Arab Republic of Egypt
Ministry of Defense
Military Technical College

11th International Scientific Conference of the Military Technical College 29-31 March 2022

المؤتمر الدولى العلمى الحادي عشر للكلية الفنية العسكرية ٢٩-٣١ مارس ٢٠٢٢

ICEENG

Conference Program and Workshops of The 13th International Conference on Electrical Engineering March 29-31, 2022.

(ICEENG-13)

برنامج بحوث وورش عمل
المؤتمـر الدولي الثالث عشـر في
الهندسـة الكهربية

CONTENTS

Preface

The Military Technical College is pleased to organize the 13th international conference on electrical engineering, sponsored by the Ministry of Defence in the period 29-31 March 2022. The main objective of this conference of to bring together scientists, researchers and engineers of Egyptian Armed Forces and their colleagues in academic and industrial institutions. This occasion provides a chance to exchange information in the following designated fields of interest:

1. Aerospace Navigation Engineering.
2. Computer Engineering and Artificial Intelligence
3. Communications and Networks.
4. Control Systems and Automation
5. Electronic Devices, Circuits and Systems
6. Electromagnetic Fields, Microwave, Antennas and Propagation.
7. Medical and Biology Engineering.
8. Power and Energy.
9. Signal Processing and Radar Applications.

From (70) full manuscript submitted to the conference, a number of (37) papers were accepted and the rest of papers are rejected.

These selected papers will be presented during the conference interval, 29-31 March 2022 in different (9) scientific sessions. In addition to scientific sessions, the conference activities include different (6) workshops and seminar. The list of workshops is:

1. Polarization Imaging in Computer Vision.
2. Developing Entrepreneurial Talents for Aerospace of the Future.
3. Multi-Sensor Fusion for Autonomous Vehicle's Positioning Research, Innovation and Future Vision.
4. Anticipatory Radio Resource Management for 5G Networks and Beyond.
5. IoT Hardware Security: Using Physically Unclonable Functions (PUFs) for Authentication and Secure Key Exchange.
6. A Journey in Design, Synthesis and Development of Novel Anticancer and Antimalarial Agents.

Finally, the conference high committee hopes that the conference will achieve its planned mission and would like to acknowledge all contributors, members of the scientific committee and chairmen of the conference session.

Hint for Authors:

Please remember that you only 10 min. to present the paper and 5 min. for discussion

Conference High Committee

- Maj. Gen prof. Ismail Mohamed Kamal — Chairman
- Maj. Gen. Assoc. Prof. Moataz Abo Elnoor — Vice- Chairman
- Maj. Gen. (R) Prof. Ahmed E. Abdalla — General rapporteur
- Brig. Gen. Prof. Mahmoud A. Abdalla — Rapporteur

Contributors

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- Defense Systems Studies Center
- Military Medical Academy, Cairo, Egypt
- Kobri El- Koba Complex Hospital, Cairo, Egypt
- Maadi Armed Forces Medical Compound, Cairo, Egypt

II. Egyptian universities

- Cairo University, Giza, Egypt
- Ain shams university, Cairo, Egypt
- Beni-Suef University, Beni-Suef, Egypt
- Arab Academy for Science and Technology, Cairo, Egypt
- Zagazig University, Zagazig, Egypt
- Higher Technological Institute
- The British University in Egypt Cairo, Egypt
- October 6 University Cairo, Egypt

III. Foreign universities

- Shaqra University, College of Engineering

Conference Program

9:00	10:00	12:00	13:30	13:45	15:15
Tuesday 29 March 2022	**Opening the Conference** **Commandant of the MTC** **Conference General Rapporteur** **قاعة العاشر من رمضان**	**Opening Lecture** **قاعة العاشر من رمضان**	**Control Systems and Automation-I (A7)** **1057-ICEENG** Mohamed Alaa Dewedar mohamed.alaa@mtc.edu.eg **1095-ICEENG** Ahmed Mansour gezowbs@gmail.com **1018-ICEENG** Mostafa A. Hussien hussienmostafa1988@gmail.com **1062-ICEENG** Mohamed S. El Sabbagh saeedmohamed616@gmail.com	**Break**	**Aerospace Navigation Engineering-I (A7)** **1053-ICEENG** M. Mamdouh m7md.mamdo755@gmail.com **1059-ICEENG** Mohamed Ibrahim Mohamed mima1551994@gmail.com **1054-ICEENG** Asser Elrouby asser.alrouby3@gmail.com **1061-ICEENG** Mohamed Sadek mohamedozo2626@gmail.com **1058-ICEENG** Mohamed F. El-Khalea mohammedfathi.3015@gmail.com

