمتمرکز برای تنظیم ولتاژ ریزشبکه‌های DC در حالت جزیره‌ای

* سمیه بهرامی - فاطمه صفایی

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## ICEE-1217

دانشگاه صنعتی امیرکبیر
( پلی تکنیک تهران )

# کنترل پیش بین مقاوم توزیع شده برای سیستم های خطی چند عامله

* علی سلمانپور - حامد کبریائی

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**ICEE-1297**

# Robust Model Predictive Control of Cyber-Physical Linear Parameter Varying System subject to deception attacks and bounded disturbances

* Sepideh Jahani VakilKandi - Farhad Bayat - Abolfazl Jalilvand

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ICEE-1082

# A Decentralized Nonlinear Control Strategy for a Robust Voltage Regulation in Islanded DC Microgrids with ZIP Loads

Somayeh Bahrami

Razi University

Abstract

In this article, a decentralized nonlinear voltage controller for islanded DC microgrids (DCmGs) containing several distributed generation units (DGUs) is developed. DGUs are connected to each other by resistive-inductive (RL) distribution lines. Each DGU feeds an unknown nonlinear ZIP (constant impedance ‘Z’, constant current ‘I’ and constant power ‘P’) load at its point of common coupling (PCC). By applying the existing voltage controllers on the DCmGs with unknown ZIP loads, convergence to the voltage setpoints is guaranteed only around the system operating point, while the proposed decentralized controller in this paper ensures voltage adjustment in a large signal sense in the presence of unknown ZIP loads, unknown DC input voltages, unknown topological changes, and plug-and-play (PnP) operations of DGUs. The local nonlinear controllers of DGUs are developed based on the adaptive backstepping procedure. Each local nonlinear controller is synthesized independently of the distribution lines and by employing only the values of the local measurements and parameters of the DGU. This leads to the stability preservation of the system under PnP operations of DGUs without the need to retune the design parameters of the local controllers. The efficiency of the proposed nonlinear controller is evaluated by simulating a DCmG system under different scenarios in MATLAB/Simscape Electrical environment.

**ICEE-1150**

# Output feedback tube-based MPC for an LPV system using inexact scheduling variables

Nima Naeiji - Ali Akbar Afzalian - Arash Sadeghzadeh

Shahid Beheshti University- Shahid Beheshti University- Shahid Beheshti University

Abstract

In this paper, the problem of output feedback tube-based model predictive control is discussed for a linear parameter varying system with inexact measurement of scheduling variables and subject to disturbances and noises. The measured values of the scheduling variables are different from the actual ones but the bounds on these errors are considered known. Also, the values of the scheduling variables in the future sampling instants are unknown. For these reasons, output feedback tube-based MPC is designed to deal with the uncertainty in the scheduling variables and also disturbances and noises. Scheduling tubes will be utilized based on inexact measurement and bounds on the rate of parameter variations and based on this, an MPC control strategy will be proposed. A numerical example demonstrates the performance of our proposed method.

ICEE-1313

# طراحی یک کنترل‌کننده غیرخطی تطبیقی غیرمتمرکز برای تنظیم ولتاژ ریزشبکه‌های DC در حالت جزیره‌ای

سمیه بهرامی - فاطمه صفایی

دانشگاه رازی-موسسه آموزش عالی پاسارگاد

چکیده

در این مقاله، یک روش کنترل غیرخطی غیرمتمرکز به منظور تنظیم ولتاژ ریزشبکه‌های ***DC*** در حالت جزیره‌ای پیشنهاد شده است. برای ریزشبکه‌ی موردنظر، یک ساختار کلی شامل تعدادی واحد تولید پراکنده که توسط خطوط توزیع سلفی-مقاومتی به هم متصل شده‌اند، درنظر گرفته می‌شود. واحدهای تولید پراکنده به منظور تامین سطوح بالاتری از ولتاژ، مجهز به مبدل‌های بوست ***DC-DC*** چندسطحی می‌باشند که علی‌رغم محبوبیت این دسته از مبدل‌ها در کاربردهای ولتاژ بالا، اثرات غیرخطی پیچیده‌ای به دینامیک سیستم کلی تحمیل می‌کنند. در این مقاله، همچنین فرض می‌شود هر واحد تولید پراکنده، یک بار غیرخطی نامعلوم تغذیه می‌کند. کنترل‌کننده‌ی پیشنهادی، بر اساس روش کنترل پسگام طراحی شده است که برای جبران کردن منابع مختلف عدم‌قطعیت اعم از بار غیرخطی نامعلوم و تغییرات نامعلوم در توپولوژی زیرشبکه، با یک رویتگر اغتشاش ترکیب می‌شود. در نهایت پس از اثبات پایداری سیستم حلقه‌بسته، نتایج شبیه‌سازی در سناریوهای مختلف، عملکرد روش پیشنهادی را نشان می‌دهد.

ICEE-1217

# کنترل پیش بین مقاوم توزیع شده برای سیستم های خطی چند عامله

علی سلمانپور - حامد کبریائی

دانشگاه تهران- دانشگاه تهران

## چکیده

**در این پژوهش به معرفی کنترل پیش بین توزیع شده با در نظر گرفتن اغتشاش پرداخته شده است. در راهکار ارائه شده یک سیستم با دینامیکی خطی همراه با تداخل و اغتشاش در نظر گرفته شده است سپس با در نظر گرفتن یک سیستم نامی -سیستمی بدون تداخل و اغتشاش- و با استفاده از نظریه‌ی مجموعه های تغییرناپذیر مقاوم مثبت یک *Tube* برای سیستم طراحی شده است. برآورده شدن قیود برای سیستم نامی با در نظر گرفتن *Tube* منجر به تضمین برآورده شدن قیود سیستم اصلی خواهد شد. همچنین به دلیل عدم تداخل میان سیستم های نامی هر عامل میتواند صورت مسئله را به صورت محلی حل کرده و قانون کنترلی را تعیین کند.**

**ICEE-1297**

# Robust Model Predictive Control of Cyber-Physical Linear Parameter Varying System subject to deception attacks and bounded disturbances

Sepideh Jahani VakilKandi - Farhad Bayat - Abolfazl Jalilvand

University of Zanjan- University of Zanjan- University of Zanjan

Abstract

The purpose of this study is to develop a robust model predictive control (RMPC) strategy for cyber-physical systems (CPSs) that are subject to bound disturbances and deception attacks. Based on the assumption that deception attacks have norm-bounded structures, a model of attack has been developed using Bernoulli-distributed white sequences. Furthermore, we propose a novel observer-based augmented closed-loop controller that performs two main functions. The first step in estimating the state of each component of the system is to estimate their current condition. As a second step, it is necessary to ensure that some unprotected communication channels are prevented from having an adverse deception attack effect on the system's response. Using estimated states, an output-feedback controller is investigated for the detection of cyber-attacks. Under the proposed approach, all CPS states under deception attacks appear to be convergent. Using linear matrix inequalities, the requirement is formulated. To demonstrate the applicability of the proposed methodology, simulation experiments have been performed on cloud-aided active suspension systems.

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| **روسای نشست** | دکتر نصرت الله گرانپایه | دانشگاه صنعتی خواجه نصیرالدین طوسی |
| | دکتر رسول امیرفتاحی | دانشگاه صنعتی اصفهان |
| | دکتر امیرنادر عسکرپور | دانشگاه صنعتی امیرکبیر |

## ICEE-1200

## Thermo-optically Adjustment of Stimulated Brillouin Scattering in Integrated Slot Ring Resonators

* Mahdi Piri- Bijan Abbasi Arand- Sayyed Reza Mirnaziry

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## ICEE-1370

## Simulation of Two Metal- Semiconductor- Metal Photodetectors for Sensing Power and Angle of Incident Light

* Shakila Karami- Maryam Khodadai- Nosrat Granpayeh

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## ICEE-1381

## Validation of Atatistical Aodels for Direction of Arrival, Time of Arrival and Received Power in a Simple Indoor Terahertz Channel

*Sina Sheybani- Amir ahmad Shishegar

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**ICEE-1087**

**طبقه بندی سکته مغزی در یک سیستم دو بعدی چند فرکانسی با استفاده از امواج مایکروویو و یادگیری عمیق**

*محسن مهرانیان- محمدسعید ماجدی- امیررضا عطاری

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**ICEE-1505**

**کاربرد امواج فراصوت در ترومبولسیس لخته خون به عنوان درمان غیرتهاجمی**

*مریم بیات- شکراله کریمیان- اسفندیار مهرشاهی

**Paper Code: ICEE- 1200**

# Thermo-optically Adjustment of Stimulated Brillouin Scattering in Integrated Slot Ring Resonators

Mahdi Piri- Bijan Abbasi Arand- Sayyed Reza Mirnaziry

Tarbiat Modares University- Tarbiat Modares University- Tarbiat Modares University

Abstract

We demonstrate tailoring SBS interactions in inte- grated ring resonators via thermo-optic approaches. We explain the advantages together with the limitations of controlling SBS thermally in these structures. To address geometrical and mate- rial requirements to achieve strong SBS, we propose a ring with slot cross-section and study SBS at frequencies in which, only linear optical loss occurs. Our results show that by changing the ring temperature one can obtain efficient SBS even when there exist fabrication tolerances. In this regard, we show how to realize SBS by adjusting the incorporated heater power in the structure.

**Paper Code: ICEE- 1370**

# Simulation of Two Metal- Semiconductor- Metal Photodetectors for Sensing Power and Angle of Incident Light

Shakila Karami- Maryam Khodadai- Nosrat Granpayeh

K. N. Toosi University of Technology- Shiraz University of Technology- K. N. Toosi University of Technology

Abstract

Photodetectors convert the optical signal into a proportional electrical current. Based on the vector nature of light, Photodetectors are designed to detect power and can be used in circuits to sense incident angle of radiant light. In this paper, a novel photodetector based on using two parallel circular metal-semiconductor-metal has been proposed which measure simultaneously the power and incident can angle of light. Each of these photodetectors is made of a silicon nanowire placed by thin gold tubes on a silicon oxide substrate. Examination of the absorption spectrum reveals that different resonances occur in the visible light spectrum. Therefore, because of the short distance between two nanowires, similar resonant modes are coupled with each other. The behavior of resonant modes can introduce based on the coupling mode theory. Assuming light illumination on the structure, the angle of incident light is obtained which is related to some factors including (1) the relationship between the ratio of energy stored in nanowires, (2) the parameters extracted from the coupled mode theory, (3) the wavelength of resonant mode, (4) the wavelength of radiant light, and (5) the distance between photodetectors. In addition, the total power is obtained by gathering the amount of absorbed power from each nanowire. The proposed structure acts as a simple and extremely small light sensors which shows more information about the environment and could be exploited in the next-generation

of smart optoelectronic and artificial intelligence systems in order to design the imaging devices, 3D positioning, autonomous vehicles, and in robotics.

**Paper Code: ICEE- 1381**

# Validation of Atatistical Aodels for Direction of Arrival, Time of Arrival and Received Power in a Simple Indoor Terahertz Channel

Sina Sheybani- Amir ahmad Shishegar

Sharif University of Technology- Sharif University of Technology

Abstract

The validation of statistical models for the direction of arrival (DoA), time of arrival (ToA), and received power in a simple indoor Terahertz channel has been investigated. At Terahertz frequencies, surface roughness can be in the order of the Terahertz frequency spectrum wavelength, so the effect of diffuse scattering must be considered in channel modeling. Therefore, a complete simulation of common indoor materials, including gypsum plaster, MDF, PVC, and glass, has been accomplished using the method of moments (MoM) at 100 GHz for TE-polarized incident plane wave, considering the surface roughness. Subsequently, simulation results have been combined with the ray tracing (RT) algorithm to perform a site-specific propagation analysis on a simple indoor scenario and to calculate the DoA, ToA, and received power histogram of all received rays. Finally, a suitable statistical distribution has been matched to the acquired histogram.

**کد مقاله: ICEE-1087**

# طبقه بندی سکته مغزی در یک سیستم دو بعدی چند فرکانسی با استفاده از امواج مایکروویو و یادگیری عمیق

محسن مهرانیان- محمدسعید ماجدی- امیررضا عطاری

دانشگاه فردوسی مشهد- دانشگاه فردوسی مشهد- دانشگاه فردوسی مشهد

چکیده

در عصر حاضر، سکته مغزی یکی از مهم‌ترین معضلات سلامت اجتماعی جوامع است. تاکنون روش‌های متنوعی برای تشخیص و طبقه‌بندی سکته مغزی تدوین شده است و یکی از روش‌هایی که دارای آینده روشن است، تشخیص مبتنی بر امواج مایکروویو است. در این مقاله، نخست یک پایگاه داده متشکل از فانتوم‌های عددی و دو بعدی مغز انسان در سه فرکانس ۰/۵، ۰/۸۵ و ۱ گیگاهرتز ساخته ایم. سپس میدان‌های پراکندگی متناظر با فانتوم‌ها را به وسیله روش ممان بدست آورده‌ایم و در نهایت نیز طبقه‌بندی سکته را به صورت مستقیم از روی میدان‌های پراکندگی توسط روش چند فرکانسی پیشنهادی در سه نسبت سیگنال به نویز ۱۰dB، ۲۵dB و بدون نویز انجام داده ایم. استفاده از روش چند فرکانسی در نسبت سیگنال به نویزهای پایین باعث بهبود دقت طبقه بندی در مقایسه با روش تک فرکانسی می شود. دقت روش پیشنهادی در نسبت سیگنال به نویز ۲۵dB و بدون نویز نیز به ترتیب برابر ۹۵/۷ و ۹۶/۶ درصد است.

**کد مقاله: ICEE-1505**

# کاربرد امواج فراصوت در ترومبولسیس لخته خون به عنوان درمان غیرتهاجمی

مریم بیات- شکراله کریمیان- اسفندیار مهرشاهی

دانشگاه شهید بهشتی- دانشگاه شهید بهشتی- دانشگاه شهید بهشتی

چکیده

در پژوهش حاضر کاربرد امواج فراصوتی در ترومبولیسیس لخته خون برای جلوگیری از انسداد عروق خونی یا ترومبوز که از مهمترین عوامل ابتلا به سکته قلبی یا آنفارکتوس میوکارد و سکته مغزی ایسکمیک یا انسدادی می باشد، مورد بررسی قرار گرفت و آزمایشاتی بصورت in vivo بر روی بافت لخته خون انجام گردید. با تابش امواج فراصوتی در فرکانس ها و شدت های مختلف و تابش امواج بصورت یکنواخت و پالسی، ضمن مشاهده پدیده کاویتاسیون یا حفره سازی، تاثیر تابش امواج فراصوت بصورت لیز شدگی و تخریب لخته در تصاویر سونوگرافی و میکروسکوپی مشاهده گردید. لذا روش پیشنهادی می تواند به عنوان جایگزینی غیرتهاجمی برای از بین بردن لخته های خونی مورد کاربرد پزشکان قرار گیرد.

دانشگاه صنعتی امیرکبیر
( پلی تکنیک تهران )

انجمن علوم مهندسی برق ایران
مجوز ۱۳۹۰

**سی و یکمین کنفرانس بین‌المللی مهندسی برق**

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| **روسای نشست** | دکتر محمد رحمتی | دانشگاه صنعتی امیرکبیر |
| | دکتر حمیدرضا ربیعی | دانشگاه صنعتی شریف |
| | دکتر مهران یزدی | دانشگاه شیراز |

**ICEE-1030**

**Object Detection enhancement based on Super-Resolution Mapping**

*Danial Abyazi- Dadfar Abyazi - Mehran Yazdi

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**ICEE-1365**

**Speech Emotion Recognition Using Transfer Learning and Self-Supervised Speech Representation Learning**

*Marziye Azad- Babak Nasersharif

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**ICEE-1382**

**Transformer-Based Unsupervised Image Registration using SSIM and Homography Loss for Steady Camera and Aerial Videos**

*Golnoosh Abdollahinejad- Matin Hashemi

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**ICEE-1554**

**Skeleton-based Human Action Recognition Using Joint Distance Images and Vision Transformers**

*Elham Shabaninia- Hossein Nezamabadi-pour

**Paper Code: ICEE- 1030**

# Object Detection enhancement based on Super-Resolution Mapping

Danial Abyazi- Dadfar Abyazi - Mehran Yazdi

University Zanjan- Shiraz University- Shiraz University

Abstract

Object detection, while being a key step in many applications, has remained challenging, mainly due to the different resolutions of objects in an image. On the other hand, Super-Resolution (SR) approaches have recently been developed to improve the resolution of an image. In this paper, we utilize SR to enhance the quality of images before applying them to a detection model and propose a structure where the detection performance is improved. Furthermore, we remove the image noises by SR methods. Comparisons depict the superior visual performance of the proposed method compared to the conventional detection models. We evaluate our proposed method for detection of solar panels in two countries. To this aim, we created a dataset of satellite images needed for implementing detection models. As a result, we can simply evaluate the usage of solar panels in countries

**Paper Code: ICEE- 1365**

# Speech Emotion Recognition Using Transfer Learning and Self-Supervised Speech Representation Learning

Marziye Azad- Babak Nasersharif

K.N.Toosi University of Technology- K.N.Toosi University of Technology

Abstract

Self-supervised speech representation learning (S3RL) models like wav2vec2.0, Hidden-unit BERT (HuBERT), and WavLM are trained with a great amount of speech data and subsequently give a general purpose speech representation that then needs to be finetuned for different speech processing tasks like ASR. Despite these models' good performance, they suffer from massive structures and a great number of parameters which makes their finetuning inapplicable for low-resource tasks like speech emotion recognition. In this paper, a small model is proposed for speech emotion recognition based on the Hubert model by transferring the Hubert convolutional feature encoder and substituting all of its transformers with a simple conformer block. Then this simple model is trained with emotional speech signals. The experimental results demonstrate that the proposed model has comparable results with other well-performing S3RL models.

**Paper Code: ICEE- 1382**

# Transformer-Based Unsupervised Image Registration using SSIM and Homography Loss for Steady Camera and Aerial Videos

Golnoosh Abdollahinejad- Matin Hashemi

Sharif University of Technology- Sharif University of Technology

Abstract

Image registration is an essential and initial block in the pipeline of computer vision tasks and systems. It is defined as transforming a moving image into a target image with the minimum difference when aligned. Unlike previous work for general-purpose datasets, aerial images suffer from mechanical shakes, leading to deformed distortion similar to medical volumetric image registration task. Inspired by medical approaches, we use a Transformer-based network with a semi-unlimited receptive field Swin block to produce a general output for each pixel named flow matrix. Flow matrix is utilized instead of regressing parameters of transformation matrix with a fixed degree of freedom that cannot handle the structural difference between images. This leads to introducing a new loss function based on the Structural Similarity Index Measure (SSIM) and embedding Homography transformation as a regularization term. Combining a generalized-designed network and loss function based on problem definition significantly enhanced results.

**Paper Code: ICEE- 1554**

# Skeleton-based Human Action Recognition Using Joint Distance Images and Vision Transformers

Elham Shabaninia- Hossein Nezamabadi-pour

Shahid Bahonar University of Kerman- Shahid Bahonar University of Kerman

Abstract

a novel approach is proposed to introduce transformer self-attention in skeleton-based activity recognition along with Convolutional Neural Network (CNN) to efficiently extract long-range dependencies across the action. The proposed method uses the 3D distances of pair-wise joints to make a relatively view-independent image called Joint Distance Image (JDI) for each frame. The extracted JDIs of different frames are fed to a CNN for extracting spatial features. These features along with positional embedding are used as input to a transformer encoder to encode the frame number and reconstruct the action image structure from the training data. Experimental results demonstrate the performance comparable to the existing ones for the NTU RGB+D dataset.

دانشگاه صنعتی امیرکبیر
( پلی تکنیک تهران )

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| عنوان نشست: **قدرت (انرژی) ۶**- تولید پراکنده- شبکه‌های هوشمند | | |
| **روسای نشست** | دکتر محمود فتوحی | دانشگاه صنعتی شریف |
| | دکتر گئورک قره‌پتیان | دانشگاه صنعتی امیرکبیر |
| | دکتر امیر خرسندی | دانشگاه صنعتی امیرکبیر |

**ICEE-1084**

**Optimal Probability Placement of the Charge Station of Electric Vehicles in a Distributed Power Network Containing the DG using the Queuing Theory**

* Mohammadreza Mousavi khademi - Ebrahim Kazemi - Mehdi Zareian Jahromi

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**ICEE-1379**

**Voltage and Active Power Control in a Grid Connected Photovoltaic System Considering Maximum Power Point Tracking Using the ANFIS Controller**

*Shadi Akbari - Mohammad bagher Menhaj - Amir abolfazl Suratgar

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**ICEE-1422**

**بررسی تحلیلی به کارگیری ریزشبکه برای مصرف کننده های پر مصرف مسکونی در ایران**

* عنایت الله محقق- حبیب رجبی مشهدی

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**ICEE-1046**

**A Brief Review on DC-Link Control Strategies in Microgrids**

*Mehran Seydi - Hassan Moradi CheshmehBeigi - Mohammad Hossein Mousavi

**ICEE-1153**

**System Sectioning to Retain Durability of an Inverter-Based Microgrid**

*Sara Noorollah

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**ICEE-1557**

**A Two-Step Stochastic Market-Oriented Approach for Optimal Operation of Commercial VPPs under Uncertainty**

*Jalal Moradi- Hossein Shahinzadeh- Ahmad Hafezimagham- Gevork B. Gharehpetian- S.M. Muyeen- Mohamed Benbouzid

**Paper Code: ICEE- 1084**

# Optimal Probability Placement of the Charge Station of Electric Vehicles in a Distributed Power Network Containing the DG using the Queuing Theory

Mohammadreza Mousavi khademi - Ebrahim Kazemi - Mehdi Zareian Jahromi

Hormozgan Distribution Electric company- Islamic Azad University , Shahre-Kord branch- Amirkabir University of Technology

Abstract

In recent years, the electrification of the transportation system and the increasing demand of electric vehicles have prompted researchers to investigate the optimal location and capacity of electric vehicle charging stations (EVCSs). However, there are many challenges when deploying electric vehicles on a large scale. For example, the underdeveloped infrastructure of charging stations, their optimal locations, and their charging schedule are among the most fundamental challenges of distribution network operators. In addition, according to different approaches in this field, objective functions, limitations, modeling the behavior of electric vehicle owners at charging stations, uncertainties, integration of distributed generation, types of charging methods, optimization techniques and sensitivity analysis among others. The upcoming challenges are the placement of electric vehicle charging stations, which have been neglected in previous researches.

Therefore, in this article, firstly, the probabilistic behavior of electric car owners when visiting electric car charging stations will be investigated and modeled using queuing theory, and then the optimal location and capacity of electric car charging stations in The standard distribution network of 69 buses is addressed

with the aim of reducing their negative effects, including active and reactive line losses and voltage deviation in the network buses, taking into account the uncertainty of the loads in the network.

**Paper Code: ICEE- 1379**

# Voltage and Active Power Control in a Grid Connected Photovoltaic System Considering Maximum Power Point Tracking Using the ANFIS Controller

Shadi Akbari - Mohammad bagher Menhaj - Amir abolfazl Suratgar

Amirkabir University of Technology- Amirkabir University of Technology- Amirkabir University of Technology

Abstract

The present paper proposes a novel approach for the simultaneous control of voltage and active power in a photovoltaic (PV) system connected to the standard 13-bus distribution network which considers the maximum power point tracking (MPPT) of the system. Therefore, the proposed controller has two parts, ac and dc, in the first part, the maximum power point of the photovoltaic system is tracked by the boost convertrer in the dc part. After that, the maximum power is injected into the local distribution network in such a way that the voltage and frequency ranges are also controlled according to the distribution network. In this case, the P-V control requires an additional MPPT logic based on a power balance between the DC and AC parts in a two-stage PV configuration using a fuzzy neural controller which is neglected in the previous studies. Therefore, in this paper, power-voltage (P-V) control in MPPT mode is investigated. The simulation resultson the 13-bus network shows the efficient and successful performance of the proposed method.

**کد مقاله: ICEE-1422**

# بررسی تحلیلی به کارگیری ریزشبکه برای مصرف کننده های پر مصرف مسکونی در ایران

عنایت الله محقق- حبیب رجبی مشهدی

دانشگاه فردوسی مشهد- دانشگاه فردوسی مشهد

چکیده

با توسعه ریزشبکه ها، کاربرد سیستم تولید انرژی خورشیدی در بخش مسکونی در اغلب کشورهای دنیا افزایش یافته است. اما در کشور ما به دلیل شرایط اقتصادی و پایین بودن قیمت برق انگیزه کافی برای استفاده از این منبع انرژی وجود ندارد. در این مقاله هدف تحلیل مساله به کارگیری واحدهای انرژی فوتوولتاییک توسط مصرف کننده های پرمصرف می باشد. بدین منظور نخست نحوه محاسبه هزینه برق مصرف کننده با توجه به تعرفه موجود بررسی می شود. سپس هزینه‌های سرمایه‌گذاری برای یک واحد فوتوولتاییک که شامل پنل خورشیدی، اینورتر و باتری می باشد، با توجه به نرخ بهره و روابط اقتصاد مهندسی برای بازه ماهانه محاسبه می شود. با توجه به امکان اعمال خاموشی در ایام اوج مصرف، این مصرف کننده با خسارت های قابل توجه خاموشی نیز مواجه نمی شود. در این مقاله مساله استفاده از یک سیستم تولید برق خورشیدی از دید مصرف کننده پرمصرف و از دید شرکت توزیع برق به صورت یک مساله استراتژیک برای شرایط موجود در کشور مورد تجزیه و تحلیل قرار می گیرد و اثر عوامل مختلف بر هزینه های مصرف کننده با توجه به تعرفه های متفاوت و سیاست های حمایتی از سمت شرکت برق مورد ارزیابی قرار می گیرد

**Paper Code: ICEE- 1046**

# A Brief Review on DC-Link Control Strategies in Microgrids

Mehran Seydi - Hassan Moradi CheshmehBeigi - Mohammad Hossein Mousavi

Razi University Kermanshah- Razi University Kermanshah- Razi University Kermanshah

Abstract

Traditional power systems are gradually being restructured using distributed generation (DG) units. Employing DGs has created several topologies in AC, DC, and AC/DC microgrids. Most of these resources generate DC power or at least require a DC link to connect to the grid, and on the other hand, the current network infrastructure runs on AC power. In fact, the DC link is an interconnection bridge between the AC side and the DC side of the power grid. In addition, the control techniques applied to the DC link greatly affect the power-flow convergence of unified AC/DC networks. Therefore, identifying and implementing the optimal methods in order to accurately control the DC link is of paramount significance. This paper briefly reviews the effective strategies for controlling DC links in microgrids.

**Paper Code: ICEE- 1153**

# System Sectioning to Retain Durability of an Inverter-Based Microgrid

Sara Noorollah

Islamic Azad Universit Qazvin

Abstract

In distributed networks, protective procedures are highly substantial. Todays, load shedding is more beneficial in terms of stability margin increment of voltage and frequency in microgrids. This paper presents a segmentation-based hierarchical method (SHM) aimed to simultaneously recover voltage and frequency to their allowable domain in front of disruptive incidents. In the SHM, in order to specify the adequate mount of elimination load following disruptive incidents and uncertainties, a combinational study based on the system topology and the relationship between voltage and active power. According to the proposed method, achieving accurate results quickly requires the segmentation of the system into several regions from two standpoints pinpointed above and the determination of a master-bus in each region. In the following, the SHM will be simulated on a modified IEEE 37-bus distribution network, and the results will imply the accuracy of presented scheme accompanied with increasing the system safe margin and eliminating the possibility of system collapse.

**Paper Code: ICEE- 1557**

# A Two-Step Stochastic Market-Oriented Approach for Optimal Operation of Commercial VPPs under Uncertainty

Jalal Moradi- Hossein Shahinzadeh- Ahmad Hafezimagham- Gevork B. Gharehpetian- S.M. Muyeen- Mohamed Benbouzid

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Abstract

Observing the current trends of development in electrical grids, it can be perceived that the installation of distributed generation resources has had rapid growth on the demand side and distribution grid level. These small-scale sources cannot participate in the upper-level electricity markets. However, with the emergence of the virtual power plants (VPP) concept, these small capacities can be integrated and VPPs can participate and compete in the electricity markets. Nevertheless, there are uncertainties in VPP generation caused by the inherent nature of renewable energy sources (RES) and the inability to accurately predict the price, due to high volatility and intermittency. In this article, a bidding strategy to maximize profit in a VPP is presented. A VPP scheme can also be comprised of a microturbine, an energy storage system (ESS), and an aggregator of a demand response program (DRP) for internal loads. The uncertainty parameters, including wind turbine harvested energy and the market clearing price, are modeled in this work. In addition, a stochastic model has been incorporated in order to assess the uncertainty in a day-ahead and real-time electricity market. The whale Optimization Algorithm (WOA) is employed to solve this non-convex and non-smooth optimization problem once the proposed model has been applied to a

targeted network as the case study. The results indicate that the deployment of the VPP paradigm can considerably increase the profitability of distributed energy sources while mitigating the risk of participation in the electricity markets.

دانشگاه صنعتی امیرکبیر
( پلی تکنیک تهران )

**سی و یکمین کنفرانس بین‌المللی مهندسی برق**

**۱۹ الی ۲۱ اردیبهشت ماه ۱۴۰۲**

**31st International Conference on Electrical Engineering**

**May 9-11/2023 –Tehran, Iran**

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| عنوان نشست: **مخابرات (سیستم) ۶**- مخابرات سیار و بدون سیم ۲ | | |
| **روسای نشست** | دکتر وحید شاه‌منصوری | دانشگاه تهران |
| | دکتر قاسم میرجلیلی | دانشگاه یزد |
| | دکتر حمیدرضا بخشی | دانشگاه شاهد |

## ICEE-1274

**بهبود بازدهی انرژی در سیستم‌های بدون سلول با آنتن‌های انبوه مبتنی بر مخابرات پهپادها به کمک انتقال همزمان توان و اطلاعات به صورت بی‌سیم**

*امیرحسین زحمتی - محسن اسلامی

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## ICEE-1337

**نحوه کنترل سطوح هوشمند با قابلیت تنظیم مجدد در راستای مقابله با استراق سمع کننده ها**

* محمد کاظم ناطقی- زلفا زینل پور یزدی

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## ICEE-1373

**A Novel UAV-enabled V2V Mobile Network: A Reinforcement Learning Approach**

*Hossein Mohammadi Firouzjaei - Javad Zeraatkar - Mehrdad Ardebilipour

**ICEE-1374**

**ارائه روشی جهت بهبود عملکرد شبکه‌های بی‌سیم حسگر ناهمگون مبتنی بر برداشت انرژی**

* محمد فرشته حکمت - علیرضا کشاورز حداد

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**ICEE-1383**

**بررسی اثر نوسانات حرکتی در ارتباطات بی‌سیم مبتنی بر پهپاد حامل سطوح بازتابی هوشمند**

* معین درون پرور- نسیم محمدی- سیدمحمد رضوی‌زاده

کد مقاله: ICEE-1274

# بهبود بازدهی انرژی در سیستم‌های بدون سلول با آنتن‌های انبوه مبتنی بر مخابرات پهپادها به کمک انتقال همزمان توان و اطلاعات به صورت بی‌سیم

امیرحسین زحمتی - محسن اسلامی

دانشگاه صنعتی شیراز- دانشگاه صنعتی شیراز

چکیده

اخیراً تمرکز بر روی تقاضاهای مهم مانند افزایش نرخ ارسال داده، بهبود بازدهی انرژی و بازدهی طیفی در نسل چهارم ارتباطات و بعدازآن بیشتر شده است. سیستم چند ورودی چند خروجی بدون سلول ساختاری است شامل تعداد زیادی نقطه اتصال که به‌صورت پراکنده در یک منطقه جغرافیایی توزیع‌شده‌اند و به تعدادی از کاربران که ممکن است تعدادشان کمتر از آن هاباشد، ارائه خدمات می‌کنند. این ساختار می‌تواند تا حد قابل قبولی تقاضاهای گفته‌شده را پاسخگو باشد. پهپاد به دلیل قابلیت جابه‌جایی مکانی، امکان داشتن کانال بی‌سیم دیدمستقیم و درجات بالای آزادی در طراحی، می‌تواند برای پوشش دهی مناطق جغرافیایی مختلف با پوشش‌های محیطی متفاوت به‌خوبی عمل کند و نرخ بازدهی انرژی و بازدهی طیفی را بهبود دهد. هدف کلی این پژوهش نیز افزایش نرخ بازدهی انرژی کل سیستم ارتباطی که متشکل از پهپاد و سیستم چند ورودی چند خروجی بدون سلول است، خواهد بود و برای این کار از الگوریتم بهینه سازی ازدحام ذرات استفاده خواهد شد. تمرکز بر روی تخصیص ضرایب انرژی نقاط اتصال به‌منظور ارائه ضرایب تخصیص انرژی بیشتر به پهپادها با شرایط مناسب‌تر و نزدیک تر برای افزایش بهره‌وری انرژی است. نتایج شبیه‌سازی‌ها نشان دهنده عملکرد بهتر روش پیشنهادی نسبت به سایر روش ها است.

**کد مقاله: ICEE-1337**

# نحوه کنترل سطوح هوشمند با قابلیت تنظیم مجدد در راستای مقابله با استراق سمع کننده ها

محمد کاظم ناطقی- زلفا زینل پور یزدی

دانشگاه یزد- دانشگاه یزد

چکیده

سطوح قابل تنظیم مجدد هوشمند که به اختصار به آن‌ها RIS گفته می‌شود؛ فناوری نوظهوری است که برای رسیدن به اهداف نسل ششم شبکه‌های مخابراتی پیشنهاد گردیده است. این سطوح این قابلیت را دارند تا با نصب بر روی دیوارها و موانع، جهت انتشار امواج را تغییردهند. تعیین نحوه کنترل ضرایب سامانه‌های RIS یکی از چالش‌های اصلی در این سامانه‌ها است که با در نظر گرفتن اهداف مختلف، روش‌های متفاوتی را می‌توان برای آن پیشنهاد داد. در این مقاله سعی شده تا با مد نظر قرار دادن امنیت لایه‌ی فیزیکی، روشی پیشنهاد شود تا استراق سمع کننده ها به طور کلی از شنود کاربران ناتوان شوند. در ادامه نیز به محاسبه پارامترهای مهم امنیت لایه‌ی فیزیکی پرداخته می‌شود. روابط محاسبه شده نیز در انتها با شبیه‌سازی تایید می‌گردند.

**Paper Code: ICEE- 1373**

# A Novel UAV-enabled V2V Mobile Network: A Reinforcement Learning Approach

Hossein Mohammadi Firouzjaei - Javad Zeraatkar - Mehrdad Ardebilipour

K. N. Toosi University of Technology- University of Birjand- K. N. Toosi University of Technology

Abstract

While using Unmanned Aerial Vehicles (UAVs) as flying Base Stations (FBSs) to improve the efficiency of mobile networks can be a promising approach, there are some challenges like the limited energy of the UAV. Applying Reinforcement Learning (RL) algorithms can be a practical solution to solve the energy problem. Furthermore, combining the UAV-aided mobile networks with RL algorithms can be a promising tendency to help other terrestrial vehicles to find the best route. A Vehicle-to-Vehicle (V2V) mobile network, which the UAV plays the role of a FBS and harvests energy from terrestrial users is investigated in this paper. Following that, the limited energy problem of the UAV that avoids it to complete its mission, is solved by using RL algorithms. The RL algorithm of this paper is formed by a modified Q-Learning algorithm. The effectiveness of the proposed scenario is indicated in the simulation results.

**کد مقاله: ICEE-1374**

# ارائه روشی جهت بهبود عملکرد شبکه‌های بی‌سیم حسگر ناهمگون مبتنی بر برداشت انرژی

محمد فرشته حکمت - علیرضا کشاورز حداد

دانشگاه شیراز- دانشگاه شیراز

چکیده

امروزه باتوجه به پیشرفت‌های بوجود آمده در زمینه ارتباطات بی‌سیم، شبکه‌های حسگر بی‌سیم نیز کاربردهای متنوعی پیدا کرده‌اند. در سال‌های اخیر ابعاد گوناگونی از این نوع شبکه‌ها مورد بررسی قرار گرفته و تحقیقات انجام شده در این زمینه نیز سعی بر تکامل و بهبود عملکرد این نوع شبکه‌ها داشته‌اند. یکی از مباحث مهم مطرح شده در زمینه شبکه‌های بی‌سیم حسگر مسئله برداشت انرژی از منابع تجدیدپذیر محیطی است که توسط گره‌های موجود در سطح شبکه و به‌منظور افزایش طول عمر شبکه و سوق دادن آن به سمت یک شبکه تقریبا دائمی انجام می‌پذیرد. از این رو در این مقاله سعی شده است تا با بررسی روش‌های پیشین و همچنین درنظر گرفتن مسائلی چون ناهمگونی شبکه و مسئله کاهش مصرف انرژی در ارائه الگوریتم مسیریابی برای این نوع شبکه‌ها، روشی ارائه شود که منجر به بهبود عملکرد کلی شبکه براساس معیارهای مختلف سنجش عملکرد شبکه گردد. در انتها نیز به‌منظور بررسی عملکرد الگوریتم ارائه شده و مقایسه آن با سایر روش‌ها، اقدام به شبیه‌سازی این روش با مدلسازی در محیط نرم‌افزار ***MATLAB*** نموده‌ایم. نتایج شبیه سازی نشان می دهد که روش پیشنهادی می تواند تا حدود ۳۰ درصد مصرف انرژی را کاهش دهد.

**کد مقاله: ICEE-1383**

# بررسی اثر نوسانات حرکتی در ارتباطات بی‌سیم مبتنی بر پهپاد حامل سطوح بازتابی هوشمند

معین درون پرور- نسیم محمدی- سیدمحمد رضوی‌زاده

دانشگاه علم و صنعت ایران- دانشگاه علم و صنعت ایران- دانشگاه علم و صنعت ایران

چکیده

در این مقاله به مطالعه یک شبکه ارتباطی بی سیم می پردازیم که در آن از سطوح هوشمند نصب شده روی پهپادها کمک گرفته می شود. به این منظور، یک شبکه‌ی بی‌سیم در باند میلیمتری در نظر گرفته شده که در آن ارتباط بین ایستگاه پایه و کاربران به وسیله‌ی یک مانع سد شده ولی این ارتباط می‌تواند از طریق سطح هوشمند بازتابنده که بر روی پهپاد نصب شده است، برقرار شود. بطور خاص ما در این مقاله، مسئله‌ی لرزش پهپاد در اثر وزش باد و تاثیر آن در تغییرات زوایای ورود و خروج سیگنال و در نتیجه کاهش عملکرد سیستم یاد شده را مورد مطالعه قرار می دهیم. برای کاهش اثر مخرب لرزش پهپاد از روش شکل‌دهی پرتو بهینه استفاده خواهیم کرد و ماتریس فاز بهینه فازهای سطح هوشمند به دست می‌آوریم. همچنین موقعیت بهینه پهپاد را با بهینه کردن مقدار بدترین نسبت سیگنال به نویز دریافتی به دست خواهیم آورد.

دانشگاه صنعتی امیرکبیر
( پلی تکنیک تهران )

**سی و یکمین کنفرانس بین‌المللی مهندسی برق**

**۱۹ الی ۲۱ اردیبهشت ماه ۱۴۰۲**

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| عنوان نشست: **الکترونیک ۶**- فوتونیک و اپتوالکترونیک | | |
| **روسای نشست** | دکتر حسن کاتوزیان | دانشگاه صنعتی امیرکبیر |
| | دکتر محمدرضا صالحی | دانشگاه صنعتی شیراز |
| | دکتر سارا درباری | دانشگاه تربیت مدرس |

**ICEE-1067**

**Design and Simulation of Modified Salisbury Spatial Filter using Genetic Algorithm for Improving Optical Image Processing**

*Mohammadmahdi Modabberanbeh - Hassan Kaatuzian - Amir Nader Askarpour

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**ICEE-1117**

**طراحی و ساخت لیدار پالسی برای خودرو خودران با حذف موثر پدیده تداخل**

*سبحان دبیدیان - صدرا تفقدی جامی - زهرا کاوه وش - علی فتوت احمدی

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**ICEE-1384**

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*Iman Alibeigi- Mahmoud Tabandeh- Saeed Baghei Shouraki- Ramin Rajaei

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**ICEE-1503**

**Study of the interaction between different parameters in the fabrication of paper-based microfluidic devices using the wax printing method**

*Mohammad Derakhshani- Seyed Hossein Tayebi- Mehrdad Lotfi Choobbari- Amir Jahanshahi

**Paper Code: ICEE- 1067**

# Design and Simulation of Modified Salisbury Spatial Filter using Genetic Algorithm for Improving Optical Image Processing

Mohammadmahdi Modabberanbeh - Hassan Kaatuzian - Amir Nader Askarpour

Photonics Research Laboratory (PRL)- Photonics Research Laboratory (PRL)- Wave and Wireless Communications Research Lab

Abstract

Traditional all-optical image processing has been done by bulky devices or expensive equipment. Salisbury Screen Absorber (SSA) is a subwavelength device that enables real-time image processing in an all-optical way. Here, the applications of standard and multilayer SSA as a spatial frequency filter system for edge detection and phase gradient visualization are investigated. The system's output manifests itself in the intensity of the reflected light. The optimized SSA indicates the potential of this device in edge-detection applications. The improvements are performed using the Genetic algorithm. Both Matrix Optics (MO) and Transmission Line model (TLM) are used for the simulations and calculation of transmission and reflection coefficient.

کد مقاله: ICEE-1117

# طراحی و ساخت لیدار پالسی برای خودرو خودران با حذف موثر پدیده تداخل

سبحان دبیدیان - صدرا تفقدی جامی - زهرا کاوه وش - علی فتوت احمدی

دانشگاه صنعتی شریف- دانشگاه صنعتی شریف- دانشگاه صنعتی شریف- دانشگاه صنعتی شریف

چکیده

در این مقاله یک نمونه حسگر لیدار پالسی زمان پرواز مستقیم با آشارساز نوری بهمنی طراحی، شبیه‌سازی و پیاده‌سازی شده است. این سیستم در طول موج ۹۰۵ نانومتر با ارسال توان نوری ۲۵ وات و عرض پالس ۱۰ نانوثانیه، امکان اندازه‌گیری فواصل تا برد ۴ متر را دارد. لیدار ساخته شده دارای ۶۰ پیکسل در جهت افقی و ۸ پیکسل در راستای عمودی می‌باشد که رزولوشن $0/3^{\circ}$ افقی و $1^{\circ}$ عمودی را در ناحیه دید $18^{\circ}$ افقی در $8^{\circ}$ عمودی با تصویربردار مکانیکی پوشش می‌دهد. یکی از مهمترین چالش‌های لیدار پالسی در کاربرد خودرو خودران پدیده تداخل با سایر لیدارها است. روش‌هایی که تاکنون برای حذف این تداخل پیشنهاد شده است، دارای مشکلات اساسی هستند. در این مقاله ایده جدید ایجاد تاخیر متغیر برای کد کردن پالس‌های ارسالی برای حذف موثر تداخل سایر لیدارها، معرفی می‌شود. نتایج اندازه‌گیری نشان می‌دهد که در این روش با استفاده از N بیت کد در پالس‌های ارسالی لیزر می‌توان سطح تداخل را تا 2N برابر کاهش داد.

**کد مقاله: ICEE-1384**

# جدید با مصرف توان پایین مبتنی بر تکنولوژی اسپینترونیک Xor/Xnor گیت

ایمان علی‌بیگی- محمود تابنده- سعید باقری شورکی- رامین رجایی

چکیده

ضعف‌های عمده فن‌آوری ***CMOS*** مانند مصرف توان استاتیک بالا و توان پردازشی پایین آن موجب استفاده از فن‌آوری‌های نوظهور در پیاده‌سازی سخت‌افزاری الگوریتم‌های هوش مصنوعی شده است. توان پردازشی بالا و حجم زیاد اطلاعات در شبکه‌های عصبی مصنوعی موجب شده است که پیاده‌سازی سخت‌افزاری این شبکه‌ها با استفاده از فن‌آوری‌های جدید مانند اسپینترونیک بسیار پرکاربرد باشد. در این مقاله یک ساختار ***Xor/Xnor*** با استفاده از یک المان اسپینترونیک جدید طراحی و ارائه گردیده است که نسبت به نمونه‌های مشابه مصرف توان را تا حدود ۵۰درصد کاهش می‌دهد. این کاهش توان در ساختارهایی مانند شبکه‌های عصبی باینری یا مدارات تولیدکننده توازن (***Parity***) که دارای تعداد زیادی ***Xor/Xnor*** می‌باشند چشمگیر بوده و می‌تواند در طراحی سیستم‌های نهفته توان پایین مورد استفاده قرار گیرد. همچنین به دلیل تقارن کامل ساختار سلول اسپینترونیک استفاده شده گیت ***Xor/Xnor*** ارائه شده در مقابل تغییرات فرآیند ساخت بسیار مقاوم می‌باشد و نرخ خطای صفر دارد. ساختار ارائه شده با توجه به مصرف توان پایین و نرخ خطای صفر برای پیاده‌سازی شبکه‌های عصبی باینری بسیار مناسب است.

دانشگاه صنعتی امیرکبیر
( پلی تکنیک تهران )

انجمن علوم مهندسی برق ایران
مجوز ۱۳۹۰

**سی و یکمین کنفرانس بین‌المللی مهندسی برق**

**۱۹ الی ۲۱ اردیبهشت ماه ۱۴۰۲**

**31st International Conference on Electrical Engineering**

**May 9-11/2023 –Tehran, Iran**

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| چهارشنبه ۲۰ اردیبهشت ماه ۱۴۰۲ ساعت ۱۶:۱۵ الی ۱۷:۴۵ | | |
| عنوان نشست: **کنترل ۶**- سایر موضوعات مرتبط با کنترل(۱) | | |
| **روسای نشست** | دکتر محمد تشنه لب | دانشگاه صنعتی خواجه نصیرالدین طوسی |
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| | دکتر ایمان شریفی | دانشگاه صنعتی امیرکبیر |

**ICEE-1048**

**Kalman Filter Fusion Based on Interactive Multiple Model for Target Tracking in Wireless Sensor Networks**

* Zahra Zamani - Behrouz Safarinejadian

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**ICEE-1305**

**Generalized multi-sensor Kalman filters with detectable measurement delays and their comparison**

* Babak Tavassoli - Parisa Joshaghani

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**ICEE-1161**

**Dominant Control Set Selection in Clustered Complex Brain Network**

* Sana Motallebi - Mohammad Javad Yazdanpanah - Abdol-Hossein Vahabie

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**ICEE-1223**

**Dynamic Lane Changing Control of Vehicle Platoon**

* Abolfazl Saadati Moghadam - Mohammad Haeri

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**ICEE-1226**

**Secret Sharing Implementation of Predictive Functional Control**

* Enayat Amiri - Mohammad Haeri - Saeed Adelipour

ICEE-1048

# Kalman Filter Fusion Based on Interactive Multiple Model for Target Tracking in Wireless Sensor Networks

Zahra Zamani - Behrouz Safarinejadian

Shiraz University of Technology- Shiraz University of Technology

Abstract

Target tracking in wireless sensor networks has become one of the most challenging and popular topics in the last decade. Target tracking includes different algorithms, one of the most effective of which is the interactive multiple model algorithm based on the Kalman filter (IMM-KF). This algorithm is used when the target is maneuverable and the equations of motion are linear. In this paper, in order to have a better tracking performance and obtain extensive information from the target in wireless sensor networks, a fusion algorithm based on Kalman filter and interactive multiple model is proposed. Finally, the Monte Carlo simulation results of the proposed fusion algorithm are compared with single-sensor algorithms.