	Room	8:30 – 10:00	Break	10:15 – 11:45	Break	12:00 – 13:30	Break	13:45 – 15:15
Wednesday 30 March 2022	(A7)	**Power and Energy**		**Control Systems and Automation-II**		**Computer Engineering and Artificial Intelligence-I**		**Communications and Networks**
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	(Maj. Gen. Abd Elhamed Shawky)	**ICEENG-WS-1** **Polarization Imaging in Computer Vision**		**ICEENG-WS-2** **Developing Entrepreneurial Talents for Aerospace of the Future**		**ICEENG-WS-3** **Japan Society for the Promotion of Science (JSPS); Functions, Structures and Strategies**		**ICEENG-WS-4** **Anticipatory Radio Resource Management for 5G Networks and Beyond**

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	Room	8:30 10:00		10:15 11:45		12:00 13:30		13:45 15:15
Thursday 31 March 2022	**(A7)**	**Aerospace Navigation Engineering-II**	**Break**	**Computer Engineering and Artificial Intelligence-II**	**Break**	**Image processing**	**Break**	
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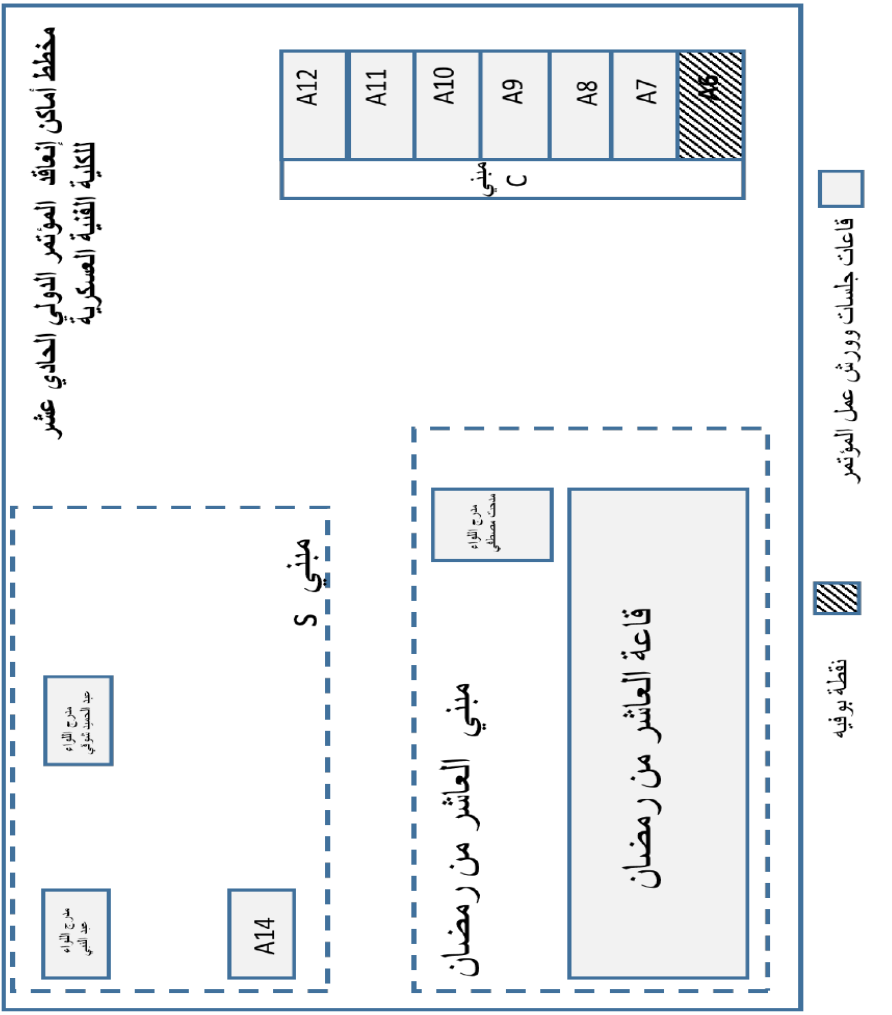
	(Maj. Gen. Abd Elhamed Shawky)	**ICEENG-WS-5** **IoT Hardware Security: Using Physically Unclonable Functions (PUFs) for Authentication and Secure Key Exchange**		**ICEENG-WS-6** **A Journey in Design, Synthesis and Development of Novel Anticancer and Antimalarial Agents**				