ICEE-1305

# Generalized multi-sensor Kalman filters with detectable measurement delays and their comparison

Babak Tavassoli - Parisa Joshaghani

K.N. Toosi University of Technology- K.N. Toosi University of Technology

Abstract

Considering applications involved with remote sensing and estimation, this work investigates Kalman filtering of measurement data from multiple sensors with time-varying delays, intermittent measurements, and out-of-order arrival of the sampled data. Relying on time-stamping in the existing network protocols, it is assumed that the delay magnitudes are detectable. Two approaches are proposed to derive functionally equivalent Kalman filtering methods for optimal estimation in presence of the communication effects. An example is presented to verify the filtering performance and compare between the computational loads of the two methods under various conditions.

ICEE-1161

# Dominant Control Set Selection in Clustered Complex Brain Network

Sana Motallebi - Mohammad Javad Yazdanpanah - Abdol-Hossein Vahabie

University of Tehran- University of Tehran- University of Tehran

Abstract

The human brain is a complex network divided into distinct cognitive networks. Although much research has been done in the area of brain controllability, a comprehensive method to select a dominant control set while guaranteeing the distribution of control inputs in local areas is lacking. This study evaluates the relative effect of clustering on structural brain network controllability by considering inter-cluster and intracluster connections. Our framework employs average controllability criteria to assess the ability of brain regions to spread control inputs. Our experiment demonstrates efficient dominant control set selection by choosing some hub regions that are within hub clusters. We conclude that clustering the brain complex network is a useful method for identifying potential dominant control regions that are overlooked in whole-brain controllability measurements.

ICEE-1223

# Dynamic Lane Changing Control of Vehicle Platoon

Abolfazl Saadati Moghadam - Mohammad Haeri

Sharif University of Technology- Sharif University of Technology

Abstract

In this paper, a cooperative approach for control heterogeneous connected and autonomous vehicles (CAVs) platoon considering lane-change maneuvers is proposed. In complex dynamic traffic environment, the speed of the surrounding vehicles of CAVs changes dynamically. Thus, the lane changing vehicle requires considering velocity fluctuations to achieve safe driving. The aim of this study is to combine dynamic path planning based on a cubic curve and model predictive control (MPC) with collision avoidance constraint to track an optimally generated path. The proposed control performs as a maneuver switching model including the vehicle's continuous states and discrete maneuver transition rule for the platoon merging and splitting events. Simulations have been performed on different scenarios and results illustrate the performance and effectiveness of the proposed approach.

ICEE-1226

# Secret Sharing Implementation of Predictive Functional Control

Enayat Amiri - Mohammad Haeri - Saeed Adelipour

Sharif University of Technology- Sharif University of Technology- Sharif University of Technology

Abstract

In this paper, we focus on design and implementation of an encrypted model predictive controller. The proposed encrypted scheme can perform control calculations based on cryptography mathematics without intermediate decryption. In fact, a secret sharing scheme as a privacypreserving tool is used to create a secure environment for computing a class of predictive controllers called predictive functional control by distributing data in the cloud. This controller is known for its simplicity retaining the basic features of predictive controls. The proposed encrypted predictive functional controller is applied on a flexible single-interface robotic arm and its effectiveness is assessed by a set of simulations.

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| **روسای نشست** | دکتر مسعود صبائی | دانشگاه صنعتی امیرکبیر |
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| | دکتر احمد کلهر | دانشگاه تهران |

**ICEE-1070**

**An Improved Real-Time Implementation of Adaptive Neuro-fuzzy Controller**

*Iman Gholizadeh - Haniye Raziyan - Reza Javidan

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**ICEE-1073**

**A model to Measure Cyber Security Maturity at The National Level**

*Mahdi Omrani- Masoud Shafiee- Siavash Khorsandi

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**ICEE-1329**

**An Autonomous Multi Agent Q-Learning Approach for Resource Allocation in D2D-Enabled Heterogeneous Networks**

* Pouya Akhoundzadeh - Ghasem Mirjalily - Mohammad taghi Saadeghi

**ICEE-1341**

**Multi-Attribute Decision-Making Methods to a Cloud Service Providing Selection**

*Amirhossein Shahbakhsh razavi - Kiumars Javan - Mehdi Zaferanieh - Somayeh Sobati-Moghadam

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**ICEE-1399**

# Semi-supervised Deep Reinforcement Learning in Decentralized Multi-Agent Collision Avoidance and Path Planning in a Complex Environment

* Marzie Parooei - Mehdi Tale Masouleh - Ahmad Kalhor

ICEE-1070

# An Improved Real-Time Implementation of Adaptive Neuro-fuzzy Controller

Iman Gholizadeh - Haniye Raziyan - Reza Javidan

Isfahan University of Technology- Sheikh Bahaei University- Shiraz University of Technology

Abstract

Adaptive neural network-based control method is a highly recommended solution for the control of nonlinear systems that operate under various operational conditions. The Neural Controller has the capability to train and adapt the controlled system to attain the desired outcome. The backpropagation algorithm is utilized to optimize the neural controller parameters and reach the desired system reference. Compared to other neural control methods, the proposed neurofuzzy controller boasts a quick response time of its learning algorithm and is feasible for real-time implementation. To enhance the adaptive ability of the neural controller, fuzzy rules are established to select optimal values for the momentum and learning rate parameters. The method has been implemented in LabVIEW software and tested in a real-time laboratory position control system, demonstrating that optimizing the neuro-fuzzy controller with optimal parameters of the neural network model leads to improved control and faster response times in nonlinear controller systems.

ICEE-1073

# A model to Measure Cyber Security Maturity at The National Level

Mahdi Omrani- Masoud Shafiee- Siavash Khorsandi

Amir Kabir University of Technology- Amir Kabir University of Technology- Amir Kabir University of Technology

Abstract

Cyberspace is one of the important components of countries' national security, and the evaluation of the security of this space will identify the strengths and weaknesses of systems and networks. Using the results of the evaluations, countries can adopt the necessary strategies to improve cyber security. Considering the inefficiency and weakness of global and regional models for measuring Iran's cyber security maturity, the present research was conducted to obtain a national cyber security maturity measurement model with a mixed approach (qualitative and quantitative) and content analysis method. Further, after receiving experts' opinions about the importance and degree of influence of the components on each other, ten key components of cyber security were selected using the method of cross-effects analysis and Micmac software, and 30 criteria were used compiled to measure the key components. Finally, the level of maturity of Iran's cyber security has been determined based on the proposed maturity model, and the results of this model have been compared with other research models and its advantages have been stated.

ICEE-1329

# An Autonomous Multi Agent Q-Learning Approach for Resource Allocation in D2D-Enabled Heterogeneous Networks

Pouya Akhoundzadeh - Ghasem Mirjalily - Mohammad taghi Saadeghi

Yazd University- Yazd University- Yazd University

Abstract

In today's heterogeneous networks (HetNets), Device to Device (D2D) communications is a vital technology that enables the user equipment to communicate on a point-topoint basis without needing for network infrastructure. This paper considers a three-tier D2D-enabled HetNets with one macro cell, several D2D users, and several femto cells with femto cellular users scattered over each cell. Then, a new method named Autonomous Multi Agent Q-learning (AMAQL) is presented for optimal transmission power level selection and sub-channel allocation. Each user's equipment (UE) is assumed to be provided with an intelligent agent. This agent can make decisions about resource management independently, without any requirements for network infrastructure. The simulation results show that the proposed AMAQL method convergences properly and achieves better system performance than other existing strategies.

ICEE-1341

# Multi-Attribute Decision-Making Methods to a Cloud Service Providing Selection

Amirhossein Shahbakhsh razavi - Kiumars Javan - Mehdi Zaferanieh - Somayeh Sobati-Moghadam

Hakim Sabzevari University- Hakim Sabzevari University- Hakim Sabzevari University- Hakim Sabzevari University

Abstract

With the emergence of cloud computing in recent years, many cloud service providers offer various types of services to customers. There is a significant possibility for optimizing the selection of services to serve users as efficiently as possible. Indeed, cloud system providers (CSPs) offer a variety of services with different payment cost criteria. From the customer's point of view, the most important factor for choosing the appropriate CSP is service quality Service quality which is relevant to such different features as security, cost, reputation, finances, performance, etc. In this article, two multi-feature optimization methods, including the Analytical Hierarchical Process (AHP) and Shannon's entropy method are considered to rank different features of CSPs. The AHP method performs the ranking, by using an initial pairwise decision matrix proposed by some experts. But Shannon's entropy method corresponds to the maximum likelihood problem and is performed without the intervention experts' decisions. Therefore, comparing these methods determines the weaknesses and strengths of the experts' decisions. Next, the results obtained by these methods have been combined with the TOPSIS and COPRAS methods to analyze the data offered by users to rank some selected cloud service providers. The TOPSIS and COPRAS methods are performed based on clinging to positive and negative ideals. Besides that, the COPRAS method considers the superiority and dependence between features to suggest the final indicators' ranks.

ICEE-1399

# Semi-supervised Deep Reinforcement Learning in Decentralized Multi-Agent Collision Avoidance and Path Planning in a Complex Environment

Marzie Parooei - Mehdi Tale Masouleh - Ahmad Kalhor

University of Tehran- University of Tehran- University of Tehran

Abstract

The problem of path planning and collision avoidance in complex and natural environments is one of the basic requirements of the robotic world, enabling robots to enter social environments. This paper aims to provide a decentralized path planning and collision avoidance method in multi-agent environments. In this method, each agent is a decision-making unit that decides independently from other agents and based on what is in its field of view. In the present paper, classical methods have been used to generate data for training purposes. Models were trained offline by imitating classical methods then semi-supervised methods were used for feature extraction. The results obtained from this method were compared with the Optimal Reciprocal Collision Avoidance (ORCA) method in three environments with different densities and three different indices. The proposed method performed relatively optimally and successfully increased the interaction index while decreasing the computation time. On the other hand, due to the scalable potential of this method, the number of agents could be increased without affecting the computation time.

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| عنوان نشست: **مهندسی پزشکی ۲**- پردازش تصاویر پزشکی۱ | | | |
| **روسای نشست** | دکتر عماد فاطمی زاده | دانشگاه | |
| | دکتر رسول مهدوی فر | دانشگاه | |
| | دکتر عباس نصیرایی مقدم | دانشگاه | |

**ICEE-1097**

**Extension Network of Radiomics-based Deeply Supervised U-Net (ERDU) For Prostate Image Segmentation**

* Mahdi Ashtarian - Karim Faez - Marjan Firouznia - Hamidreza Amindavar

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**ICEE-1473**

**Deep Convolutional Neural Network for ADHD Classification using resting-state fMRI**

* MohammadHadi Firouzi - Maliheh Ahmadi - Kamran Kazemi - Mohammad Sadegh Helfroush - Ardalan Aarabi

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**ICEE-1493**

**Improved Attention U-Net combined with Conditional Random Field for Ischemic Lesion Segmentation from Magnetic Resonance Images**

* Ali Rezaei - Asieh Khosravanian - Habibollah Danyali - Kamran Kazemi - Ardalan Aarabi

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**ICEE-1054**

**کاهش نویز و کلاتر در تصاویر رنگی داپلر اولترسوند**

بهینا علیزاده - سید محمود سخایی

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**ICEE-1152**

**Medical Ultrasound Image Restoration in Presence of Defective Transducer Elements**

* Mohammad Saeed Zare Dehabadi - Mehran Jahed

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ICEE-1097

# Extension Network of Radiomics-based Deeply Supervised U-Net (ERDU) For Prostate Image Segmentation

Mahdi Ashtarian - Karim Faez - Marjan Firouznia - Hamidreza Amindavar
Amirkabir University of Technology- Amirkabir University of Technology- Amirkabir University of Technology- Amirkabir University of Technology

Abstract

Automatic prostate segmentation from MRI images is important in disease diagnosis and treatment. The main challenges are the complex boundaries, the spatial and morphological heterogeneity, and the variety of prostate shapes. This paper proposes a deep CNN network based on 2D Res-Unet with equalization and noise reduction for preprocessing using a median filter. Additionally, a residual connection and batch normalization are used in the UNetbased network to improve gradient flow and avoid overfitting the network. The 2D Res-Unet method showed promising results on the PROSTATEx prostate MRI dataset. It achieves a dice similarity coefficient of 82.7% with a small number of parameters while outperforming the standard benchmark algorithms. Our results show that the EDRU network achieves more accurate results than the state-of-the-art U-net network for prostate gland segmentation.

ICEE-1473

# Deep Convolutional Neural Network for ADHD Classification using resting-state fMRI

MohammadHadi Firouzi - Maliheh Ahmadi - Kamran Kazemi - Mohammad Sadegh Helfroush - Ardalan Aarabi

Shiraz university of technology- Shiraz university of technology- Shiraz university of technology Shiraz university of technology- University Hospital

Abstract

Attention Deficit/Hyperactivity Disorder (ADHD) is the most common diagnosed mental disorder in childhood and may persist into adulthood. ADHD is characterized by symptoms of inattention, hyperactivity, and impulsivity. ADHD is a neurodevelopmental disease and widely affects brain functions; thus, investigating brain functional connectivity is more effective in childhood. The exact mechanism of how ADHD affects brain neural connections has not been discovered, and discriminating children with ADHD from the control group is a challenging issue. Deep learning methods yielded promising results in disease diagnosis. Deep learning and neuroimaging tools such as functional resonance imaging (fMRI) were combined in order to differentiate between the neural activities of ADHD and typically developing children (TDC) patients. This study suggests a deep learningbased procedure that is used for classifying these TDC and ADHD groups. At the first step, resting-state fMRI (rsfMRI) data from the NYU imaging site from the ADHD-200 global competition public dataset were preprocessed in order to remove artifacts. Next, our algorithm uses functional parcellation to divide brain regions into 412 parcels. Our algorithm extracts features and classes ADHD and TDC patients at the same time, while some other methods extract features and classify subjects with different algorithms. A 5-fold cross-validation is applied to investigate classification results. Our results show

that the proposed procedure in this study outperforms other methods in the state-of-the-art by an accuracy of 76.096%.

ICEE-1493

# Improved Attention U-Net combined with Conditional Random Field for Ischemic Lesion Segmentation from Magnetic Resonance Images

Ali Rezaei - Asieh Khosravanian - Habibollah Danyali - Kamran Kazemi - Ardalan Aarabi

Shiraz University of Technology- Shiraz University of Technology- Shiraz University of Technology Shiraz University of Technology- University Hospital

Abstract

Stroke Lesion segmentation from magnetic resonance images is of great research interest due to its capability in providing appropriate clinical information for the effective treatment of stroke. Deep learning methods have demonstrated promising results in medical image segmentation and U-Net is one of the most effective models. Nevertheless, these algorithms in the area of ischemic stroke lesion segmentation are in the first stages of development and they lack performance compared to other problems for instance brain tumor segmentation. In this paper, we improved the U-Net algorithm by applying blocks consisting of depth-wise separable convolutions with skip connections instead of normal convolution layers and new attention blocks. Based on these improvements, the new architecture has better performance and accuracy with fewer parameters which would need simpler equipment for implementation. We utilized a 3D fully connected Conditional Random Field (CRF) as post-processing to improve the model prediction. Experimental results showed that the proposed end-to-end deep encoder-decoder model has a significant improvement compared to existing deep learning methods on the publicly available Anatomical Tracings of Lesion After Stroke (ATLAS) dataset.

ICEE-1054

# کاهش نویز و کلاتر در تصاویر رنگی داپلر اولترسوند

بهینا علیزاده - سید محمود سخایی

دانشگاه صنعتی نوشیروانی بابل- دانشگاه صنعتی نوشیروانی بابل

چکیده

تصویربرداری جریان رنگی (CFI) اولتراسوند یکی از تکنیک‌های برجسته به منظور تجسم دقیق جریان خون است. متاسفانه سیگنال‌های کلاتر که از حرکات آهسته‌ی بافت و دیواره‌ی رگ‌ها ناشی می‌شوند، یکی از موانع اصلی بر سر راه دستیابی به دیدی واضح از شبکه‌ی عروقی می‌باشند. تقویت تصویر جریان خون از طریق حذف کلاترها، گامی مهم برای بسیاری از کاربردها در اولتراسوند CFI است. این کار با استفاده از روش‌های مختلفی از جمله فیلترهای بالاگذر کلاسیک، فیلترهای مبتنی بر تحلیل ویژه و استفاده از روش تجزیه‌ی ماتریس‌های تنک و کم‌رتبه با کمک دو الگوریتم تجزیه مقادیر تکین (SVD) و تجزیه ماتریسی مقاوم برای حذف کلاتر در اولتراسوند (RAPID) انجام می‌شود. این روشها در حذف کلاتر، کارایی خوبی دارند اما برای حذف نویز کارایی مطلوبی ندارند و بنابراین در شرایطی که نسبت سیگنال جریان خون به نویز کم است مانند تصویربرداری از رگهای عمیقتر یا رگهای کوچکتر، کیفیت تصویر مطلوب نیست. . در این مقاله، ما پسپردازش سیگنال توان داپلر بعد از حذف کلاتر به منظور بهبود نسبت سیگنال به نویز مورد توجه قرار میدهیم و نشان میدهیم که در سیگنال توان داپلر، نویز به صورت یک مولفه فرکانس پایین ظاهر میشود. سپس استفاده از دو روش میانگین‌گیر زمانی لغزان و فیلتر بالاگذر کلاسیک را برای کاهش اثرات نویز پیشنهادمیدهیم . نتایج ارزیابیها روی دادههای شبیهسازی بیانگر بهبود قابل ملاحظه کیفیت تصویر است، مخصوصا استفاده همزمان از دو روش ذکر شده، بهترین کارایی را نشان میدهد.

ICEE-1152

# Medical Ultrasound Image Restoration in Presence of Defective Transducer Elements

Mohammad Saeed Zare Dehabadi - Mehran Jahed

Sharif University of Technology- Sharif University of Technology

Abstract

Quality of medical ultrasound images is negatively affected by common defective elements in the ultrasonic transducer arrays. In this work, radio frequency (RF) signals from weak elements with low sensitivity are restored using an adaptive nonblind signal deconvolution method. For this purpose, the electromechanical impulse response of each element in the transducer must be measured. Initially, the negative effects of the RF signals recorded from each element are removed by Wiener deconvolution of RF signals through the measured impulse responses. Then to restore the RF signals, the deconvolution result is convolved with the reference electromechanical impulse response, corresponding to the intact and ideal element. To present the performance of this method, the electrical fatigue in piezoelectric materials, as a common real example for defective elements, is simulated by reducing the piezoelectric constant and permittivity parameters based on finite element method (FEM). The electromechanical impulse responses for the intact and fatigued transducers are obtained from the simulation. Finally, the quality of reconstructed point spread function (PSF) from the transducers is evaluated. The side lobe level (SLL) and full width at half maximum (FWHM) in axial and lateral directions are measured for the reference PSF from intact transducer and also original and compensated PSFs from the fatigued transducer. The results show that the metrics are improved to an acceptable level compared to the reference PSF after applying the proposed compensation method.

دانشگاه صنعتی امیرکبیر
( پلی تکنیک تهران )

**سی و یکمین کنفرانس بین‌المللی مهندسی برق**

**۱۹ الی ۲۱ اردیبهشت ماه ۱۴۰۲**

**31st International Conference on Electrical Engineering**

**May 9-11/2023 –Tehran, Iran**

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| پنجشنبه ۲۱ اردیبهشت ماه ۱۴۰۲ ساعت ۰۹:۰۰ الی ۱۰:۳۰ | | |
| عنوان نشست: **نشست قدرت (انرژی)۷**- بهره برداری و برنامه ریزی سیستم های قدرت (۱) | | |
| **روسای نشست** | دکتر محمد رستگار | دانشگاه شیراز |
| | دکتر حمید فتحی | |
| | دکتر حامد نفیسی | دانشگاه صنعتی امیرکبیر |

**ICEE-1133**

**Integrated expansion planning of the distribution network and distributed generations considering energy storage systems, electric vehicles charging stations, and daily load modeling**

*Ahmad Mohammadi Pour - Mehrdad Setayesh Nazar

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**ICEE-1367**

**بازآرایی پویا شبکه توزیع با حضور ایستگاه شارژ خودرو الکتریکی به کمک یادگیری تقویتی**

**محمدامین ساعدی - صالح رازینی - محمدامین قاسمی**

**ICEE-1139**

**Integration of P2G and Renewables in Stochastic Day-ahead Electricity-Gas Scheduling**

* Mojtaba Choghaei - Mohammad Kazem Sheikh-El-Eslami

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**ICEE-1154**

**Deep Learning based Electrical Load Forecasting using Temporal Fusion Transformer and Trend-Seasonal Decomposition**

* Ehsan Saadipour-Hanzaie - Mohammad-Amin Pourmoosavi - Turaj Amraee

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**ICEE-1222**

**Flexible Microgrid Scheduling with the Presence of Renewable Energy Resources**

* Mahdi Rahimi - Fatemeh Jahanbani Ardakani - Ali Reza Rahimi

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**ICEE-1287**

**Flexibility Assessment of Virtual Power Plant with Considering Dispatchable Wind Turbine**

* Mahdi Rahimi - Fatemeh Jahanbani Ardakani - Ali Reza Rahimi

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ICEE-1133

# Integrated expansion planning of the distribution network and distributed generations considering energy storage systems, electric vehicles charging stations, and daily load modeling

*Ahmad Mohammadi Pour - Mehrdad Setayesh Nazar
Shahid Beheshti University- Shahid Beheshti University

Abstract
Growth of the population, the need for electrical energy, convince distribution companies (DISCO) to expand their activities and respond to the increase in demand. Computations of the considered model are executed at various load levels. The cost of Energy Not Supplied (ENS), energy losses, and revenue from the consumers' purchase of energy are affected in the maximizing of profit. Electric Vehicles Charging Stations (EVCS) placement was further scrutinized as a constraint along with Energy Storage Systems (ESS) and Distributed Generations (DG), with an examination of accurate load modeling for the first time in this essay. The obtained results demonstrate the expansion of the distribution system with AC load flow, in which the expansion of substations, lines, and DGs was considered. The results of planning cost, exclusively the construction and development of substations, are estimated to be higher than the cost of construction of DG and restoration of lines. Therefore, reinforcing and replacing the line conductors is the optimal decision for the system. This research deals with the increasing expansion cost by considering the DGs. This model's expertise is stronger than the lack of ESS, and their deployment reduces the energy cost at the peak. With the correct placement of EVCS, it satisfied their energy consumption. Eventually, the result of the study illustrates the profitability of the model.

ICEE-1367

# بازآرایی پویا شبکه توزیع با حضور ایستگاه شارژ خودرو الکتریکی به کمک یادگیری تقویتی

محمدامین ساعدی - صالح رازینی - محمدامین قاسمی

دانشگاه بوعلی سینا- دانشگاه بوعلی سینا- دانشگاه بوعلی سینا

چکیده

همزمان با هوشمندسازی شبکههای توزیع، رشد روزافزون تقاضا در شبکه و افزایش نفوذ بارهایی با ماهیت متغیر در زمان، مانند ایستگاه شارژ خودرو الکتریکی، نیاز به پویایی ساختار شبکه متناسب با توزیع زمانی و مکانی تقاضا را، بیش از پیش کرده است. بازآرایی سیستم توزیع که توسط مجموعهای از کلیدزنیها انجام میگیرد روشی موثر برای این منظور است. در این مقاله برای حل مساله بازآرایی پویای شبکه توزیع با حضور ایستگاه شارژ خودروی الکتریکی، از روش یادگیری تقویتی استفاده شده است. این روش بدون نیاز به داشتن مدل سیستم و پیش بینی بار، میتواند با دریافت پاداش آنی ناشی از نتیجه مستقیم یک عمل، به تدریج بهترین انتخاب را در هر حالتی برای برآوردن اهداف اصلی سیستم بیاموزد. اهداف تعریف شده در این مطالعه، در مدل پایه کاهش تلفات توان و در مدل بهبود یافته کاهش تلفات بهمراه کاهش انحراف ولتاژ کل سیستم از مقادیر نامی میباشد. همچنین با ارائه تابعی برای تنظیم پارامترهای الگوریتم نسبت به مطالعات پیشین همگرایی بهبود یافته است. الگوریتم پیشنهادی در شبکه استاندارد ۳۳ باسه اجرا و نتایج آن با مطالعات مشابه مقایسه شده است که گویای کارآیی الگوریتم و بهبود عملکرد سیستم با اجرای روش ارائه شده در این مطالعه میباشد.

ICEE-1139

# Integration of P2G and Renewables in Stochastic Day-ahead Electricity-Gas Scheduling

* Mojtaba Choghaei - Mohammad Kazem Sheikh-El-Eslami
Tarbiat Modares University- Tarbiat Modares University

Abstract

Increasing the capacity of renewable resources, usually concentrated in prone areas, and the lack of sufficient network capacity can lead to wasting clean energy. Grid reinforcement is costly and time-consuming; hence, short-term solutions are expected. Although the power-to-gas (P2G) technology comes into the industrial phase, its application is limited due to the loss in the conversion process. This paper evaluates the role of integrated wind farms and P2G technology in covering this issue, in which P2Gs use the suppressed amount of cheap and clean energy to supply gas-fired generators. So, the proposed approach can improve the performance of both the renewables and P2G technology. The proposed model is described as a stochastic unit commitment problem for scheduling the electricity and gas in the day-ahead market, while P2G equipment helps to compensate for the variation associated with wind generation. The model is implemented on a modified IEEE RTS-24 bus test system, and the result shows the positive impact of P2Gs in improving the operational costs and as a suitable integration option for wind farms.

ICEE-1154

# Deep Learning based Electrical Load Forecasting using Temporal Fusion Transformer and Trend-Seasonal Decomposition

* Ehsan Saadipour-Hanzaie - Mohammad-Amin Pourmoosavi - Turaj Amraee
K.N. Toosi University of Technology- K.N. Toosi University of Technology- K.N. Toosi University of Technology

Abstract— Secure and consistent electrical power supply is promised by smart grids. Moreover, high-tech monitoring and metering instruments provoked smart grids into more selfcontrolled and automated systems. Therefore, load forecasting with high accuracy is fundamentally required at the individual and aggregated level of the power system for planning and operation studies. Deep neural networks have proved their capability of time-series forecasting in different fields. As well, Transformer architecture was a revolution in deep neural networks with outstanding performance in different fields. So far, Temporal Fusion Transformer (TFT) is one of the leading neural networks based on the Transformer concept. The TFT model is designed particularly for stochastic time-series forecasting, which reveals high-accuracy forecasting results. In this paper, TFT is employed as the backbone neural network architecture for electrical load forecasting. Furthermore, a trend-seasonal decomposition method is utilized based on the moving-average concept to break down the original time series into the trend and seasonal components. Trend-seasonal decomposition can provide a bright view of time series over time. The proposed model is tested on Iran's historical load data to validate the performance of mid-term load forecasting. However, the proposed method is robust for any time horizon. Results demonstrate notable improvements in the forecasting accuracy of the proposed model compared to the original TFT.

ICEE-1222

# Flexible Microgrid Scheduling with the Presence of Renewable Energy Resources

* Mahdi Rahimi - Fatemeh Jahanbani Ardakani - Ali Reza Rahimi
Yazd University- Yazd University- Islamic Azad University

Abstract

The growing need for energy has led to the high installation of renewable energy resources (RES), especially wind turbines (WT) and photovoltaic (PV). Although these generations provide cheap power to the power grid, the uncertainty of their output power, along with other uncertainties of the power system, such as demands, leads to imbalances in the power system. The system operator requires a flexible energy portfolio of various distributed energy resources (DER) to cope with uncertainties and reduce imbalances. This study proposes a flexible optimal scheduling model for microgrid (MG) participation in the electricity market. Various DERs, including WT, PV, conventional generators (CG), and battery energy storage systems (BESS), are considered. Also, dynamic line rating (DLR) equipment is installed on the line connected to the upstream network. The simulation is implemented on the standard 33-busses IEEE. The flexibility indices (FI) for the line with DLR equipment and the CG are calculated to show the effect of DLR on flexibility. Then, the total system's flexibility index (SFI) is calculated by the provided weights and used to compare in different case studies, i.e., static line rating (SLR) and DLR models. Finally, the effect of RES penetration increments on the net profit of MG, total energy sold and purchased, unit flexibility, and the SFI are compared. The results demonstrate the effectiveness of the proposed model in improving net profit and the SFI.

ICEE-1287

# Flexibility Assessment of Virtual Power Plant with Considering Dispatchable Wind Turbine

* Mahdi Rahimi - Fatemeh Jahanbani Ardakani - Ali Reza Rahimi
Yazd University- Yazd University- Islamic Azad University

Abstract

Nowadays, the uncertainty in the power system parameters has led to more operator flexibility requirements. Flexibility is the ability of the system to deal with uncertainty and balance the supply-load equilibrium. This study presents an optimal operation model of distributed generation resources to supply electrical and thermal load as a virtual power plant for participating in the electricity market. Normalized up-ward and down-ward flexibility indices (FI) are expressed for demand response programs, conventional generators, and energy storage systems. Additionally, by assigning weights to each of the above indices, the up-ward and down-ward FI of the whole system has been calculated. The model has been evaluated on the standard 33-busses IEEE distribution system. The results demonstrate that the proposed flexibility model can quantify the system's flexibility so that the system operator has an adequate view of the system's hourly flexibility.

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| پنجشنبه ۲۱ اردیبهشت ماه ۱۴۰۲ ساعت ۰۹:۰۰ الی ۱۰:۳۰ | | |
| عنوان نشست: **نشست مخابرات (سیستم) ۷**- رادار | | |
| **روسای نشست** | دکتر مهرزاد بیغش | دانشگاه شیراز |
| | دکتر محمدحسن باستانی | دانشگاه صنعتی شریف |
| | دکتر یاسر نوروزی | دانشگاه صنعتی امیرکبیر |

**ICEE-1027**

## طراحی بهینه ی آرایه ی تُنُک بی افزونگی با فاصله ی ناصحیح میان عناصر

سید محمد حسینی - محمود کریمی

**ICEE-1135**

## بهینه‌سازی نرخ امن با استفاده از انتخاب آنتن فرستنده در سیستم‌های دوکاره‌ی راداری- ارتباطی با چند ورودی - چند خروجی

نیلوفر حسینی - هنگامه کشاورز

**ICEE-1225**

## انتخاب آنتن در رادارهای چندورودی-چندخروجی با رویکرد یادگیری بانظارت در شبکه‌های عصبی کانولوشنی عمیق

مرضیه سادات میررفیع - ندا فرجی - ایاز قربانی

**ICEE-1427**

**بهبود پردازش وفقی فضا-زمان (STAP) در سیستم‌های رادار هوابرد با استفاده از الگوریتم‌های آگاه به تنک بودن (Sparsity) سیستم**

علی شیخیان - سارا میهن دوست - نعمت الله عزتی - احسان مصطفی پور

**ICEE-1429**

SAR Images Clustering Based on Modified Nonlinear Orthogonal non-Negative Matrix Factorization (NMF)

* Mahdi Jowkar dehouei - Soolmaz Khazandi - Yaser Norouzi

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**ICEE-1434**

Human Identification based on micro-Doppler images using Residual Networks

* Ali Pouresmaeil - Pegah Kakvand - Mohammad Ali Sebt

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ICEE-1027

# طراحی بهینه ی آرایه ی تُنُک بی افزونگی با فاصله ی ناصحیح میان عناصر

سید محمد حسینی - محمود کریمی

دانشگاه شیراز - دانشگاه شیراز

**چکیده – یکی از روش‌هایی که اخیراً برای افزایش تعداد منابع قابل جهت‌یابی با آرایه‌ای از حسگرها و کاهش اثر نامطلوبِ تزویج متقابل میان عناصر آرایه بسیار مورد توجه قرار گرفته است، جهت‌یابی با استفاده از آرایه‌ی مجازیِ ایجاد شده با یک آرایه‌ی تُنُک است. یکی از شناخته شده‌ترین ساختارها برای آرایه‌ی تنک، آرایه‌ی بی افزونگی است. در آرایه‌های بی‌افزونگیِ متداول، مکان هر حسگر همواره مضرب صحیحی از نصف طول موج است. در این مقاله روشی برای طراحی آرایه‌های بی‌افزونگی بهینه پیشنهاد می‌شود که در آن حسگرها می‌توانند در مکان‌هایی که مضرب صحیحی از کسری از نصف طول موج است هم قرار گیرند. از آنجا که برای هر تعداد مشخص از حسگرها، تعداد آرایه‌های بهینه‌ی بی‌افزونگی محدود است، استفاده از این روش باعث افزایش تعداد آرایه-های بی‌افزونگی بهینه‌ی در دسترس می‌شود و می‌تواند باعث افزایش دقت جهت‌یابی و کاهش اثر تزویج متقابل شود. علاوه بر روش طراحی آرایه‌ی بی‌افزونگی با حداقل طول، روش‌های طراحی آرایه‌ی بی‌افزونگی با طول دلخواه و آرایه‌ی بی‌افزونگی با کاهش اثر تزویج متقابل و آرایه‌ی بی-افزونگی ترکیبی هم در این مقاله بررسی می‌شود. نتایج شبیه‌سازی‌ها نشان می‌دهند در هنگام جهت‌یابی منابع، آرایه‌های به دست آمده با روش پیشنهادی می‌توانند عملکرد بهتری را نسبت به آرایه‌های موجود داشته باشند.**

ICEE-1135

# بهینه‌سازی نرخ امن با استفاده از انتخاب آنتن فرستنده در سیستم‌های دوکاره‌ی راداری- ارتباطی با چند ورودی - چند خروجی

نیلوفر حسینی - هنگامه کشاورز

دانشگاه سیستان و بلوچستان - دانشگاه سیستان و بلوچستان

**چکیده - یک سیستم دوکاره‌ی راداری- ارتباطی چند ورودی - چند خروجی (D-MIMO DFRC)، ساختاری است متشکل از چند آنتن فرستنده و چند آنتن گیرنده که به صورت توزیع یافته در محیط قرار گرفته‌اند. آنتن‌های فرستنده‌ی این سیستم سیگنالی را ارسال می‌کنند که کار آشکارسازی هدف پرنده و ارسال اطلاعات به گیرنده‌ی قانونی را به طور همزمان انجام می‌دهد. سیگنال‌های ارسالی از فرستنده‌ها متعامد هستند و به صورت همه‌پخشی در فضا منتشر می‌شوند؛ چراکه گیرنده‌ی قانونی بر روی زمین قرار دارد و هدف مورد شناسایی در آسمان است، بنابراین برای انجام هم‌زمان آشکارسازی هدف و ارسال اطلاعات، سیگنال باید به صورت همه‌پخشی در فضا منتشر شود. در این مقاله برای نخستین بار تلاش کردیم تا با روش انتخاب آنتن در دو گام، نخست با انتخاب خوشه‌ای از آنتن‌ها بر اساس تلفات مسیر و سپس انتخاب آنتن از میان آنتن‌های موجود در خوشه‌ی برگزیده، بر اساس اطلاعات وضعیت کانال بتوانیم ضمن حفظ عملکرد راداری مطلوب، نرخ امن را بهبود بخشیده و نرخ داده‌ی دریافتی در شنودگر را تا حد ممکن کاهش دهیم.**

ICEE-1225

# انتخاب آنتن در رادارهای چندورودی-چندخروجی با رویکرد یادگیری بانظارت در شبکه‌های عصبی کانولوشنی عمیق

مرضیه سادات میررفیع - ندا فرجی - ایاز قربانی

دانشگاه بین‌المللی امام خمینی (ره) - دانشگاه بین‌المللی امام خمینی (ره) - دانشگاه صنعتی امیرکبیر

**چکیده – انتخاب آنتن در رادارهای چندورودی-چندخروجی از اهمیت ویژه‌ای برخوردار است، چرا که هزینه‌های سخت‌افزاری و نگهداری، توان مصرفی و حجم محاسبات در این رادارها بالاست و انتخاب زیرمجموعه‌ای بهینه از آنتنها در سمت فرستنده و نیز گیرنده می‌تواند معایب این نوع رادارها را پوشش دهد و در عین‌حال ما را از مزایای این نوع رادارها در تخمین بهتر و دقیق‌تر موقعیت اهداف بهره‌مند سازد. در این مقاله، با استفاده از شبکه‌های عصبی عمیق کانوولوشنی مساله انتخاب آنتن را در رادارهای چندورودی-چندخروجی هم‌مکان بررسی می‌کنیم و چالشهای آن را مورد مطالعه قرار می‌دهیم. داده‌های آموزش شبکه شامل ماتریس کواریانس نمونه مشاهدات به عنوان ورودی و برچسب زیرآرایه بهینه به عنوان خروجی است. زیرآرایه بهینه برای هر ورودی با ارزیابی مقدار کران پایین کرامر-رائو تخمین زاویه ورود برای تمام انتخابهای ممکن و انتخاب بهترین زیرآرایه به لحاظ این معیار تعیین می‌شود. با کمک یک معماری مطرح‌شده از شبکه‌های عصبی کانوولوشنی عمیق و در تعداد مشاهدات ۱۰ و ۵۰، این شبکه قادر به انتخاب زیرمجموعه بهینه از آنتنهای فرستنده و گیرنده با دقت ۷۶٪ و ۹۰.۰۴٪ روی مجموعه داده تست می‌باشد.**

ICEE-1427

# بهبود پردازش وفقی فضا-زمان (STAP) در سیستم‌های رادار هوابرد با استفاده از الگوریتم‌های آگاه به تنک بودن (Sparsity) سیستم

علی شیخیان - سارا میهن دوست - نعمت الله عزتی - احسان مصطفی پور

دانشگاه صنعتی ارومیه - دانشگاه صنعتی ارومیه - دانشگاه صنعتی ارومیه - دانشگاه ارومیه

**چکیده – در این مقاله، عملکرد پردازش وفقی فضا-زمان (*STAP*) با استفاده از یکی از الگوریتم‌های وفقی آگاه به اسپارسیتی (*Sparsity*) که اخیرا مطرح شده، بهبود می‌یابد. این الگوریتم‌ها شامل تابع پارامتر هموار مبتنی بر معیار بیشینه آنتروپی مشترک نرمالیزه شده (*SPF-NMCC*) هستند. عملکرد الگوریتم پیشنهادی با عملکرد سیستم *STAP* اصلاح شده با الگوریتم *LMS* تکرار توام نرم-*L1* (*L1-J1-LMS*) و الگوریتم پیشرفته تر ولی با بار محاسباتی بیشتر *RLS* تکرار توام نرم *(L1-JI-RLS)* به کمک معیارهای مختلف برای مقادیر مختلف *SNR* و *SINR* بررسی و مقایسه می‌گردند. نتایج نشان می‌دهند که الگوریتم اصلاح‌شده *SPF-NMCC* عملکرد بهتری نسبت به سایر الگوریتم‌های تطبیقی ارائه شده برای *STAP* دارد.**

ICEE-1429

# SAR Images Clustering Based on Modified Nonlinear Orthogonal non-Negative Matrix Factorization (NMF)

Mahdi Jowkar dehouei - Soolmaz Khazandi - Yaser Norouzi
Amirkabir University of Technology- Amirkabir University of Technology- Amirkabir University of Technology

Abstract

This study presents the results of unsupervised learning (clustering) on Synthetic Aperture Radar (SAR) images. Fast and accurate clustering allows us to perform Automatic Target Recognition (ATR) in SAR images. Data can be automatically clustered based on similar properties. Nonnegative matrix factorization (NMF) is usually applied linearly. We employed a nonlinear NMF with orthogonal properties in this presentation. The outcomes of spectral clustering for subspaces and NMF matrix factorization are equivalent, as demonstrated by mathematical and empirical experiments. The results of kernel-based orthogonal in subspace clustering with updates in this method have been superior to those in other methods. We have been using the stationary target dataset to study our method's accuracy in acquisition and recognition.

ICEE-1434

# Human Identification based on micro-Doppler images using Residual Networks

Ali Pouresmaeil - Pegah Kakvand - Mohammad Ali Sebt
K. N. Toosi University of Technology- K. N. Toosi University of Technology- K. N. Toosi University of Technology

Abstract

Importance of human identification is well known in surveillance systems. In this sense, radar is playing a key role in remote observation systems due to its ability in working in unsuitable weather and insufficient light. In this paper, human identification is investigated based on micro-Doppler signatures acquired from human walking and employing ResNet deep convolutional networks. Required micro-Doppler images are generated by simulation the backscattered signal of different persons using a Kinect sensor in absence of the radar. Then these images are fed to ResNet network to recognize person's identity. It is shown that this method can achieve more accuracy in larger group of people which are 95.53% in identifying 30 different persons and 97.9% for 14 people.

دانشگاه صنعتی امیرکبیر
( پلی تکنیک تهران )

**سی و یکمین کنفرانس بین‌المللی مهندسی برق**

**۱۹ الی ۲۱ اردیبهشت ماه ۱۴۰۲**

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| عنوان نشست: **نشست الکترونیک ۷**- فناوری میکرو و نانو الکترونیک ۱ | | |
| **روسای نشست** | دکتر ابراهیم ندیمی | دانشگاه صنعتی خواجه نصیر الدین طوسی |
| | دکتر امیر جهانشاهی | دانشگاه صنعتی امیرکبیر |
| | دکتر حسن کاتوزیان | دانشگاه صنعتی امیرکبیر |

## ICEE-1158

**ساخت حسگر مقاومتی گاز سولفید هیدروژن با استفاده از ترکیب نانوذرات اکسید تیتانیوم و گرافن اکسید کاهش یافته**

محمد دیانتی - سمانه حامدی

## ICEE-1276

Inexpensive fabrication of stretchable dry EEG electrodes using well known dry film photoresists

* Mohammad Sadegh Rasekh - Amir Jahanshahi - Hassan Ghafoorifard

## ICEE-1348

Design and fabrication of wearable and stretchable EEG headband using textile-based electrode wire

* Kourosh Motiepor - Arman Modoudi Yaghouti - Simin Bakhtiyari - Amir Jahanshahi - Roohollah Bagherzadeh

## ICEE-1471

Design and simulation of a surface acoustic wave based micro pressure sensor

* Sohrab Ghasemi Bisheh - Mohammad Tahmasebipour - Fatemeh Anousheh

ICEE-1477

# آشکارسازی گاز فسژن با استفاده از بروفن تک لایه ۱۲ β: شبیه سازی با استفاده از نظریه تابعی چگالی

صادق رنجبر - رزا صفایی - محمدحسین شیخی

ICEE-1158

# ساخت حسگر مقاومتی گاز سولفید هیدروژن با استفاده از ترکیب نانوذرات اکسید تیتانیوم و گرافن اکسید کاهش یافته

محمد دیانتی - سمانه حامدی

دانشگاه صنعتی شیراز - دانشگاه صنعتی شیراز

**چکیده - تشخیص گاز سولفید هیدروژن که محصول جانبی بسیاری از فعالیت های کشاورزی و صنعتی می‌باشد، به دلیل سمی بودن از اهمیت بالایی برخوردار است. هدف اصلی این مطالعه پیشنهاد و ساخت حسگر مقاومتی این گاز بر پایه اکسیدهای نیمه رسانای فلزی (تیتانیوم اکسید و گرافن اکسید کاهش یافته و ترکیب آنها) می‌باشد. ساختار حسگر ساخته شده بر روی الکترودهای دندانه شانه ای از جنس طلا است. ویژگی شاخص حسگر معرفی شده عملکرد آن در دمای اتاق است. نتایج نشان می‌دهد از بین مواد مورد آزمایش براساس شاخص حساسیت (پاسخ) ترکیب تیتانیوم اکسید با ۱۰ درصد وزنی گرافن اکسید کاهش یافته عملکرد بهتری دارد. پاسخ حسگر موردنظر ۴۵ درصد است. همچنین بررسی عملکرد پاسخ سایر حسگرهای گاز سولفید هیدروژن مقاومتی در مطالعات پیشین نشان می‌دهد حسگر ساخته شده در این مطالعه از نظر این شاخص درصد پاسخ عمل می کند.**

ICEE-1276

# Inexpensive fabrication of stretchable dry EEG electrodes using well known dry film photoresists

Mohammad Sadegh Rasekh - Amir Jahanshahi - Hassan Ghafoorifard
Amirkabir University of Technology- Amirkabir University of Technology- Amirkabir University of Technology

Abstract

with the discovery of new brain diseases, clinical tests for electroencephalogram (EEG) have become more important. Commercially available wet Ag/AgCl electrodes apply conductive gel to the scalp of the subject before recording of the EEG signal. After applying the gel, the impedance is gradually decreased and the EEG signal can be received. In the long term, the conductive gel dries and the impedance increases again. The gel causes skin irritations in the course of time as well. Therefore, Ag/AgCl electrodes are inappropriate to be used in long term measurements. Dry electrodes are introduced as a gel free no preparation alternatives of wet electrodes in the literature. In this manuscript, a novel flexible and stretchable dry EEG electrode is demonstrated. The electrode features four conductive pads to contact the scalp. The stretchable electrodes are embedded in elastomer. A flexible polyimide layer supports the conductive electrodes to increase mechanical reliability in elongations. The electrodes are produced using a relatively straightforward and cost-effective fabrication method namely commercial dry film photolithography. The EEG signal is recorded with the fabricated electrode as well as wet Ag/AgCl electrodes. The received signals from the two electrodes feature relatively high correlation.

ICEE-1348

# Design and fabrication of wearable and stretchable EEG headband using textile-based electrode wire

Kourosh Motiepor - Arman Modoudi Yaghouti - Simin Bakhtiyari - Amir Jahanshahi - Roohollah Bagherzadeh
Amirkabir University of Technology- Amirkabir University of Technology- Amirkabir University of Technology-Amirkabir University of Technology- Amirkabir University of Technology

Abstract
Electroencephalography (EEG) is an evaluation of the electrical activity of the human brain. One of the primary challenges when recording EEG signals is its comfort and wearability for the user. Dry electrodes are a suitable alternative for commercially available wet Ag/AgCl electrodes due to the removal of conductive gel. Furthermore, with the increase in the number of channels, the electrode wires increase as well and make recording the signal more difficult. Electrode wires are used to transmit the EEG signal from the electrode to an amplifier. Due to the unwanted movements of the user, displacement of electrical wires introduces artifacts and noise in the received signal. It is preferred to integrate the electrodes and their electrical wires into an EEG cap or headband that can improve the level of user comfort. In this study, a novel textilebased electrode wire headband is designed and fabricated. Conductive copper wires are knitted into the fabric in a way that dry and wet electrodes can be conveniently interconnected. Thus, the technique prevents additional clutter of wires introducing the aforementioned artifacts. Various electrical and mechanical characterizations are performed on the fabricated sample to measure their electrical and elasticity performance compared to conventional electrical wires.

ICEE-1471

# Design and simulation of a surface acoustic wave based micro pressure sensor

* Sohrab Ghasemi Bisheh - Mohammad Tahmasebipour - Fatemeh Anousheh
University of Tehran - University of Tehran - University of Tehran

Abstract

Among electromechanical systems, sensors based on surface acoustic waves (SAW) are of particular importance due to their fast response, high sensitivity, compact structure, small size, low cost of mass production as well as their wide range of applications. This paper presents design simulation and optimization of a SAW based micro pressure sensor using finite element method. Using the mathematical model of Delta function and various analysis like time-dependent analysis and frequency-domain analysis, several methods for calculating the central frequency of this kind of sensors have been presented. Determination of central frequency is then followed by calculation of changes in surface acoustic wave velocities for applied pressures. This lead to obtain the sensitivity of microsensor. By optimization of the affecting parameters, sensitivity of this sensor has been improved up to -101 ppm/ bar.