Location of conference rooms


مخطط أماكن إنعقاد المؤتمر الدولي الحادي عشر
للكلية الفنية العسكرية
A12
A11
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عبد الحميد عزالي
مدرج الإناث
عبد الله الشي
مبني العاشر من رمضان
مدرج الإناث
مدخل مستقل
قاعة العاشر من رمضان
قاعات جلسات وورش عمل المؤتمر
نقطة بوفيه

Part I:

SCIENTIFIC SESSIONS

Session No. 1

Control Systems and Automation (1)

Room: ***A7***

Date: Tuesday, March 29, 2022 **Time:** 12:00 - 13:30

Board:

Dr.	Ahmed Taimour	Military Technical College
Dr.	Mohamed Sayed Korani	Military Technical College

1057-ICEENG	Real-Time Arial Targets Tracking for Anti-UAV Systems Using OpenCV
1095-ICEENG	System Identification and Modeling of an Actuation System for Small Aerial Vehicle
1018-ICEENG	Re-entry Vehicle Longitudinal Autopilot Design via Two-Loop with PI and Three-Loop Topologies
1062-ICEENG	Nonlinear Autoregressive Neural Network Integrated Approach for Tackling GPS Outages Intervals

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1057-ICEENG

Real-Time Arial Targets Tracking for Anti-UAV Systems Using OpenCV

Mohamed Alaa Dewedar*, Ahmed M. Kamel, mohammed Abozid, Yehia Z. Elhalwagy
Military Technical College, Cairo, Egypt

Abstract

Recently, Unmanned Aerial Vehicles (UAVs) have been widely used in numerous applications nevertheless in military operations. Therefore, there is a crucial need to develop various mechanisms to confront these UAVs. For this reason, it must first determine their location then track them. Thus, Accurate target tracking is an important demand in the drone defense system. Because of the significant advancement in computers and software processors, it is now possible to employ these current programs in the operations of positioning and tracking. In this paper, an OpenCV (Open-Source Computer Vision) based drone tracking system is the proposed technique. A comparative analysis is carried out using a small data set – and generating its ground-truth using ViTBAT tool – for evaluating different tracking algorithms imposed in the OpenCV library. The evaluation parameters in this paper are precision percentage and time analysis. The simulation results present a tradeoff between the accuracy and execution time for the used techniques.

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1095-ICEENG

System Identification and Modeling of an Actuation System for Small Aerial Vehicle

Ahmed Mansour*, Ahmed M. Kamel, Ehab Safwat
Military Technical College, Cairo, Egypt

Abstract

System identification develops a mathematical model of a dynamic system from the observed input and the measured output data. It is very important for a successful control application. This work proposes a method for Unmanned Aerial Vehicle (UAV) servo system identification. Taking into account horn length and fixation point on the control surface by using a calibrated gyroscope using a turntable to find the mathematical relationship (transfer function) between the input signal value and the output control surface deflection. MATLAB simulation is introduced and the results show an improved model compared to the traditional method of using a potentiometer on the servo itself. This paper provides a more accurate modeling method by taking into account the servo horn length in addition to pivot point on the control surface, future work will take into account servo load due to aerodynamic forces on the control surface. The simulation results are presented for the first-order and the second-order transfer functions.

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1018-ICEENG

Re-entry Vehicle Longitudinal Autopilot Design via Two-Loop with PI and Three-Loop Topologies

Mostafa Ahmed Hussien*, Mostafa Saad, Mohammed Abozied Hassan, Yehia Zakria Elhalwagy
Military Technical College, Cairo, Egypt

Abstract

Re-entry vehicle (REV) longitudinal autopilot aims the vehicle in order to track guidance commands to reach the required target with minimum miss distance. The trajectory of a ballistic aerospace vehicle from launch to impact point can be divided into three phases of flight: powered, ballistic, and re-entry phases. The autopilot of REV will be utilized to control the vehicle motion in the re-entry phase. Aerospace vehicle longitudinal autopilot usually configured as two-loop with PI compensator or three-loop with angular rate and acceleration feedback. In this paper, the static stability problems are studied and compensated by adding a stability augmentation loop in three-loop autopilot structure. A comparative analysis is carried out with the two loop autopilot topology to present the effect of the proposed three loop autopilot structure. The autopilot topologies are presented for a REV linear time invariant (LTI) system model at different design points through re-entry trajectory and The standard control signal algorithm is used to analyse the system using MATLAB/Simulink environment

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1062-ICEENG

Nonlinear Autoregressive Neural Network Integrated Approach for GPS Outages Tracking

mohamed saeed elsabbagh*, ali maher, mohamed abozaid hassan, Ahmed M. Kamel
Military Technical College, Cairo, Egypt