ICEE-1477

# آشکارسازی گاز فسژن با استفاده از بروفن تک لایه ۱۲ β: شبیه سازی با استفاده از نظریه تابعی چگالی

صادق رنجبر - رزا صفایی - محمدحسین شیخی

دانشگاه شیراز - دانشگاه شیراز - دانشگاه شیراز

**چکیده – در این مقاله با استفاده از نظریه تابعی چگالی (DFT) و با در نظر گرفتن نیروهای واندروالسی به بررسی توانایی بروفن $\beta_{12}$ برای جذب گاز فسژن ($COCl_2$) می‌پردازیم. نتایج حاصل نشان از ماهیت فیزیکی و همچنین گرماده بودن این جذب بر روی تک لایه بروفن $\beta_{12}$ دارد. محاسبات ساختار نواری نیز نشان می‌دهد که پس از جذب فسژن بر روی صفحه بروفن $\beta_{12}$، خاصیت رسانایی افزایش یافته است. بنابراین می‌توان از این ماده در ساخت حسگرهای مقاومتی و گرمایی استفاده کرد. علاوه بر این، جذب فیزیکی گاز بر روی این صفحه منجر به زمان بازیابی بسیار کوتاه در دمای اتاق و آمادگی بسیار سریع حسگر برای استفاده مجدد شده است.**

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| عنوان نشست: **کنترل ۶**- سایر موضوعات مرتبط با کنترل(۲) | | |
| **روسای نشست** | دکتر علی خاکی صدیق | دانشگاه صنعتی خواجه نصیرالدین طوسی |
| | دکتر سجاد ازگلی | دانشگاه |
| | دکتر هاجر عطریانفر | دانشگاه صنعتی امیرکبیر |

**ICEE-1387**

**Sliding Mode Control for a Platoon of vehicular with DoS attacks and Obstacles**

* Tara Rajabi Nezhad Siahpoosh - Hanie Marufkhani - Mohammad A. Khosravi

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**ICEE-1492**

**Privacy-Preserving Model Predictive Control Using Secure Multi-Party Computation**

* Saeed Adelipour - Mohammad Haeri

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**ICEE-1543**

**Robot-Assisted Movement Training with Optimal Impedance: Using an EKF-Based Lasso − MPC**

* Hossein Ahmadian - Iman Sharifi - Heidar Ali Talebi

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**ICEE-1562**

**Optimal Control of Rectangular Singular Systems**

* Masoud Shafiee

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**ICEE-1295**

# Weak GPS Signal Acquisition Based on Wavelet Transform Denoising and Deep Learning Method

* Navid Moradi - Mohsen Nezhadshahbodaghi - Mohammad-Reza Mosavi

ICEE-1387

# Sliding Mode Control for a Platoon of vehicular with DoS attacks and Obstacles

Tara Rajabi Nezhad Siahpoosh - Hanie Marufkhani - Mohammad A. Khosravi

Amirkabir University of Technology- Amirkabir University of Technology- Amirkabir University of Technology

Abstract

The platoon-based driving pattern is a reciprocity pattern for vehicles containing a virtual leader and some followers. The mentioned pattern can be applicated to deal with traffic, unwanted collisions, and reducing fuel consumption. Although manifold advantages arise from using the aforementioned pattern, each platoon member can lose control under cyberattacks. This matter may affect the stability of the platoon. This paper presents a Sliding Mode Controller (SMC) method for platoons that suffer from a Denial of Service (DoS) attack. To develop the Idea, two general assumptions are considered in the present article: platoons have a virtual leader, and each platoon member can detect obstacles and can avoid crashes. In order to prove the stability of the system, the Lyapunov second method is used. Finally, numerical simulations are used to evaluate the effectiveness of the method.

ICEE-1492

# Privacy-Preserving Model Predictive Control Using Secure Multi-Party Computation

Saeed Adelipour - Mohammad Haeri

Sharif University of Technology- Sharif University of Technology

Abstract

In this paper, a secure multi-party computation strategy based on secret sharing is used to derive a privacypreserving model predictive control for a class of cyberphysical systems. In the proposed framework, the underlying optimization problem of model predictive control is solved by a variation of projected gradient method. All required computations are carried out by outsourced computation units at the cloud level, while data privacy is maintained using a secret sharing scheme. The original values of system private parameters are not revealed to any external eavesdroppers and the cloud computing units. Simulation results demonstrate the efficiency of the proposed method in terms of performance and privacy.

**ICEE-1543**

# Robot-Assisted Movement Training with Optimal Impedance: Using an EKF-Based Lasso − MPC

Hossein Ahmadian - Iman Sharifi - Heidar Ali Talebi

Amirkabir University of Technology- Amirkabir University of Technology- Amirkabir University of Technology

Abstract

Wearable robots are crucial for helping patients with lower limb diseases, particularly those with trouble walking, since their numbers are rising. These robots assist patients in walking, provide comfort, and aid in recuperation. In this work, the model predictive control by the Lasso regression theory (Lasso−MPC) with the extended Kalman filter (EKF) was used to make a controller that helps the patient walk by adjusting the impedance so that, in addition to regular walking, the patient has to put out the most effort when walking. The simulation results demonstrate the suggested control's incredible effectiveness in robot-assisted rehabilitation.

ICEE-1562

# Optimal Control of Rectangular Singular Systems

Masoud Shafiee

Abstract

In this paper, the problem of linear quadratic regulator (LQR) optimal control, tracking optimal control and stochastic control for rectangular singular systems is considered. In this paper, for the LQR and tracking, the necessary and sufficient conditions for the controllability, observability, regularity, admissibility, and the existence of the solution for two types of rectangular singular systems have been obtained. In first case, the number of equations is greater than the number of unknowns and in the second case, the number of unknowns is greater than the number of equations, then, it is shown that the Hamiltonian form of a rectangular singular system is a square singular system. Therefore, the theorems concerning the uniqueness of the solution, stability and others which have been proved for the square singular systems can be extended to the rectangular singular systems. The only difference in the square singular systems is the necessary conditions for the existence of a solution. It is also shown that there are cases for which the matrix form system has never a unique solution. Simulation results demonstrate the good performance of the proposed methods.

ICEE-1295

# Weak GPS Signal Acquisition Based on Wavelet Transform Denoising and Deep Learning Method

Navid Moradi - Mohsen Nezhadshahbodaghi - Mohammad-Reza Mosavi

Iran University of Science and Technology- Iran University of Science and Technology- Iran University of Science and Technology

Abstract

Global Positioning System (GPS) signals are weakened by various phenomena and factors in the path from the satellite to the receiver. This incident causes problems in different stages of GPS signal processing and correct positioning. To denoising GPS signals, wavelet transform (WT) is one of the most widely used tools, which increases the sensitivity of GPS receivers to acquire weak GPS signals. One of the most effective factors in the efficiency of the denoising process is the selection of the appropriate mother wavelet. Considering this issue, we propose a quantitative method for choosing the proper mother wavelet in this paper. Also, we investigate the usage of deep learning in signal acquisition to acquire GPS signals when physics-based models do not work correctly and normal conditions do not hold. The proposed method combines the WT denoising method and the deep learning method. The experiment results show that the proposed method improved the sensitivity of GPS receivers.

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| عنوان نشست: **نشست کامپیوتر۳**- یادگیری ماشین و سیستم¬های خبره | | |
| **روسای نشست** | دکتر محمدمهدی عبادزاده | دانشگاه صنعتی امیرکبیر |
| | دکتر کامبیز بدیع | پژوهشگاه ارتباطات و فناوری اطلاعات |
| | دکتر مهدی رعایایی | دانشگاه تربیت مدرس |

## ICEE-1074

### پیش‌بینی بازار سرمایه به کمک داده‌کاوی با الگوریتم‌های رگرسیونی

شیوا نمایان - محمدشهرام معین

## ICEE-1140

**Batch(offline) Reinforcement Learning for recommender system**

* Mohammad Amir Rezaei Gazik - Mehdy Roayaei

## ICEE-1480

**An Improved Hybrid Recommender System: Integrating Document Context-Based and Behavior-Based Methods**

* Meysam Varasteh - Mehdi Soleiman Nejad - Hadi Moradi - Mohammad Amin Sadeghi - Ahmad Kalhor

## ICEE-1511

**On the selection of superspreaders for advertising in science education using a new similarity measure**

* Sanaz Afsharian - Mohsen Heidari - Heidar Nosratzadeh - Mojgan Khalifeh

## ICEE-1535

### پیش‌بینی مسیر حرکت انسان‌ها در محیط‌های پر ازدحام

امین منافی سلطان احمدی - سمانه حسینی سمنانی

ICEE-1074

# پیش‌بینی بازار سرمایه به کمک داده‌کاوی با الگوریتم‌های رگرسیونی

شیوا نمایان - محمدشهرام معین

پژوهشگاه ارتباطات و فناوری اطلاعات - پژوهشگاه ارتباطات و فناوری اطلاعات

**چکیده – در بازارهای مالی، از آنجا که تراکنش های بلادرنگ به طور مستقیم با سود مرتبط هستند، پردازش و تجزیه و تحلیل داده‌ها بر اساس زمان واقعی مهم است. امروزه در عمل، تصمیماتی که متخصصان بازار سرمایه از تحلیل فنی و بنیادی می‌گیرند، اغلب در مقایسه با تصمیماتی که با استفاده از الگوریتم‌های پیش‌بینی اتخاذ می‌شوند، رخ می‌دهد. از این رو، در این تحقیق با بررسی عوامل موثر بر بازار سرمایه، از یک چارچوب داده‌کاوی جهت پیش‌بینی مقادیر هدف استفاده شده است. مدل‌سازی پیش‌بینی با استفاده از سه الگوریتم رگرسیونی نسبتا ساده و سریع یعنی پرسپترون چندلایه، جنگل تصادفی و رگرسیون بردار پشتیبان انجام و چارچوب داده‌کاوی بر روی داده‌های واقعی گروه فلزات اساسی بازار بورس اوراق بهادار تهران، از سال ۱۳۹۸ تا ۱۴۰۱، با در نظر گرفتن بحران سقوط بازار بورس ایران در سال ۹۹، اعمال شده است. نهایتا ما به کارایی ۹۸٪ در پیش‌بینی قیمت سهام با استفاده از الگوریتم جنگل تصادفی دست یافتیم. به علاوه، توانستیم متغیرهایی (شاخص‌های اقتصادی) را به عنوان پارامترهای حیاتی مؤثر بر بازار به عنوان معیارهای پیش‌بینی معرفی کنیم که می‌تواند به عنوان یک ابزار پشتیبانی سریع و دقیق برای تصمیم‌گیری توسط فعالان بازار در دنیای واقعی مورد استفاده قرار گیرد.**

دانشگاه صنعتی امیرکبیر
( پلی تکنیک تهران )

ICEE-1140

# Batch(offline) Reinforcement Learning for recommender system

Mohammad Amir Rezaei Gazik - Mehdy Roayaei
Tarbiat Modares University-Tarbiat Modares University

Abstract

The explosive spread of the Internet in recent years has increased the types and amounts of big data, making it difficult for users to search for the data they need. With the continued growth of business on the Internet, e-learning, increased communication and sharing among users, and the advent of social networking, there is an undeniable need to design and implement systems that make it easier for people to search. A recommender system provides the ability to provide the most appropriate and accurate suggestions to users by checking user-related information from relevant datasets. In other words, it extracts user preferences and interests from data and makes suggestions. In this paper, we study the problem of learning recommendation systems with large datasets. We propose an offline RL framework for recommender systems to achieve high accuracy and perform recommendations quickly. Specifically, we propose a framework called Ofrec that first transforms the problem into a Markov Decision Process (MDP) and provides highly accurate and time-saving recommendations. We conduct extensive experiments on a large dataset of CIKM 2019 EComm AI and show that the proposed approach outperforms

ICEE-1480

# An Improved Hybrid Recommender System: Integrating Document Context-Based and Behavior-Based Methods

Meysam Varasteh - Mehdi Soleiman Nejad - Hadi Moradi - Mohammad Amin Sadeghi - Ahmad Kalhor
University of Tehran - University of Tehran - University of Tehran - University of Tehran - University of Tehran

Abstract
One of the main challenges in recommender systems is data sparsity, which leads to high variance. Several attempts have been made to improve the bias-variance trade-off using auxiliary information. In particular, document modeling-based methods have improved the model's accuracy by using textual data such as reviews, abstracts, and storylines when the user-toitem rating matrix is sparse. However, such models are insufficient to learn optimal representation for users and items. For building recommender systems, user-based and item-based collaborative filtering have long been used due to their efficiency. A user and item profile are created based on their historically interacted items and the users who interacted with the target item. In spite of the fact that these two approaches have been studied separately, there has been little research into combining them. The purpose of this study is to combine these two approaches by considering the opinions of users on these items. Each user is represented by their historical behavior, while each item is represented by the users who have interacted with it before, combined with contextual information, which is processed with NLP. The proposed algorithm is implemented and tested on three real-world datasets that demonstrate our model's effectiveness over the baseline methods.

ICEE-1511

# On the selection of superspreaders for advertising in science education using a new similarity measure

Sanaz Afsharian - Mohsen Heidari - Heidar Nosratzadeh - Mojgan Khalifeh
Islamic Azad University - Esfarayen University - Islamic Azad University - Islamic Azad University

Abstract

Social networks play a very important role in solving the challenges of the contemporary world, including education, advertising, etc., many institutions use social network platforms to better promote educational courses, and for this reason, advertising is optimized in social network diffusion. Finding k superspreaders that have the greatest effect of publication and advertisement is one of the most important and challenging topics in the world of science. This issue has been the focus of many researchers due to its popularity and its connection with marketing science. But the algorithms presented in this problem face two challenges: the solution is not close to the realworld problems and the runtime. Also, in the algorithms presented in recent years, similarity in diffusion is ignored, which can play a very decisive role in information diffusion. Accordingly, to deal with these challenges, in this article, the NSPS algorithm is presented, which first calculates a new criterion based on centrality for similarity, the similarity criterion can create a large cascade of diffusion in social networks because nodes that are very similar to each other they can easily influence each other. It also uses network topology criteria to select seed nodes to estimate diffusion and reduce computational overhead. Finally, this algorithm is compared with the algorithm presented in recent years, which provides NSPS Influence spread algorithm and better runtime.

ICEE-1535

# پیش‌بینی مسیر حرکت انسان‌ها در محیط‌های پر ازدحام

امین منافی سلطان احمدی - سمانه حسینی سمنانی

دانشگاه صنعتی اصفهان - دانشگاه صنعتی اصفهان

**چکیده - انسان‌ها مسیر حرکت‌های متعددی را برای رسیدن به هدفشان می‌پیمایند. در این مسیر موانع ایستا و پویای متفاوتی وجود دارند که از برخورد با آن‌ها اجتناب می‌کنند. یکی از مسائل اصلی در حرکت انسان‌ها پیش‌بینی مسیر حرکت آینده آن‌هاست که در بسیاری از کاربردها از جمله رباتیک، انیمیشن و ... کاربرد دارد. در این مقاله روش جدیدی مبتنی بر شبکه‌های با حافظه بلند-کوتاه مدت ارائه شده‌است که از فاکتوری با نام "ضریب توجه هر انسان نسبت به همسایگانش" به همراه اطلاعات مسیر گذشته آن فرد برای پیش‌بینی مسیر حرکت آینده انسان‌ها استفاده می‌کند. شبکه پیشنهادی با استفاده از دو دیتاست *UCY* و *ETH* آموزش داده شد و روی پارامترهای *Average Displacement Error* (*ADE*) و *Final Displacement Error* (*FDE*) مورد ارزیابی قرار گرفت. نتایج بدست‌آمده نشان می‌دهد میامگین خطا در کل داده‌های تست برای پارامتر *ADE*، ۶.۰۱٪ و برای پارامتر *FDE*، ۹.۹۸٪ نسبت به روش قبلی بهبود پیدا کرده‌است.**

دانشگاه صنعتی امیرکبیر
( پلی تکنیک تهران )

سی و یکمین کنفرانس بین‌المللی مهندسی برق

۱۹ الی ۲۱ اردیبهشت ماه ۱۴۰۲

**31st International Conference on Electrical Engineering**

**May 9-11/2023 –Tehran, Iran**

| پنجشنبه ۲۱ اردیبهشت ماه ۱۴۰۲ ساعت ۰۹:۰۰ الی ۱۰:۳۰ | | |
|---|---|---|
| عنوان نشست: **مهندسی پزشکی ۳**- پردازش سیگنال¬های بیولوژیکی ۱ | | |
| **روسای نشست** | دکتر محمدباقر شمس‌الهی | دانشگاه صنعتی شریف |
| | دکتر علی مطیع نصرآبادی | دانشگاه شاهد |
| | دکتر سیدعلی سید صالحی | دانشگاه صنعتی امیرکبیر |

**ICEE-1089**

**Kernel-Based Embedded Feature Selection for Motor Imagery Based BCI**
* Mehdi Kamandar

**ICEE-1124**

**An improved ECG segmentation method based on adaptive Hermite functions**
* Abazar Arabameri - Sajad Haghzad Klidbary

**ICEE-1144**

**BLSTM-Convolutional Neural Networks for Respiratory Disease Diagnosis**
* Mohammad Hassan Khamechian - Mohammad Reza Akbarzadeh Tootoonchi

**ICEE-1171**

**An Ensemble Model for Sleep Stages Classification**
* Sahar Hassanzadeh Mostafaei - Jafar Tanha - Amir Sharafkhaneh - Zohair Hassanzadeh Mostafaei - Mohammed Hussein Ali Al-jaf - Alireza Fakhim babaei

**ICEE-1263**

**Fatigue Detection in SSVEP-Based BCIs Using Biomarkers: A Comparative**

**Study**

* Maedeh Azadi Moghadam - Ali Maleki

ICEE-1089

# Kernel-Based Embedded Feature Selection for Motor Imagery Based BCI

Mehdi Kamandar
Graduate University of Advanced Technology

Abstract

Brain-computer interface (BCI) based on motor imagery (MI) classification using scalp recorded multi-channel EEG signal play a major role in the control of artificial limbs and machines by people with severe disabilities. The most popular features are band power of EEG signals in frequency sub-bands in a relatively wide frequency band (e. g., 8-30 Hz) in different time windows of imagination period. The effectiveness of these features is highly dependent on the sub-bands and time windows adopted, since the optimal sub-bands and time windows is generally subject-specific. The nonlinear support vector machine (SVM) with Gaussian kernel is an excellent classifier for MI classification. In this paper, the SVM with an anisotropic Gaussian kernel with a scaling coefficient for each feature is used, instead of one scale factor for all features. The scaling coefficients are tuned by maximizing the kernel-target alignment criterion with l1 regularization. Some of the scaling coefficients will be zero after maximization due to l1 regularization, that is equivalent to removing corresponding irrelevant features from classification processes. Therefore, an embedded feature selection is also done to remove the destructive effect of irrelevant and redundant features. The average accuracy of the SVM classifier with anisotropic Gaussian kernel for four subjects in BCI IV-1 dataset is about 10% more than the SVM with isotropic Gaussian kernel.

دانشگاه صنعتی امیرکبیر
( پلی تکنیک تهران )

**ICEE-1124**

# An improved ECG segmentation method based on adaptive Hermite functions

Abazar Arabameri - Sajad Haghzad Klidbary
University of Zanjan - University of Zanjan

Abstract

Electrocardiograms (ECGs), which are recordings of the electrical activity of the heart with electrodes placed on the body, have many clinical applications. Each phase of the heart's mechanical function is represented by one of the P, QRS, and T waves in the ECG. The change in the morphological characteristics of these waves compared to the normal state can be used to diagnose cardiac functional abnormalities. Therefore, developing algorithms that can automatically extract these waves from the ECG signal with high accuracy is of high diagnostic importance. In this paper, an adaptive method is presented to estimate the shape of each heartbeat individually. The proposed algorithm is based on the improvement of previous studies. It tries to get a more accurate estimate of ECG waves by including the ST segment model in the ECG signal model. Simulation results on experimental data show that the proposed method outperforms previous similar algorithms.

ICEE-1144

# BLSTM-Convolutional Neural Networks for Respiratory Disease Diagnosis

* Mohammad Hassan Khamechian - Mohammad Reza Akbarzadeh Tootoonchi
Ferdowsi University of Mashhad - Ferdowsi University of Mashhad

Abstract

Even before the coronavirus, respiratory illnesses could not be neglected. These diseases are responsible for a sizeable fraction of annual global population deaths. Numerous and diverse respiratory illnesses exist. Subtypes of this illness include chronic obstructive pulmonary diseases, respiratory cancers such as lung and laryngeal malignancies, respiratory tract infections, and coronavirus. This project suggests combining convolutional neural networks with bidirectional long short-term memory. The suggested approach is superior to other contemporary papers since it accurately (average of 92% accuracy) identifies more respiratory disorders (6 respiratory diseases and healthy peaple). In recent years, because of the high precision and noise resistance of convolutional neural networks, they have been utilized in a variety of applications, including signal and image processing. Furthermore, The BLSTM approach is the most intelligent way to solve time series challenges since it saves the dependencies of input sequences in models and can deal with difficulties including vanishing gradients. Therefore, a combination of these two approaches has been used to detect some respiratory disorders using the audio respiration signal from a digital stethoscope. This article also uses data augmentation and filtering to create more data as the preprocessing methods. The ICBHI'17 database, the richest and most comprehensive collection of respiration sound signals available to the public, serves as the foundation for this investigation.

ICEE-1171

# An Ensemble Model for Sleep Stages Classification

Sahar Hassanzadeh Mostafaei - Jafar Tanha - Amir Sharafkhaneh - Zohair Hassanzadeh Mostafaei - Mohammed Hussein Ali Al-jaf - Alireza Fakhim babaei

University of Tabriz - University of Tabriz - Baylor College of Medicine - University of Tabriz - University of Tabriz - University of Tabriz

Abstract

One of the most important parts of health is the quality of sleep. Sleep disorders can be diagnosed using a standard sleep test called polysomnography. Sleep staging is a task in the field of sleep study that determines sleep cycles. In recent years, machine-learning approaches are used to classify sleep stages using biological signals derived from PSGs. In this study, we propose an ensemble machine-learning method for sleep stage classification. We use nine biological signals from the SHHS1 dataset, including two-channel EEG, two-channel EOG, ECG, EMG, abdominal, thorax, and airflow signals. Then we extract different features such as RRI and RPE from the ECG signals and frequency features from EEG signals. Finally, we develop an ensemble model using Light Gradient Boosting (LGB) and eXtreme Gradient Boosting (XGB) algorithms. In the end, we evaluate the proposed ensemble method using different metrics and compare its performance with other stateof-the-art techniques. The results of the proposed method show that it achieves an overall accuracy of 0.8951 in the five-class classification of sleep stages including Wake, N1, N2, N3, and REM.

ICEE-1263

# Fatigue Detection in SSVEP-Based BCIs Using Biomarkers: A Comparative Study

Maedeh Azadi Moghadam - Ali Maleki
Semnan University - Semnan University

Abstract

In a BCI system, prolonged command execution can lead to mental fatigue, making the user dissatisfied and decreasing the system's effectiveness. Utilizing functional indicators to determine the level of fatigue is the first step in reducing its negative consequences. This study classified alert and fatigue states using a combination of fatigue indices for better classification performance. First, α, β, θ frequency bands, SNR, and MSE were extracted from long-term and continuously recorded signals. The significant increases in ,as well as the decrease in SNR and MSE, are observed to be associated with the increasing fatigue level. Then, all of the fatigue indices were classified with SVM, KNN, Decision Tree, Ensemble, and Logistic Regression. frequency band and MSE are the most appropriate fatigue indices because in the fatigue state the ability to process complex information decreases and the mental effort to maintain vigilance level increases. The main results show that a combination of fatigue indices can improve the accuracy of classification between alert and fatigue conditions to 88.5%.

دانشگاه صنعتی امیرکبیر
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| پنجشنبه ۲۱ اردیبهشت ماه ۱۴۰۲ ساعت ۱۱:۰۰ الی ۱۲:۳۰ | | |
| عنوان نشست: **نشست قدرت (انرژی)۸**- بهره برداری و برنامه ریزی سیستم های قدرت (۲) | | |
| **روسای نشست** | دکتر محمدتقی بطحائی | دانشگاه صنعتی خواجه نصیر الدین طوسی |
| | دکتر جلیلیان | |
| | دکتر حامد نفیسی | دانشگاه صنعتی امیرکبیر |

## ICEE-1527

## پیش‌بینی بلندمدت بار فصلی شبکه برق با استفاده از روش سری زمانی ETS

میلاد حاجی ابوالحسنی - محسن صفرزاده - زهرا عظیمی - سیدمرتضی میرباقری

## ICEE-1300

## Flexible Generation Expansion Planning Considering Representative Days of Load and Renewable Variations

* Peyman Amirian - Zeinab Maleki - Mohammad-Amin Pourmoosavi - Turaj Amraee

## ICEE-1418

## The Effect of Optimal PMU Placement in Power System State Estimation considering the Seasonal Load Curve

* Seyed Hamed Mir Mohammad Ali Roudaki - Mehrdad Abedi - Iraj Pourkeivani

## ICEE-1449

## A Bi-Level Attack-Defense Model for the Forecasting False Data Injection Attacks on the Integrated Energy Systems

* Maryam Azimi - Hamed Delkhosh - Mahdi Ghaedi

ICEE-1216

# Effects of Derating Factor and Minimum Short Circuit Current on the BOP Cable Sizing of a Power Plant

* Hossein Zamanpour abyaneh

ICEE-1527

# پیش‌بینی بلندمدت بار فصلی شبکه برق با استفاده از روش سری زمانی ETS

میلاد حاجی ابوالحسنی - محسن صفرزاده - زهرا عظیمی - سیدمرتضی میرباقری

شرکت مهندسین دانشمند - شرکت مهندسین دانشمند - شرکت مهندسین دانشمند - شرکت مهندسین دانشمند

**چکیده – پیش‌بینی بلندمدت بار به عنوان یک نیاز اولیه و اساسی شرکت توانیر و شرکت‌های زیرمجموعه جهت انجام برنامه‌ریزی مناسب برای توسعه شبکه در سال‌های آینده است. در حال حاضر روش علمی مشخص و فراگیری برای پیش‌بینی بار پست‌های انتقال و فوق توزیع برق در شرکت‌های برق منطقه‌ای کشور ایران وجود ندارد و عمدتاً براساس قواعد کلی متوسط رشد بار و تجربیات کارشناسان نسبت به رشد بار پست‌های هر مرکز مصرف انجام می‌گیرد. در این شرایط، امکان راستی‌آزمایی نتایج پیش‌بینی بار پست‌ها تا زمان محقق شدن بار واقعی وجود ندارد. در نتیجه، خطای زیاد پیش‌بینی بار پست‌ها برنامه‌ریز سیستم قدرت را دچار خطا نموده و منجر به اتلاف هزینه یا کاهش قابلیت اطمینان در تامین پایدار برق مشترکان خواهد شد. در این مقاله، به ارائه روش علمی سیستمی مبتنی بر سری زمانی ETS پرداخته شده است که قابلیت پیش‌بینی بار پست‌های برق با لحاظ تغییرات فصلی و روند رشد بار را خواهد داشت. نتایج مطالعه موردی این پژوهش در یک مرکز مصرف شرکت برق منطقه‌ای اصفهان ارائه شده است که از جمله مزایای روش مورد استفاده می‌توان به عدم نیاز به اطلاعات ورودی زیاد، قابلیت دنبال کردن تغییرات فصلی بار شبکه و دقت قابل قبول آن اشاره کرد.**

ICEE-1300

# Flexible Generation Expansion Planning Considering Representative Days of Load and Renewable Variations

Peyman Amirian - Zeinab Maleki - Mohammad-Amin Pourmoosavi - Turaj Amraee

K.N. Toosi University of Technology - K.N. Toosi University of Technology - K.N. Toosi University of Technology - K.N. Toosi University of Technology

Abstract

In this paper, a long-term generation expansion planning (GEP) model considering short-term constraints is presented. We propose a single-stage (Static) GEP model that will determine the capacity mix for a target year in the future under different constraints, including techno-economic constraints of thermal and renewable technologies. In order to reduce the computational burden of the proposed model, some representative days for load demand and renewables are extracted based on annual historical data of demand and renewable resources. In this regard, to capture the uncertainty and variability of load demand and renewable resources, a clustering method is utilized. Using the selected representative days, the proposed model is able to give the optimal generation expansion plans in the presence of flexibility requirements. The proposed model is formulated as a Mixed Integer Linear Programming (MILP) model. The proposed MILP model is implemented in GAMS and solved using the CPLEX algorithm.

ICEE-1418

# The Effect of Optimal PMU Placement in Power System State Estimation considering the Seasonal Load Curve

Seyed Hamed Mir Mohammad Ali Roudaki - Mehrdad Abedi - Iraj Pourkeivani
Amirkabir University of Technology - Amirkabir University of Technology - Amirkabir University of Technology

Abstract

State estimation is one of the essential processes in controlling and monitoring a power system. State estimation with conventional and low precision measurements is now replaced by fast and direct measurements provided by Phasor Measurement Units (PMUs). However, the high cost of PMU requires engineers to place these meters optimally. In this article, depending on the desired observability depth and considering the conventional measurements, various methods for combining PMU measurements to increase the accuracy in power system state estimation have been investigated. The key idea of this method is to maintain full observability of the system and reduce the installation costs of the meter. Also, the results of two scenarios using MATLAB software on IEEE standard systems, 14 and 30 buses, have been investigated regarding PMU placement and its effect on the estimation error. A seasonal load profile is considered to measure the accuracy of the state estimation and make the simulation more realistic. The simulation results show that the effect of the optimal placement of the phasor measurement unit, even in the state of incomplete observability of the power system, has increased the accuracy and speed of the estimation.

ICEE-1449

# A Bi-Level Attack-Defense Model for the Forecasting False Data Injection Attacks on the Integrated Energy Systems

Maryam Azimi - Hamed Delkhosh - Mahdi Ghaedi
Tarbiat Modares University - Tarbiat Modares University - Tarbiat Modares University

Abstract

Integrated Energy Systems (IESs) are attractive flexible energy infrastructures that improve the reliability and efficiency. Utilizing the information and communication technologies in the IESs brings better observability and controllability while also increasing the risk of malicious cyber-attacks. This paper specifically focuses on the forecasting False Data Injection Attacks (FDIAs) on the electricity, heat, and natural gas IESs. In this study, a bi-level model is developed from the attacker's point of view in order to determine the optimal attack vector taking the optimal defender response into account. At the upper level, the attacker intends to deceive the IES Energy Management System (EMS) to purchase the energy carriers from the markets in a non-optimal manner. It is assumed that the attacker is capable of manipulating the forecasting data including electricity loads, heating loads, and renewable power generation. At the lower level, the optimal economic operation of the IES is included considering the forecasting FDIA. Finally, the simulation results demonstrate the correctness and effectiveness of the proposed optimization scheme which is solved using the Genetic Algorithm (GA).

**ICEE-1216**

# Effects of Derating Factor and Minimum Short Circuit Current on the BOP Cable Sizing of a Power Plant

* Hossein Zamanpour abyaneh
Monenco Iran Consulting Engineers

Abstract

Balance of plant (BOP) is a term that refers to all the supporting components and auxiliary systems of a combined cycle power plant (CCPP) needed to deliver the energy, other than the generating unit itself. The cable sizing of this part has particular importance in the CCPP. Different Site conditions and cable installations directly affect the current carrying capacity and Subsequent cable sizing. In this article, different modes are investigated, and the results are analyzed. It is shown that when there are no clearances between adjacent cables on a ladder, a more pessimistic condition is observed than the case where the cables are far apart. Cable sizing methods are at variance across international standards. For example, International Electrotechnical Commission (IEC), National Electrical Code (NEC), and British Standard (BS). In this research and Comparison between different modes, IEC 60364-5-52 standard is used. Another influential factor in determining the size of the cable is to pay attention to the minimum short circuit current at the end of the cable. This parameter is discussed in two IEC and ABB standards, which differ due to specific coefficients. In the following, it is shown that there may be no difference between these two standards.

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| عنوان نشست: **نشست مخابرات (سیستم)۸**- پردازش صوت و تصویر ۲ | | |
| **روسای نشست** | دکتر رضا آقایی زاده ظروفی | دانشگاه تهران |
| | دکتر محمدحسین کهایی | دانشگاه علم وصنعت ایران |
| | دکتر حسن آقائی نیا | دانشگاه صنعتی امیرکبیر |

**ICEE-1376**

# بازشناسی مقاوم زمانی – مکانی انسان در یک سیستم نظارتی بر اساس شبکه GAN

آزاده سادات موسوی - شهریار برادران شکوهی

دانشگاه علم و صنعت ایران - دانشگاه علم و صنعت ایران

**چکیده - بازشناسی افراد یکی از پردازش‌های مهم و پایه‌ای در سیستم‌های نظارت ویدیویی است. این مسئله به دلیل تغییرات زیاد شدت نور، ژست، منظر و پیش‌زمینه تصاویر افراد پیاده و غیره، همچنان به‌عنوان یک چالش شناخته‌شده و مطالعات بیشتری را می‌طلبد. روش‌های جدید بازشناسی بر یادگیری ویژگی‌های متمایز تمرکز می‌کنند که تنها نسبت به یک فاکتور خاص از تغییرات مقاوم هستند. همچنین بیشتر این روش‌ها محدودیت مکانی-زمانی را نادیده می‌گیرند به همین خاطر در عمل که پایگاه داده گالری بسیار بزرگ است، این رویکردها به دلیل ابهام ظاهری در نماهای مختلف دوربین، نمی‌توانند عملکرد خوبی داشته باشند. برای مقابله با این مشکلات در این مقاله، یک چارچوب دو جریانی را پیشنهاد می‌کنیم که اطلاعات معنایی بصری و مکانی-زمانی را استخراج می‌کند. در شاخه جریان بصری از قابلیت تولید تصویر شبکه‌های مولد استفاده می‌شود**

**تا روش مطرح‌شده نسبت به تغییرات درون کلاسی مقاوم شود. در شاخه جریان مکانی-زمانی نیز برای تقریب توزیع احتمال پیچیده مکانی-زمانی، از یک روش هیستوگرام-پارزن سریع بهره جستیم و درنهایت برای ادغام دو نوع اطلاعات ناهمگن از یک متریک شباهت مشترک استفاده‌شده است. نتایج تجربی اثربخشی این روش را نشان می‌دهد که به‌دقت مرتبه اول ۹۳.۸٪ و ۹۸.۲٪ به ترتیب روی مجموعه داده‌های *DukeMTMC-reID* و *Market-1501* دست می‌یابد.**

ICEE-1424

# An Iterative Post-processing Method for Speech Source Separation in Realistic Scenarios

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Abstract

The purpose of this paper is to design a speakerindependent Blind Source Separation (BSS) system which aims to reduce the word error rate (WER) metric on Persian speech data. The main idea behind this method is that it tries to improve the quality of the output of any baseline separation system with the help of an iterative model by removing the remained parts of the interferer speaker from each source. For this purpose, we use embedded representations of the input speech signals. In addition, our system benefits from a convergence metric that aims to purify the output signals. To evaluate the proposed method, we have collected a dataset that contains about one hour of real phone calls from landline phones. Although most of the energy of some consonant phonemes appears in highfrequency bins which are filtered in telephony speeches, our method can handle this condition by properly removing the interference. Experimental results based on different metrics have proved the effectiveness of the proposed method.

ICEE-1482

# Vision Transformer and Parallel Convolutional Neural Network for Speech Emotion Recognition

* Saber Hashemi - Mohammad Asgari
IRIB University - IRIB University

Abstract

Vision Transformer (ViT) is a new approach for image processing tasks. The vision transformer splits the image into patches and converts it into a sequence of vectors. This sequence is suitable for the transformer structure. This paper uses the ViT method for speech emotion recognition. Unlike ViT, which splits the image into square patches, time frames are used as patches. In addition to using the frame-based ViT to benefit from its ability to learn global features, a convolutional neural network is also used. The convolutional neural network extracts local features and focuses on the two-dimensional structure of the input. Mel-Frequency Cepstral Coefficients extracted from audio files are used as inputs for the proposed neural network. The proposed model is applied to the RAVDESS dataset and is shown to achieve an unweighted accuracy of 79.2%.

ICEE-1539

# بازسازی تصاویر رادار دهانه مصنوعی با استفاده از نمایش تنک مبتنی بر گروه

محبوبه خدرزاده - صادق صمدی

دانشگاه صنعتی شیراز - دانشگاه صنعتی شیراز

چکیده – امروزه استفاده از رادار دهانه مصنوعی در کاربردهای متنوعی از جمله تشخیص اتوماتیک اهداف بسیار متوجه قرار گرفته است، بنابراین بازسازی تصاویر با کیفیت بالا، بر اساس داده های به‌دست آمده از این رادارها اهمیت بالایی دارد. استفاده از نمایش تنک یکی از روش‌هایی است که در سال‌های اخیر برای بازسازی تصاویر رادار دهانه مصنوعی با کیفیت مطلوب، مورد استفاده قرار گرفته است، اما از آن‌جا که در این روش هر قطعه از تصویر به صورت مستقل در نظر گرفته می‌شود از این‌رو، روش رایج استفاده از نمایش تنک برای بازسازی تصاویر رادار دهانه مصنوعی در برخی کاربردها نتایج قابل قبولی ارائه نمی‌کند. در این مقاله روش جدیدی بر اساس نمایش تنک مبتنی بر گروه برای بازسازی تصاویر رادار دهانه مصنوعی ارائه می‌شود. در این روش تصاویر رادار دهانه مصنوعی در حوزه گروه نمایش داده می‌شوند که گروه قطعه‌هایی از تصویر که دارای ساختار مشابه هستند را شامل می‌شود. برای بازسازی تصاویر رادار دهانه مصنوعی با استفاده از روش پیشنهادی نمایش تنک مبتنی بر گروه، دیکشنری و ضرایب تنک برای هر گروه به صورت جداگانه محاسبه می‌شود و سپس تصویر با استفاده از دیکشنری آموزش یافته و ضرایب تنک به صورت بهینه به‌دست می‌آید. نتایج به دست آمده با استفاده از روش پیشنهادی نمایش تنک مبتنی بر گروه نشان می‌دهد که تصاویر بازسازی شده با این روش نسبت به روش‌های دیگرکارایی بهتری دارد.

ICEE-1541

# Improving CycleGAN-VC2 Voice Conversion by Learning MCD-Based Evaluation and Optimization

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Shahid Beheshti University - Shahid Beheshti University

Abstract

Nowadays' voice conversion (VC) systems that convert source speakers to target speakers in a speech utterance have various applications, and improving their quality is very important. One method that still has not attracted enough attention for VC quality improvements is to concentrate on optimizing the discriminators of a GAN-based VC System. In this paper, Cycle-GAN-VC2 is chosen as a baseline to introduce and implement a Modified version of mel-scale human hearingrelated objective evaluation metric, mel-Cepstral Distance (MMCD), to help the discriminators to learn better to judge between real and fake data. We developed and implemented our new metric MMCD between zero and one and inversely proportional to the conventional MCD to use in discriminators' loss functions. In contrast to the traditional CycleGAN-VC2 whose discriminators work as the classifiers for deciding which data is real and which is fake, here the main goal is to force them to learn the MMCD metric behavior for their judgments. This is done without any attention to the perceptual references and measures like the MCD score that can be varied continuously from zero to one. Experimental results show improvements in the quality of output speech in terms of the MCD measure despite the training of our baseline VC system is based on nonparallel data, and we don't use any time-alignment tool in the training process. So, in parallel VC systems, more improvements could be anticipated.

ICEE-1558

# VGG16-based Feature Fusion For Image Kyepoint Description

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Shiraz University of Technology - Shiraz University of Technology - Shiraz University of Technology - Shiraz University of Technology

Abstract

The detection and description of feature points or keypoints is a crucial stage in many complex computer vision tasks. Deep learning based methods are pushing the envelope in a variety of fields. Deep learning based approaches for feature point description can provide high-level abstract keypoint descriptors. The use of pre-trained networks for purposes other than those for which they were developed is an interesting area of research. To efficiently extract descriptors from the input image, we employed a pre-trained network particularly built for classification tasks. The proposed method is divided into two stages: keypoint detection and description. A traditional detector is used in keypoint detection stage to locate the image keypoints. A downscaled version of the input image is fed to the VGG16 network in keypoint description stage. The first five convolutional layers of VGG16 are used for keypoint description. By sampling the extracted features at the keypoint's locations and concatenating the extracted features, a new descriptor is generated. The size of the introduced descriptor is decreased by using a sparse random projection. The evaluation results suggest that the proposed descriptor is highly competitive with traditional descriptors and it outperforms some of them. The extracted descriptors can be used for different domains of images, by using task-specific pre-trained networks.

دانشگاه صنعتی امیرکبیر
( پلی تکنیک تهران )

سی و یکمین کنفرانس بین‌المللی مهندسی برق

۱۹ الی ۲۱ اردیبهشت ماه ۱۴۰۲

**31st International Conference on Electrical Engineering**

**May 9-11/2023 –Tehran, Iran**

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| پنجشنبه ۲۱ اردیبهشت ماه ۱۴۰۲ ساعت ۱۱:۰۰ الی ۱۲:۳۰ | | |
| عنوان نشست: **نشست الکترونیک۸**- فناوری میکرو و نانو الکترونیک ۲ | | |
| **روسای نشست** | دکتر شمس الدین مهاجر زاده | دانشگاه تهران |
| | دکتر فرشید رئیسی | دانشگاه صنعتی خواجه نصیرالدین طوسی |
| | دکتر مجید شالچیان | دانشگاه صنعتی امیر کبیر |

# ICEE-1514

## The Conduction Mechanism in Micron-Thick ZnO Layers Grown on Si Substrates by Spray Pyrolysis

* Mohsen Gharesi - Alireza Karimpour - Reza Razmand - Faramarz Hossein-Babaei
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Abstract— Metal oxide films play vital roles in the electronics industry. Most current electronic devices are based on crystalline Si substrates, and metal oxide deposition on Si wafers can result in Si-compatible useful electronic features. The oxide deposition technique determines the functionality and production cost of such structures. Here, we report growing uniform micron-thick nanostructured ZnO films on oxidized pSi substrates via the ultrasonic spray pyrolysis technique. This method is vacuum-less and can be scaled up for large-area depositions. Ohmic electrical contacts to the samples are made by the diffusion bonding of Ag wire segments to the ZnO layers. The prepared devices withstand elevated temperatures and harsh environments. The electrical characteristics of the samples are investigated by recording their current-voltage characteristics at different temperatures and voltage sweeping frequencies. The device conduction mechanism is described by the separate assessment of its ohmic and space-charge-limited currents.

ICEE-1540

# مدل سازی فشرده و شبیه سازی گذار عایق به هادی در افزاره مات مبتنی بر VO2

پرناز عباسی - مجید شالچیان

دانشگاه صنعتی امیرکبیر - دانشگاه صنعتی امیرکبیر

چکیده - افزاره مات دارای قابلیت گذار عایق به فلز در پاسخ به محرک خارجی از جمله دما یا ولتاژ می‌باشد و می‌توان از این پدیده برای کاربردهای مختلف از جمله محاسبات نورومورفیک استفاده کرد. در این مقاله ابتدا شبیه سازی گذار عایق به هادی بر مبنای مدل الکتروترمال نیمه کلاسیک در یک لایه دی اکسید وانادیوم و با فرض وابستگی عرض باند ممنوعه به دما انجام می‌شود، سپس یک مدل فشرده از گذار عایق به هادی ارائه می‌شود که در آن اثر ولتاژ روی دما و هدایت الکتریکی در آرایه ای از سلول ها مبتنی بر گرمایش ژول مدل سازی شده و در محیط شبیه ساز - ***Advanced Design System*** مورد ارزیابی قرار می‌گیرد. مدل دوم از نظر محاسباتی ساده تر بوده و سرعت پردازش بالاتری دارد و به خوبی می‌تواند رفتار غیرخطی افزاره را شبیه سازی کند. اعتبار هر دو مدل با مقایسه نتایج آنها با داده‌های تجربی مورد ارزیابی قرار گرفته است. مدل ارائه شده قابلیت به‌کارگیری برای توسعه پردازنده های نورومورفیک و به طور خاص شبیه سازی نورون های شلیکی با افزاره مات را فراهم می‌کند.

ICEE-1546

# Analysis and Simulation of the Formation and dimensions of Gate-Defined Double Quantum Dots

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Amirkabir University of Technology - Amirkabir University of Technology

Abstract

In this article, the surface potential in the metaloxide-silicon structure caused by the applying voltage to an array of electrodes is investigated. These patterned electrodes are two-dimensionally placed on the gate oxide. Moreover, by solving Poisson's equation and considering the depletion approximation, the necessary conditions for the formation of two quantum dots inside the two-dimensional electron gas are presented. The validation of the analysis is done by comparing the simulation results with a reference structure. Finally, we show that our method provides the possibility of calculating the threshold voltage for the formation of quantum dots, as well as their exact dimensions and distance according to the biases of the gate array.

ICEE-1501

# امکان استفاده از پلی آنیلین دوبعدیC3N به عنوان آشکار سازِ گاز استالدهیدِ بازدم در دستگاه های تشخیصِ غیر تهاجمیِ سرطان ریه: مطالعه اصل اولیه

محمد حسین امیدواری - حامد مهدوی نژاد - رزا صفایی اسدآبادی - محمدحسین شیخی

دانشگاه شیراز - دانشگاه شیراز - دانشگاه شیراز - دانشگاه شیراز

چکیده – در این کار پژوهشی به بررسی امکان استفاده از صفحه تک لایه ای$C_3N$ در جذب و آشکار سازی برخی گازهای موجود در بازدم افراد مبتلا به سرطان ریه پرداخته ایم. برای بررسی نظری از بسته نرم افزاری کوانتوم اسپرسو استفاده شده است. نتایج محاسبات نشان می دهد جذب گاز استالدهید روی تک لایه $C_3N$ از نوع فیزیکی و گرماده می باشد. پیکربندی های مختلفی برای جذب گاز روی صفحه حسگر در نظر گرفته شده است. در پایدارترین حالت، انرژی حرارتی به اندازه ۳۱۹ $meV$ آزاد گشته که توانایی ماده حسگر را در آشکارسازی حرارتی مولکول های گاز نشان می دهد. همچنین، در اثر برهمکنش گاز و صفحه حسگر میزان گاف نواری تک لایه $C_3N$ به میزان ۵۵ $meV$ کاهش می یابد که این پدیده قابلیت حسگر مورد مطالعه در آشکارسازی حضور گاز هدف در بازدم را از طریق مکانیزم مقاومتی نمایان می سازد. به علاوه، جذب فیزیکی گاز زمان بازیابی از مرتبه نانوثانیه را در دمای اتاق برای حسگر فراهم می آورد. بنابراین حسگر مورد بحث می تواند به صورت کارآمدی از طریق مکانیزم های حرارتی و مقاومتی حضور گاز مورد نظر در بازدم را به دفعات آشکار نماید.

ICEE-1242

# مدل سازی و شبیه سازی جداکننده پرتو کوانتومی و تداخل گر ماخ زندر کوانتومی

محمد جواد شریفی

دانشگاه شهید بهشتی

چکیده – جدا کننده پرتو ***Beam Splitter, BS*** کوانتومی و ترکیب دو ***BS*** همراه با اختلاف فاز که تداخل‌گر ماخ‌زندر کوانتومی ***Mach-Zender Interferometer, MZI*** خوانده می‌شود، دو جزء مهم دستگاه‌های کوانتومی هستند. محاسبات این سیستم‌ها به‌طور تحلیلی و به‌خصوص برای تک فتون‌ها انجام شده است ولی حل عددی و به‌خصوص تعمیم محاسبات به بیش از یک فتون هم مهم و مفید است که انجام آن به‌کمک روش‌های تحلیلی کاری دشوار است. این مقاله عهده‌دار مدل‌سازی و شبیه‌سازی کامپیوتری یک ***BS*** با تعداد دلخواه فتون ورودی در هر یک از کانال‌های ورودی ***BS*** می‌باشد. مقاله پس از آن با تعمیم محاسبات به بیش از یک ***BS***، روش شبیه‌سازی یک ***MZI*** کوانتومی و نتایج آن‌را ارائه می‌کند. به‌طور اخص روی حالتی که فتون‌های ورودی درهم تنیده باشند، تاکید و نتایج را مطرح می‌کنیم و نیز حالتی که یک یا چند فتون در طی مسیر بین دو ***BS*** از دست بروند را بررسی می‌کنیم که یک مدل اولیه برای یک لینک مخابراتی کوانتومی می‌باشد.

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| عنوان نشست: **نشست کامپیوتر۴**- تئوری محاسبات | | |
| **روسای نشست** | دکتر مهران سلیمان فلاح | دانشگاه صنعتی امیرکبیر |
| | دکتر حسین فلسفین | دانشگاه صنعتی اصفهان |
| | دکتر محمدرضا اکبرزاده توتونچی | دانشگاه فردوس مشهد |

**ICEE-1113**

# Rank-Based Adaptive Brooding in a Mimetic Coral Reefs Search for Feature Selection

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Ferdowsi University of Mashhad - Ferdowsi University of Mashhad

Abstract

Feature selection (FS) is an essential preprocessing step in machine learning and data mining. FS algorithms eliminate the irrelevant and redundant features from a feature vector, thereby increasing the accuracy and robustness of the data mining process while offering higher transparency and lower computation. Here, we suggest using the coral reefs optimization algorithms combined with a beta-hill climbing algorithm as part of a mimetic search strategy. The Coral Reefs is a population-based global search technique that combines well with local search techniques, as suggested here. However, such a combination is also computationally expensive. They could also converge prematurely with few iterations or insufficient population diversity. Accordingly, we propose here a more efficient search in the problem space by transforming the brooding operator into a function of the ranks of coral larvae. In this way, the chance of disturbing a larva with a higher rank is reduced, and at the same time, the exploratory role of larvae with a lower rank is used best. The performance of the proposed method has been evaluated using three KNN, Decision Tree, and SVM classifiers on eight UCI standard datasets using Precision, Recall and f1 score criteria. Results show that the rank-based adaptive brooding approach is superior to the fixed brooding approach in the highdimensional problem space.

ICEE-1141

# بهره‌گیری از رویکرد برنامه‌ریزی ریاضیاتی برای حل مسئله‌ی مجموعه رأس بازخورد، تحت شرط مستقل بودن یا همبندی

فاطمه سلطانی دزکی - حسین فلسفین

دانشگاه صنعتی اصفهان - دانشگاه صنعتی اصفهان

**چکیده - مسئله‌ی مجموعه رأس بازخورد کمینه، یک مسئله‌ی *NP*-سخت است. کاربردهای فراوانی برای این مسئله در دنیای واقعی وجود دارد. گونه‌های مختلفی از مسئله مجموعه رأس بازخورد کمینه وجود دارد. مجموعه رأس بازخورد مستقل و مجموعه رأس بازخورد همبند از گونه‌های این مسئله می‌باشد. برای حل مسئله مجموعه رأس بازخورد، رویکردهای دقیق مختلفی ارائه شده است اما برای گونه‌های مجموعه رأس بازخورد مستقل و مجموعه رأس بازخورد همبند، تا آنجا که اطلاع داریم، تاکنون رویکردی دقیق ارائه نشده است. به همین دلیل، ما در این مقاله با تغییر دو مدل موجود برای مسئله کلاسیک مجموعه رأس بازخورد، مدل‌هایی فشرده و دقیق برای مسئله مجموعه رأس بازخورد مستقل و همبند ارائه می‌دهیم. برای به دست آوردن جواب‌های دقیق، از رویکرد برنامه‌ریزی خطی عدد صحیح، استفاده کرده‌ایم. با استفاده از نتایج حاصل از شبیه‌سازی، دو مدل ارائه‌شده برای مجموعه رأس بازخورد مستقل را مورد مقایسه قرار می‌دهیم.**

ICEE-1296

# Connective Reconstruction-based Novelty Detection

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Institute for Advanced Studies in Basic Sciences

Abstract

Detection of out-of-distribution samples is one of the critical tasks for real-world applications of computer vision. The advancement of deep learning has enabled us to analyze realworld data which contain unexplained samples, accentuating the need to detect out-of-distribution instances more than before. GAN-based approaches have been widely used to address this problem due to their ability to perform distribution fitting; however, they are accompanied by training instability and mode collapse. We propose a simple yet efficient reconstructionbased method that avoids adding complexities to compensate for the limitations of GAN models while outperforming them. Unlike previous reconstruction-based works that only utilize reconstruction error or generated samples, our proposed method simultaneously incorporates both of them in the detection task. Our model, which we call ”Connective Novelty Detection” has two subnetworks, an autoencoder, and a binary classifier. The autoencoder learns the representation of the positive class by reconstructing them. Then, the model creates negative and connected positive examples using real and generated samples. Negative instances are generated by manipulating the real data, so their distribution is close to the positive class to achieve a more accurate boundary for the classifier. To boost the robustness of the detection of reconstruction error, connected positive samples are created by combining the real and generated samples. Finally, the binary classifier is trained using connected positive and negative examples. We demonstrate a considerable improvement in novelty detection over state-of-the-art methods on MNIST and Caltech-256 datasets.

ICEE-1441

# ARDOD: Adaptive Radius Density-based Outlier Detection

* Farshad Rahmati - Reza Heydari Gharaei - Hossein Nezamabadi-pour
Shahid Bahonar University of Kerman - Shahid Bahonar University of Kerman
- Shahid Bahonar University of Kerman

Abstract

Researchers' attention to outlier detection has increased significantly in recent years due to its applications in various research fields. This extraordinary attention has led to the design of many detection methods, most of which are based on distance or density. One of the most significant drawbacks of the existing methods is parameter adjustment and the strong dependence of the final result on this choice. Besides, each of these groups has inherent defects. Distance-based methods are weak in working with clusters, including different local densities. Density-based methods are weak in working with low-density patterns. Moreover, most of the previous methods perform well only in detecting one type of outliers (local, global, and a group of outliers). To overcome these problems, we propose the adaptive radius density-based outlier detection (ARDOD) method. First, ARDOD is a parameter-free algorithm where estimates the required parameter according to the distribution of data in the feature space. Second, ARDOD performs well in detecting all three types of outliers. The superiority and effectiveness of ARDOD are demonstrated by conducting an experimental study on several artificial and real-world datasets and comparing its results with the results of five known methods, including LOF, ABOD, INS, RDOS, and LGOD.

ICEE-1495

# بررسی عملکرد الگوریتم یادگیری تقلیدی در آموزش شبکه عصبی کاملا متصل برای حل مسئله مسیریابی در محیط‌های چندعامله

محمد روغنی – سمانه حسینی سمنانی

دانشگاه صنعتی اصفهان – دانشگاه صنعتی اصفهان

**چکیده** – در سال‌های اخیر مدل‌های یادگیری ماشین در انواع و اقسام مسائل و کاربردها استفاده شده‌اند. یکی از این مسائل مسیریابی ربات‌ها در محیط‌های چند عامله بوده است. علی رغم پیشرفت این مدل‌ها در حل این مسئله، به جهت این که هرگونه خطا در کنترل ربات‌ها می‌تواند هزینه‌های سنگین مالی و جانی داشته باشد هنوز راه بسیاری تا استفاده تجاری از این مدل‌ها باقی مانده است. تحقیقات بسیاری برای حل مسئله مسیریابی ربات‌ها در محیط‌های چند عامله انجام شده است. اکثر این تحقیقات از روش‌های یادگیری تقویتی مانند ***Actor Critic*** ،***Proximal Policy Optimization*** و ... برای آموزش مدل‌های خود استفاده کرده‌اند. زمانی که ما دسترسی به مدل‌هایی داشته باشیم که بتوانیم از آن‌ها تقلید کنیم، یادگیری تقویتی لزوما بهینه‌ترین راه برای یادگیری نیست. در این مقاله ما روشی را برای آموزش یک شبکه عصبی کاملا متصل با استفاده از یادگیری تقلیدی ارائه کرده‌ایم و عملکرد مدل تعلیم دیده شده بررسی شده است. الگوریتم یادگیری تقلیدی توانست با افت قابل قبولی نسبت به عامل خبره خود شبکه عصبی را آموزش دهد و انتظار می‌رود اگر از یک الگوریتم بهینه یا نزدیک به بهینه به عنوان عامل خبره استفاده شود در نهایت نتیجه بسیار قابل قبولی حاصل شود.

سی و یکمین کنفرانس بین‌المللی مهندسی برق

۱۹ الی ۲۱ اردیبهشت ماه ۱۴۰۲

**31st International Conference on Electrical Engineering**

**May 9-11/2023 –Tehran, Iran**

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|---|---|---|
| پنجشنبه ۲۱ اردیبهشت ماه ۱۴۰۲ ساعت ۱۱:۰۰ الی ۱۲:۳۰ | | |
| عنوان نشست: **مهندسی پزشکی ۴**- پردازش سیگنال‌های بیولوژیکی ۲ | | |
| **روسای نشست** | دکتر محمدحسن مرادی | دانشگاه صنعتی امیرکبیر |
| | دکتر سیدکمال الدین ستاره‌دان | دانشگاه تهران |
| | دکتر منصور ولی | دانشگاه صنعتی خواجه نصیرالدین طوسی |

**ICEE-1529**

**Higher-order semi-blind source separation approaches using Canonical Polyadic (CP) decomposition**

* Mohammad Jalilpour Monesi - Sepideh Hajipour Sardouie

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**ICEE-1522**

**Atrial Fibrillation (AF) Detection Using Deep Learning with GAN-based Data Augmentation**

* Amirhossein Akhoondkazemi - Arash Vashagh - Sayed Jalal Zahabi - Davood Shafie

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**ICEE-1490**

**Solving the inverse problem for EEG signals when learning a new motor task using GRU neural network**

* Milad Khosravi - Fariba Bahrami - Behzad Moshiri - Ahmad Kalhor

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**ICEE-1392**

**تشخیص و مقیاس بندی شدت افسردگی براساس روش‌های یادگیری ماشین و با استفاده از معیارهای خطی، غیرخطی و آماری محاسبه شده در سیگنال‌های الکتروانسفالگرام**

**ICEE-1458**

# Improving Spiking Neural Network Performance Using Astrocyte Feedback for Farsi Digit Recognition

* Malihe Nazari - Fariba Bahrami - Mohammad Javad Yazdanpanah

ICEE-1529

# Higher-order semi-blind source separation approaches using Canonical Polyadic (CP) decomposition

Mohammad Jalilpour Monesi - Sepideh Hajipour Sardouie

Sharif University of Technology- Sharif University of Technology

Abstract

Semi-blind source separation (SBSS) approaches are good alternatives to blind source separation (BSS) approaches in applications in which prior knowledge is available about the sources to be extracted. However, their usage has been limited to two-dimensional data sets so far. Therefore, in case of high-dimensional data sets, approaches such as canonical polyadic decomposition (CPD) have been mostly used as a BSS method. The aim of this work is to address this problem by proposing three novel high-dimensional semi-blind source separation methods in the CPD framework. To this end, our first proposed method termed semi-blind alternative least squares (SBALS) is an extension of alternative least squares (ALS), which uses prior knowledge in the separation process. Next, we propose two different versions of the denoising source separation (DSS) framework that can work in a multi-dimensional regime; higher order DSS (HODSS) that extracts sources one by one, and an extension of it termed parallel HODSS (PHODSS) which extracts all the sources simultaneously. We have used both synthesized and real data to evaluate our proposed methods against conventional ALS and DSS methods. Results show that our proposed methods outperform the ALS and DSS methods. More specifically, PHODSS has the best performance among all the considered methods

ICEE-1522

# Atrial Fibrillation (AF) Detection Using Deep Learning with GAN-based Data Augmentation

Amirhossein Akhoondkazemi - Arash Vashagh - Sayed Jalal Zahabi - Davood Shafie

Isfahan University of Technology- Isfahan University of Technology

Abstract

Atrial Fibrillation (AF) is the most common cardiac arrhythmia that may lead to stroke and heart failure and because of this, a lot of research has gone into detecting AF from the electrocardiogram (ECG) signal. In this paper, we propose an AF detection pipeline, which first transforms the ECG data into an informative 2-D image by the aid Poincare recurrence plot, ´ and then addresses the imbalance of the data by augmenting AF samples using a form of generative adversarial network (GAN). The augmented dataset is then used within the training set to train a 5-layer convolutional neural network (CNN) as a classifier. The performance of the proposed classifier is finally evaluated based on a 4-fold cross-validation scheme. The performance metrics suggest that the proposed method provides acceptable sensitivity and specificity.

ICEE-1490

# Solving the inverse problem for EEG signals when learning a new motor task using GRU neural network

Milad Khosravi - Fariba Bahrami - Behzad Moshiri - Ahmad Kalhor

University of Tehran- University of Tehran- University of Tehran- University of Tehran

Abstract

Electroencephalogram (EEG) is a noninvasive technique for recording brain neural activities. It has a poor spatial resolution compared to its temporal resolution. However, the inverse problem has to be solved to find neural sources of brain activity. In recent years artificial neural networks have been increasingly used for solving EEG inverse problem. In these methods, source reconstruction is mostly done sample by sample, while the neural sources are highly interconnected. To consider the temporal dependencies, in this research, a neural network structure based on GRU is presented, which has a low computational cost and is resistant to noise. In this novel structure, GRU networks can extract spatial and temporal information from EEG signals. Also, we employ an encoderdecoder structure which learns a latent-space representation to denoise data. Using simulated data, it has been shown that the presented method performs better than the classical methods on several defined criteria, such as AUC, MLE, and nMSE. Then the trained model was used to solve the inverse problem for real EEG data collected during a new motor task while drawing some shapes with the dominant leg.

ICEE-1392

# تشخیص و مقیاس بندی شدت افسردگی براساس روش‌های یادگیری ماشین و با استفاده از معیارهای خطی، غیرخطی و آماری محاسبه شده در سیگنال‌های الکتروانسفالگرام

پریسا رئوف امامزاده هاشمی - وحید شالچیان - رضا رستمی

دانشگاه علم و صنعت ایران- دانشگاه علم و صنعت ایران- دانشگاه علم و صنعت ایران

چکیده

اختلال افسردگی اساسی به عنوان یک بیماری روانی ناتوان‌کننده و یک معضل اجتماعی در سراسر جهان شناخته شده‌است. تشخیص افسردگی توسط روانپزشک به عوامل مختلفی از جمله سطح مهارت پزشک و هم‌کاری بیمار بستگی دارد و گاهی تشخیص با خطا همراه است. هدف از این مطالعه یافتن نشانگرهای زیستی جدید، تشخیص خودکار و همچنین مقیاس بندی شدت افسردگی با استفاده از سیگنال‌های الکتروانسفالوگرام (EEG) است. سیگنال EEG ثبت شده در حوزه زمان با استفاده از روش‌های خطی ، روش‌های غیرخطی و روش‌های آماری در باندهای فرکانسی مختلف تحلیل شدند. معیارهایی که دارای بیش‌ترین تفاوت آماری معنی‌دار بودند جهت تشخیص افسردگی و مقیاس بندی شدت افسردگی به طبقه‌بندهای ماشین بردار پشتیبان، k نزدیکترین همسایه، تحلیل تفکیک خطی، درخت تصمیم و رگرسیون لجستیک داده شدند. با توجه به نتایج کسب شده به ترتیب نواحی پس‌سر راست، آهیانه چپ و گیجگاهی در باندهای فرکانسی بالاتر بخصوص باند بتا به شدت تحت تاثیر افسردگی قرار می‌گیرند. همچنین تنها با استفاده از دو ویژگی، در تشخیص افسردگی و مقیاس بندی شدت افسردگی به ترتیب به صحت‌های ۱۰۰٪ و ۸۲.۸۵٪ دست‌یافتیم.

**ICEE-1458**

# Improving Spiking Neural Network Performance Using Astrocyte Feedback for Farsi Digit Recognition

Malihe Nazari - Fariba Bahrami - Mohammad Javad Yazdanpanah

University of Tehran- University of Tehran- University of Tehran

Abstract

The third generation of neural networks is called spiking neural networks. Spiking neural networks can not only answer all the problems that can be solved by common neural networks, they can also be computationally more powerful than them. Also, these networks are closer to the biological reality of neurons. According to these reasons, spiking neural networks have received much attention in recent years. In addition to neurons, other elements are also used in spiking neural networks, whose connection with neurons has been proven biologically. These elements are called astrocytes. In this study, we have used astrocyte local feedback in a spiking neural network to improve the accuracy of the network in a digit recognition process. To reach this goal, we use the network proposed by Diehl et al in 2015, then we added astrocyte local feedback to this network. We run the network in both states. The classification accuracy of the network in the absence of astrocytes was 88.48% on Farsi handwritten digits. After adding astrocyte local feedback, it is observed that astrocytes control the activity of neurons and modified the weight of connections based on neuron activity. In this state classification accuracy reached 90.26%. The idea was to create a neural network for learning, where, inspired by the physiological role of astrocytes at the tripartite synapse improves the performance of the neural network and we demonstrate that systems that include neurons and astrocytes perform better than systems incorporating only neurons.

دانشگاه صنعتی امیرکبیر
( پلی تکنیک تهران )

سی و یکمین کنفرانس بین‌المللی مهندسی برق

۱۹ الی ۲۱ اردیبهشت ماه ۱۴۰۲

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|---|---|---|
| پنجشنبه ۲۱ اردیبهشت ماه ۱۴۰۲ ساعت ۱۴:۳۰ الی ۱۶:۰۰ | | |
| عنوان نشست: **نشست قدرت (انرژی)**۹- دینامیک و پایداری سیستم قدرت - ذخیره سازی انرژی | | |
| **روسای نشست** | دکتر مهدی کراری | دانشگاه صنعتی امیرکبیر |
| | دکتر حسن رستگار | دانشگاه صنعتی امیرکبیر |
| | دکتر مصطفی پرنیانی | دانشگاه صنعتی شریف |

**ICEE-1409**

# Proposed Small Signal Dynamic Model for a Grid-Connected Battery Storage System

* Zahra Moradi Shahrbabak
Sirjan University of Technology

Abstract

This paper presents a new small-signal dynamic model for a grid-connected battery storage system (BES). This model, which is based on the equivalent circuit of the battery bank and dc/ac converter, is a helpful tool for the stability analysis of the power system. In this model, the On-Off status of converter switches is controlled by deviation of the frequency of the ac grid. To determine the dynamic model of BES, first, we linearized the equation of the battery bank, dc/ac converter, and its controller around a stable operating point. Then by augmenting these equations, we determine the small signal model of the BES. To investigate the accuracy of our proposed model, we investigate a typical study system consisting of BES and a synchronous generator. We calculate the eigenvalues of this system for different penetration levels of BES. Then this system is studied with time domain simulation software. This paper shows that the results of eigenvalue analysis and time domain simulations were consistent. This similarity indicates the correctness of the presented model.

ICEE-1164

# Dynamic State Estimation of Power System Using Gauss-Seidel Cubature Kalman Filter

Atiyeh Keshavarz-Mohammadiyan
Niroo Research Institute (NRI)

Abstract

Real-time Dynamic State Estimation (DSE) is one of the most important applications of Wide Area Measurement System (WAMS) and plays a critical role in power system reliability. DSE gathers data from Phasor Measurement Units (PMU) into the Phasor Data Concentrator (PDC) and estimates the state variables of the generators. Due to strong nonlinearity of power system dynamic model, a nonlinear state estimator is required to capture system dynamics, effectively. However, the existing nonlinear estimators such as Particle Filter (PF) and Cubature Kalman Filter (CKF) may fail at real-time DSE of power systems, since they have high computational complexity. To reduce computational time of state estimation and preserve estimation performance, a nonlinear power system state estimator is developed based on Gauss-Seidel CKF (GSCKF) in this paper. Performance of the proposed method is evaluated using the standard IEEE 68-bus system with PMUs.

ICEE-1486

# بکارگیری یادگیری عمیق در ارزیابی به هنگام پایداری ولتاژ کوتاه مدت با استفاده از داده های اندازه گیری فازوری

امیرحسین باباعلی - محمدتقی عاملی

دانشگاه شهید بهشتی- دانشگاه شهید بهشتی

## چکیده

توسعه کاربرد روش‌های یادگیری ماشین و هوش مصنوعی در سیستم قدرت به‌عنوان یک چالش پیش روی صنعت برق محسوب می‌شود. با توجه به ظرفیت دستگاه‌های اندازه‌گیری فازوری در شبکه برق و اینکه روش‌های یادگیری عمیق داده‌محور هستند، پیش‌بینی وضعیت پایداری ولتاژ به صورت به‌هنگام امکان‌پذیر است. چون داده‌های سری زمانی می‌توانند وابستگی‌های زمانی و مشخصات دینامیکی سیستم را نمایش دهند، در این مقاله از سری زمانی دامنه ولتاژ و زاویه فاز استفاده شده است. جهت آموزش پایگاه داده یک شبکه عصبی بازگشتی دروازه‌ای بکارگرفته شده است که در مقایسه با روش‌های دیگر یادگیری عمیق نتایج بهتری دارد. شبیه‌سازی‌ها بر روی شبکه ***IEEE 39bus*** و بخشی از شبکه ایران نشان می‌دهد روش شبکه عصبی بازگشتی دروازه‌ای دقت خوبی در پیش‌بینی وضعیت پایداری ولتاژ بعد از وقوع خطا دارد. همچنین پیشنهادی نسبت به تغییرات ساختار شبکه قدرت و تغییر نقاط بهره‌برداری مقاوم است.

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ICEE-1257

# مکان یابی بهینه ذخیره سازهای متحرک انرژی الکتریکی با هدف بهبود تاب آوری سیستم توزیع قبل از طوفان

سبحان آقابابایی - محمد صادق سپاسیان

دانشگاه شهید بهشتی تهران - دانشگاه شهید بهشتی تهران

**چکیده – خاموشی‌های ناشی از حوادث شدید (با احتمال کم و تأثیر زیاد) در چند سال اخیر باعث حرکت شرکت‌های برق به سمت شبکه‌هایی با تاب‌آوری بالا شده است. همچنین افزایش روز افزون نیاز شبکه برق به منابع تجدیدپذیر به دلایل مختلف، با در نظر گرفتن ماهیت تصادفی این منابع، نیاز به ذخیره‌سازی انرژی الکتریکی را افزایش می‌دهد. در این میان استفاده از باتری‌ها در شبکه توزیع به دلیل مزایای فنی و اقتصادی مورد توجه قرار گرفته شده است. در این پژوهش طی یک برنامه‌ریزی کوتاه مدت، مسئله بهبود تاب‌آوری شبکه‌های توزیع نیروی برق در برابر طوفان، با استفاده از ذخیره‌سازهای متحرک موجود در شبکه مورد مطالعه قرار گرفته شده است. در این پژوهش با توجه به منحنی شکست اجزاء و احتمال خرابی در نظر گرفته شده برای خطوط و جاده‌ها، با استفاده از شبیه‌سازی مونت‌کارلو وضعیت خرابی هرشین از شبکه توزیع و همچنین هر مسیر از شبکه ترافیکی در هر تکرار از این شبیه‌سازی مشخص می‌گردد. در نهایت پس از تعیین وضعیت خرابی اجزاء با استفاده از یک الگوریتم بهینه‌سازی (ژنتیک)، یک رویکرد پیش اقدامانه به جهت استقرار ذخیره‌سازهای متحرک در محلی با بهترین مقدار تابع هدف در روز قبل از طوفان اتخاذ می‌گردد. نتایج پیاده‌سازی نشان‌دهنده کارایی مدل پیشنهادی در شرایط بحرانی شبکه است. سیستم توزیع در نظر گرفته شده در مدل پیشنهادی، شبکه استاندارد ۳۳ باسه *IEEE* است که بر روی شبکه ترافیکی سوفالز نگاشت شده است.**

سی و یکمین کنفرانس بین‌المللی مهندسی برق

۱۹ الی ۲۱ اردیبهشت ماه ۱۴۰۲

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| پنجشنبه ۲۱ اردیبهشت ماه ۱۴۰۲ ساعت ۱۴:۳۰ الی ۱۶:۰۰ | | |
| عنوان نشست: **نشست مخابرات (سیستم)۹**- مخابرات سیار و بدون سیم ۳ | | |
| **روسای نشست** | دکتر حمیدبهروزی | دانشگاه صنعتی شریف |
| | دکتر سید محمد رضوی زاده | دانشگاه علم وصنعت ایران |
| | دکتر مهدی مهرجو | |

**ICEE-1403**

# Superimposed Channel Estimation in OTFS Modulation Using Compressive Sensing

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Orthogonal time frequency space (OTFS) technique is a two dimensional modulation method that multiplexes information symbols in the delay-Doppler (DD) domain. OTFS combats high Doppler shift existing in high speed wireless communication. However, conventional channel estimation in OTFS suffers from high pilot overhead because guard symbols occupy a significant part of the DD domain grids. In this paper, a superimposed channel estimation is proposed which can completely estimate channel parameters without considering pilot overhead and performance degradation. As the channel state information (CSI) in the DD domain is sparse, a sparse recovery algorithm orthogonal matching pursuit (OMP) is used. Besides, our proposed method does not suffer from high peak to average power ratio (PAPR). To detect information symbols, a message passing (MP) detector, which exploits the sparsity of DD channel representation, is employed.

ICEE-1414

# Reinforcement Learning based Joint Resource Allocation and User Fairness Optimization in mmWave-NOMA HetNets

Sima Sobhi-Givi - Mahdi Nouri - Mahrokh G. Shayesteh - Hashem Kalbkhani - Zhiguo Ding

Urmia University - Sharif university of technology - Urmia University - Urmia University of technology - The University of Manchester

Abstract

In this paper, we propose heterogeneous network (HetNet) with mmWave and hybrid non-orthogonal multiple access (NOMA) and orthogonal multiple access (OMA) transmission, where uplink (UL) of macrocell users (MCUs) and downlink (DL) of small cell users (SCUs) share the same resource block (RB) to increase the network capacity. Also, an imperfect successive interference cancelation (I-SIC) decoding is considered due to hardware impairment of the real-world NOMA systems. We formulate the problem of joint power and resource block (RB) allocation to maximize rate-fairness and sum-rate by considering minimum quality of service (QoS) requirements. Reinforcement learning (RL) named Q-learning (QL) and deep Q-learning network (DQN) algorithms are employed to solve these problems. The results indicate that the proposed QL and DQN algorithms increase the fairness and sum-rate while low number of iterations is required.

ICEE-1494

# پیاده سازی و بهبود عملکرد شبکه اینترنت اشیا سلولی بر بستر پروژه منبع باز

سیدمحمدرضا طباطبایی نژاد - حسین خالقی بیزکی - سجاد پورسجادی

دانشگاه صنعتی مالک‌اشتر - دانشگاه صنعتی مالک‌اشتر - دانشگاه صنعتی مالک‌اشتر

چکیده – شبکه‌های ***NB-IoT/LTE-M*** یک فناوری جدید دسترسی رادیویی بر بستر شبکه سلولی هستند که توسط ***3GPP*** برای شبکه‌های گسترده کم‌مصرف (***LPWAN***) معرفی شده‌اند. انگیزه اصلی این شبکه‌ها پشتیبانی از ارتباطات انبوه از نوع ماشین (***mMTC***) و فراهم‌کردن ارتباطات کم‌مصرف، کم‌هزینه و با نرخ داده پایین است. در این مقاله، پیاده‌سازی شبکه منبع‌باز اینترنت اشیا سلولی ***NB-IoT/LTE-M*** در پلتفرم نرم‌افزار منبع‌باز ***OAI*** مبتنی بر از ماژول ***BG96*** انجام شده است. در این پیاده سازی مشکلاتی مانند عدم اتصال به شبکه، تغییر و بهبود ساختار کد و بهبود پایداری سیستم انجام شده است. تست های عملی در محیط آزمایشگاه بیانگر کارآیی روش های پیشنهادی در بهبود عملکردهای شبکه بوده است. نتایج بدست آمده نشان می‌دهد این شبکه پس از بهبود عملکرد، قابلیت اتصال مودم‌های تجاری دیگر را داشته و در فواصل بلندتری پوشش دهی داشته باشد.

ICEE-1519

# تخمین کانال های پهپاد به پهپاد با استفاده از فیلتر کالمن توسعه یافته

فهیمه رنجبر - محمدعلی سبقتی

دانشگاه صدا و سیما - دانشگاه صدا و سیما

چکیده - امروزه پهپادها در کاربردهای گسترده‌ای مورد استفاده قرار می‌گیرند. استفاده از چند پهپاد می‌تواند کارایی سیستم را افزایش می‌دهد. در شبکه‌ای متشکل از چند پهپاد، لینک مخابراتی کارآمد میان پهپاد با پهپاد نقش مهمی دارد. به دلیل تحرّک پهپادها، محوشوندگی متغیر با زمان در کانال‌های بی‌سیم یکی از چالش‌های اساسی در ارتباطات پهپاد به پهپاد است. در این شرایط، مسأله تخمین و جبرانسازی کانال اهمیّت خاصی دارد. یک رویکرد پرکاربرد، تخمین کانال به کمک پایلوت است. وقتی چینش پایلوت‌ها ثابت است، تعداد پایلوت‌ها متناسب با وضعیت کانال تغییر نمی‌کند. در این مقاله، برای تخمین کانال پهپاد به پهپاد ساختار پایلوت وفقی پیشنهاد شده است. در این ساختار، محل پایلوت‌ها بر اساس تقریبی از پهنای باند همدوسی کانال (متناسب با عکس گسترش تأخیر) و تقریبی از زمان همدوسی کانال تعیین می‌شود. بدین منظور گسترش تأخیر کانال همراه با پاسخ فرکانسی کانال در پایلوت‌ها تخمین زده می‌شود. با این تعریف از بردار مجهول، معادلات دینامیک سیستم غیرخطی است، بنابراین از فیلتر کالمن توسعه یافته ($EKF$) استفاده شده است. نتایج شبیه‌سازی در شرایط مختلف نشان می‌دهد روش پیشنهادی نسبت به روش حداقل مربعات ($LS$) با چینش پایلوت ثابت عملکرد بهتری دارد؛ زیرا با سربار پایلوت کمتر، نرخ خطای بیت را کاهش می‌دهد.

ICEE-1547

# Active and Passive Beamforming for Secure Wireless Communication via Star-RIS under imperfect CSI

Seyedeh Reyhane Shahcheragh - Kamal Mohamed-pour
K.N Toosi University of Technology - K.N Toosi University of Technology

Abstract

In this work, we propose a beamforming design for secure wireless communication via Simultaneous transmission and reflection reconfigurable intelligent surface (Star RIS). We consider a practical scenario with imperfect channel state information of an eavesdropper. We maximize the sum rate (SR) of legitimate users by jointly optimizing active and passive beamforming under the maximum tolerable rate leakage of the eavesdropper and power consumption constraint of the AP. The optimization problem is non-convex and solved with the assistance of the path-following technique, S-procedure and general sign definiteness to approximate the non-convex part and semi infinite inequalities and finally, the penalty concaveconvex procedure (PCCP) is implemented. Simulation results show the superiority of Star-RIS over conventional RIS and higher performance with lower channel estimation error.

دانشگاه صنعتی امیرکبیر
( پلی تکنیک تهران )

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| عنوان نشست: **نشست کامپیوتر۵**- کاربردهای هوش مصنوعی | | |
| **روسای نشست** | دکتر مصطفی حقیر چهرگانی | دانشگاه صنعتی امیرکبیر |
| | دکتر شهرام معین | پژوهشگاه ارتباطات و فناوری اطلاعات |
| | دکتر بهزاد مشیری | دانشگاه تهران |

## ICEE-1114

# Single- and Multi-Hop BERT Question Classifier for Open-Domain Question Answering (SiMQC)

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Institute for Advanced Studies in Basic Sciences (IASBS) - Institute for Advanced Studies in Basic Sciences (IASBS)

Abstract
Multi-hop Question Answering has recently received particular attention in research and practice, especially in the context of conversational systems and answering complex questions. Various architectures have been proposed to answer these complex multi-hop questions. However, in real-world scenarios, a conversational system should answer both simple (single-hop) and complex (multi-hop) questions. In this work, we propose an efficient BERT question classifier that supports retrievers in the question-answering systems to process single- and multihop questions. We also released a mixed dataset consisting of both single- and multi-hop questions. We show that utilizing our classifier inside the QA system can improve these systems' accuracy and enable them to answer both kinds of questions considering their complexity.

ICEE-1201

# A Hybrid Computer-aided Diagnosis System For Central Obesity Screening In A Large Sample Of Iranian Children and Adolescents

* Amirhossein Koochekian - Morteza Farahi - Hamid Reza Sadr manouchehri Naeini - Mohammad Reza Mohebian - Hamid Reza Marateb - Marjan Mansourian - Roya Kelishadi

Isfahan University of Medical Sciences - Tehran University of Medical Sciences - Islamic Azad University - University of Saskatchewan - University of Isfahan - Isfahan University of Medical Sciences - Isfahan University of Medical Sciences

Abstract

Central obesity is the basis of metabolic syndrome, which may lead to type 2 diabetes and cardiovascular disease. Its screening is critical in childhood to prevent such problems in adulthood. We presented a computer-aided diagnosis system to classify children and adolescents into obese and non-obese groups based on input features obtained from the subject's nutritional behavior, physical activity, genetics, socioeconomic status, and family history of diseases (the CASPIAN IV study). A total of 13,386 subjects (49% female) with a central obesity prevalence of 19% participated. The categorical features were converted to interval features using the Logit function, and the XGBoost classifier with grid search was then used. Other linear and nonlinear classifiers were also used for comparison. Some selected features were family history of hypertension, weight at birth, number of close friends, breakfast, and screen time categories. The proposed screening system showed a high association between predicted and observed class labels (Matthews correlation coefficient =0.76), excellent balanced diagnosis accuracy (AU-ROC =0.90), and excellent class labeling agreement rate (Kappa = 0.75) using 4- fold cross-validation. It is thus a promising screening tool. Moreover, it significantly outperformed the other tested classifiers (adj. P-value

ICEE-1326

# MAD-TI: Meta-path Aggregated-Graph Attention Network for Drug Target Interaction Prediction

Reza Shami Tanha - Maryam Sadighian - Arash Zabihian - Mohsen Hooshmand - Mohsen Afsharchi

Institute for Advanced Studies in Basic Sciences (IASBS) - Institute for Advanced Studies in Basic Sciences (IASBS) - University of Tehran - Institute for Advanced Studies in Basic Sciences (IASBS) - University of Zanjan

Abstract

Computational identification of unknown drugtarget interactions (DTI) is crucial in locating new drug treatments for proteins, viruses, and diseases. This work proposes MAD-TI a meta-path-based, GAT-oriented method to predict DTIs. Our proposed method uses a heterogeneous graph of drugs, targets, diseases, and side effects as the input graph. Then, it applies two graph attention networks to generate the embeddings of drugs and targets. Using the embeddings, it predicts the unknown DTIs. The results show that MAD-TI outperforms the state-of-the-art methods.

ICEE-1380

# A Novel Model for Student's Mental Health Monitoring Based on Hard and Soft Data Fusion

Mohammad Fatahi - Masoud Alizadeh - Behzad Moshiri

University of Tehran - University of Tehran - University of Tehran

Abstract

The importance of monitoring mental health has expanded in recent years. To promote the well-being of society, it is necessary to comprehend human behavior and monitor mental health. Even though existing studies provide a method for detecting mental illness, they are difficult to use for early diagnosis. In addition, the growing number of mental health problems among students has resulted in a range of societal challenges. Therefore, the objective of this study is to present a model for recognizing mental health illnesses in students by combining both soft and hard data sources. In previous studies, both types of data have been treated as separate entities in monitoring health status. In this study, we utilized a CNN-LSTM network for speech emotion recognition in the hard data flow to determine the probability of depression among students. In addition, the Dempster-Shafer theory was employed in the soft data stream to model psychologists' opinions. Finally, the results from both hard and soft data were combined to reach a final diagnosis.

ICEE-1432

# A modified Dempster Shafer approach to classification in surgical skill assessment

Arash Iranfar - Mohammad Soleymannejad - Behzad Moshiri - Hamid D. Taghirad

University of Tehran - University of Tehran - University of Tehran - K. N. Toosi University of Technology

Abstract

Artificial intelligence systems are usually implemented either using machine learning or expert systems. Machine learning methods are usually more accurate and applicable to a broader range of applications. Expert systems, on the other hand, require much less data for training and generate more comprehensible results. These characteristics are typically desired in the fields of surgery and medicine because there isn't much data available. In order to give a machine's decisions a deeper level of semantics, it is also advantageous to incorporate a doctor's expertise into it. Furthermore, it is safer to understand the reasoning behind a machine's choices. In this paper, a Dempster-Shafer Theory (DST) based expert system is suggested for the task of surgical training skill assessment. An interval-based probabilistic feature analysis was applied to the data to assign values to the mass functions. Zhang's rule of combination was applied to handle the conflicting evidence in the prediction phase. The performance of the proposed method was compared to another DST classifier, SVM, and XGBoost. Our method outperforms SVM and other DST classifiers, but it is not as precise as XGBoost. By reducing the size of the dataset, the added benefit of using an expert system as opposed to a machine learning method was explored further. The performance of the suggested method is not adversely affected by the size of the dataset, whereas the XGBoost classifier is.

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| عنوان نشست: **مهندسی پزشکی ۵**- سایر موضوعات مهندسی پزشکی |

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| **روسای نشست :** | دکتر حمید بهنام | دانشگاه علم وصنعت ایران |
| | دکتر مجید بدیعی رستمی | دانشگاه تهران |
| | دکتر علی فلاح | دانشگاه صنعتی امیرکبیر |

**ICEE-1213**

# Proposing an indirect distributed approach to apply SSSEP vibrational stimulation

* SAHAR SADEGHI - Ali Maleki

Semnan University - Semnan University

Abstract

Steady-state somatosensory evoked potential (SSSEP) is one of the brain-computer interface (BCI) signals, which is often used in a two-class BCI system. One of the shortcomings of SSSEP-based BCI systems is low accuracy. Achieving high accuracy requires stimulating more mechanical skin receptors. Due to the small dimensions of vibration motors, this is not possible to stimulate several fingers simultaneously. The goal of this paper is to present a new stimulus pattern for effective vibrational stimulation. The stimulus system consists of a cylindrical vibration motor and sponge equipment for applying stimulation. In the proposed stimulus pattern, simultaneous stimulation of several fingers was introduced using the distributed stimulation approach while using the indirect vibration transfer caused by the sponge. Results were reported for different time window lengths. The proposed method achieved the canonical correlation

analysis (CCA) classification accuracy of 88%. It improved the accuracy by 13% compared with the skin direct stimulation approach from the motor surface. Distributed indirect stimulation produced a stronger response by stimulating more fingers while taking advantage of the lateral stimulation caused by the sponge. The proposed method is suitable for two-class SSSEP-based BCI systems individually or in combination with other signals in a hybrid BCI system.

ICEE-1328

# Towards Blockchain-based Remote Management Systems for Patients with Movement Disorders

Behnaz Behara - Mehdi Delrobaei

K. N. Toosi University of Technology - K. N. Toosi University of Technology

Abstract

Secure storage and sharing of patients' medical data over the Internet are part of the challenges for emerging healthcare systems. The use of blockchain technology in medical Internet of things systems can be considered a safe and novel solution to overcome such challenges. Patients with movement disorders require multi-disciplinary management and must be continuously receive medical care by a specialist. Due to the increasing costs of face-to-face treatment, especially during the pandemic, patients would highly benefit from remote monitoring and management. The proposed work presents a model for blockchain-based remote management systems for patients with movement disorders, especially those with Parkinson's disease. The model ensures a high level of integrity and decreases the security risks of medical data sharing.

ICEE-1438

# Non-pharmacological interventions for Covid-19 new variants with fractional order fuzzy type-2 PID

Hadi Delavari - Amir Veisi - Maryam Ranjbaran

Hamedan University of Technology - Hamedan University of Technology - Hamedan University of Technology

Abstract

Covid-19 disease has become a major challenge due to its high rate of transmission. All nations on earth were quickly infected by the virus. Recently, a novel viral variety with a substantially higher rate of transmission has been discovered. Vaccines and effective treatments are currently being developed and distributed, but in many nations, non-pharmacological interventions remain a crucial and basic tactic. One of the most¬ vital global measures now involve concentrating on nonpharmacological means of stopping and reducing the transmission of the virus. In this paper, a new fractional order model of COVID-19 is utilized. The parameters in all variants of COVID-19 have uncertainty, so a novel robust TakagiSugeno (T-S) fuzzy type-2 fractional PID controller as a nonpharmacological intervention (NPI) is proposed to limit the disease outbreak in society in the presence of new variants high rate of transmission. The proposed fractional controller has advantages such as robustness against new variants of Covid-19 with higher rate of transmission and, simplicity in design.

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| عنوان نشست: **صنعت برق** | | |
| **روسای نشست** | دکتر حبیب رجبی مشهدی<br>دکتر سعیدرضا توفیقی<br>مهندس حسن آبنیکی | دانشگاه فردوسی مشهد |

**ICEE-1351**

# تعیین آرایش بهینه خطوط جهت کاهش فرسایش یقه پایه های بتنی ناشی از تنشهای باد

**میثم پوراحمدی نخلی - حمیدرضا فیروزآبادی**

**دانشگاه هرمزگان - شرکت توزیع نیروی برق استان هرمزگان**

## چکیده

در این مقاله یکی از مهمترین عوامل خوردگی پایه های بتنی توزیع نیروی برق در استان هرمزگان مورد بررسی قرار می گیرد. اکثر پژوهش ها تا کنون به بررسی عوامل شیمیایی در خوردگی بتن پرداخته اند لذا تلاش ها در راستای کاهش نفوذ عوامل خورنده فسفات و کلراید از طریق افزودن روان کننده های بتن، مواد پلوزانی، سیلرها، پوشش ها و نهایتا بهبود عیار بتن بوده است. مشاهدات میدانی نظریه تاثیر تنش های مکانیکی نیروی باد به یقه پایه و به تبع افزایش ترک و خلل و فرج های ناشی از آن را در بتن تایید می کند. افزایش ترک های ناشی از تنش های مکانیکی نفوذ عوامل خورنده را به شدت تسریع کرده به نحوی که این شرایط عمر مفید پایه را در برخی نواحی ساحلی استان هرمزگان حتی تا ۵ سال کاهش می دهد. در این مقاله آرایش و نحوه نصب بهینه خطوط انتقال نیروی برق از میان آرایش های استاندارد و رایج به نحوی انتخاب می شوند

تا تنش های مکانیکی ناشی از باد در محل یقه حداقل شود. شبیه سازی های توزیع تنش بر مبنای روش عددی المان محدود  از طریق نرم افزارهای آباکوس و *PLS-Pole* انجام شده است.

ICEE-1007

# گیمیفیکیشن یک رویکرد نوآورانه جهت کاهش مصرف برق دربخش خانگی

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کارشناس روابط عمومی و رئیس گروه استارت آپ بازی وارسازی شرکت توزیع نیروی برق استان بوشهر - کارشناس روابط عمومی شرکت توزیع نیروی برق استان بوشهر

بیان مسئله: مصرف انرژی در کشور روندی فزاینده را دنبال می‌کند. خشک‌سالی و افزایش دما از جمله دلایلی است که باعث بر هم خوردن تراز تولید و مصرف برق شده است که خروجی آن ممکن است قطعی برق برای صنعت برق به دنبال داشته باشد. از جمله راهکار چالش پیش رو ، هدایت سبک مصرف کننده در بخش خانگی به سمت الگوی مصرف بهینه است در دهه اخیر در مجامع جهانی گیمیفیکیشن به عنوان یکی از راهکارهای علوم رفتاری به صورت ویژه برای تغییر رفتار افراد و بهبود سبک مصرفی معرفی شده است.

هدف: هدف از اجرای این پژوهش افزایش مشارکت مشترکین در مدیریت مصرف و کاهش پیک و همچنین فرهنگ‌سازی مدیریت مصرف برق به خصوص برای خانواده ها و نسل کودک و نوجوان است.

روش پژوهش: در این پژوهش ۳ هزار مشترک برق استان بوشهر طی سه سال و هر سال به صورت مجزا وداوطلبانه وتصادفی و همچنین تعدادی از مشترکین پر مصرف انتخاب شدند. گروه مورد با استفاده از سامانه تحت وب و اپلیکیشنی تحت عنوان گیمیفای قرار گرفتند،در این سامانه که با داده کاوی پشتیانی شده و از طریق درگیر نمودن مصرف‌کنندگان با بازی و ایجاد حس رقابت و ترس از قضاوت و ساخت داشبورد اختصاصی برای هر مشترک میزان مصرف انرژی آن‌ها را کاهش می‌دهد. محدوده زمانی اجرای طرح سال‌های متوالی ۱۴۰۱-۱۳۹۹ و قلمرو مکانی آن استان بوشهر می‌باشد. دامنه اجرای طرح در این پژوهش در فاز نخست خانواده پرسنل صنعت برق استان بوشهر و در فاز دوم و سوم کلیه مشترکین برق این استان بودند.

یافته‌ها: یافته‌ها حاکی از آن است که با ساخت سامانه گیمیفیکیشن گیمیفای و با ایجاد حس رقابت و ترس از قضاوت به خصوص در مجامعه محلی مثل روستا و شهری مثل محله ها و مجتمع ها و اداره ها که افراد یکدیگر را می شناسند منجر به همکاری آن‌ها در این حوزه و کاهش چشمگیر مصرف انرژی تا ۶.۳۱ درصد می‌شود، این در حالی است که تحقیقات جهانی نشان داده است که نرخ جهانی کاهش مصرف برق در دنیا با گیمیفیکیشن ۳ درصد است.

نتیجه‌گیری: در این فرآیند کشف شد با ایجاد یک رقابت بین مردم می‌توان آن‌ها را به سمت تغییر رفتار در جهت مصرف بهینه انرژی سوق داد و رقابت (و کمی حس قضاوت شدن) می‌تواند الهام‌بخش تغییرات مثبت در زمینه مصرف بهینه انرژی باشد.

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# کاربرد داده کاوی در بخش مشترکین صنعت توزیع برق

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## چکیده

داده کاوی فرآیند رسیدن به معلومات و دانش از طریق تحلیل داده ها می باشد. حجم وسیعی از داده، ناشی از گسترش استفاده از ابزار تولید و ذخیره داده ها در خصوص مشترکین و مصرف کنندگان برق وجود دارد. با توجه به پتانسیل های نهفته در این داده ها ضرورت استفاده از ابزاری قدرتمند مشهود است که بتواند داده های متنوع، با ابعاد وسیع، و با حجم بالا را بررسی کرده و در خدمت کاربری سیستم، داده ها را تجزیه و تحلیل کند. در سیستم قدرت، در حال حاضر داده های بسیاری وجود دارد که با توسعه و حرکت به سمت شبکه هوشمند، حجم آن در آینده بسیار بیشتر خواهد بود. در چنین شرایطی، شناخت ویژگی های مصرف برق و الگوهای رفتار بار، بهبود عملکرد و افزایش کارآیی سیستم بر مبنای استفاده از داده ها، از طریق داده کاوی و الگو پردازی های کامپیوتری امکان پذیر می گردد.