Abstract

Nowadays inertial navigation system and global positioning system (INS/GPS) integrated systems are widely used in many moving vehicles. an optimal estimator such as Extended Kalman Filter (EKF) is utilized extensively in the integration task to obtain accurate and continuous estimated position. However, the efficiency of EKF to estimate position degrades in case of GPS signal outages due to signal blockage or jamming. In this work a Nonlinear Autoregressive Neural Network with Exogenous input (NARX) based technique is proposed to estimate the position during GPS outages Two simulation environments are created for both ground and aerial vehicles alongside three inertial sensors with different accuracy grades to validate the proposed algorithm. different periods of GPS outage are performed, Two position estimation experiments are performed one by using EKF only while the other experiment utilize the proposed algorithm at GPS outage. The conducted experiments reveal the superiority of the proposed method in estimating accurate and continuous position at different GPS outage's intervals.

Session No. 2

Aerospace Navigation Engineering (1)

Room: ***A7***

Date: Tuesday, March 29, 2022 **Time:** 13:45 - 15:15

Board:

Assoc. Prof	Ahmed Mohsen	Miltary Technical College
Dr.	Ehab Safwat	Miltary Technical College

1053-ICEENG	Comparative Synthesis of Linear and Optimal Controllers for a Quadcopter Unmanned Aerial Vehicles
1059-ICEENG	Modeling, Simulation and Attitude Control of An Aerial Gliding Vehicle
1054-ICEENG	Robust Performance Attitude Control System for Nano-Satellites
1061-ICEENG	Enhancement of estimated stochastic errors using Allan Variance and Wavelet De-noising for inertial navigation systems
1058-ICEENG	Loosely Coupled GNSS/INS for Android Platforms

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1053-ICEENG

Comparative Synthesis of Linear and Optimal Controllers for a Quadcopter Unmanned Aerial Vehicles

Mohamed Mamdouh*, Mohamed Ibrahim, Amr sarhan, Mahmoud ashry
Military Technical College, Cairo, Egypt

Abstract

Recently, unmanned aerial vehicle (e.g. quadcopter) has been used in many applications, e.g., search-and rescue missions, because of its capabilities, e.g. vertical take off and landing. To achieve these missions, we need to design a suitable control system to stabilize and control quadcopter to track a desired flight trajectory. In this paper, we proposed a comparative synthesis between a classical and optimal controllers implemented on a quadcopter model. Moreover, this paper discusses a method of tuning gains of the classical controller using optimal control approach. Implementing these linear controllers requires to linearize the nonlinear quadcopter model around a steady state flight condition. The simulation results compare the performance of each controller under different model uncertainties and external disturbance. The results of this study indicate that tunning the classical controller gains using an optimal control approach responds effectively and provide more robustness compared to classical and optimal controllers separately in different flight conditions.

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1059-ICEENG

Modeling, Simulation and Attitude Control of An Aerial Gliding Vehicle

Mohamed Ibrahim Mohame*, Ehab Safwat, Ahmed M. Kamel
Military Technical College, Cairo, Egypt

Abstract

Aerial Gliding Vehicle (AGV) is an unmanned vehicle that is released from an aircraft flying at high speed towards the ground. The AGV is a time-varying stochastic complex system including the 6DOF Model, aerodynamic model, and flight guidance and control system. Motivated by the advantages of the availability of a high-fidelity flight simulation model, this research focuses on designing a general nonlinear 6DOF of an AGV based on LabVIEW software. Moreover, the nonlinear dynamic inversion (NDI) approach is also used to control the AGV's attitude angles in roll, pitch, and yaw. The AGV states are divided into two groups based on their rate of response using the two-time scaled concept. The aerodynamic control surfaces serve as inputs in the DI control law, which is suited for rapid variables. On the other hand, the outputs of the fast outer loop are used as inputs for the inner slow loop. The proposed technique's validity and effectiveness were demonstrated by simulation results for the AGV nonlinear flight control system.

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1054-ICEENG

Robust Performance Attitude Control System for Nano-Satellites

Asser Medhat Elrouby*, Mahmoud Ashry, Hossam Hendy
Military Technical College, Cairo, Egypt

Abstract

Mathematical modeling of attitude control system (ACS) for a nano-satellite has been developed. Three reaction wheels mounted orthogonally have been used as actuators. Environmental disturbing torques have been analyzed and modeled. Nonlinear model for the satellite has been efficiently linearized. The satellite has been controlled by an optimal linear quadratic regulator (LQR) controller based on "Ricatti Algebraic Equations" (RAE). In this research, the satellite has been considered in the nominal mode flight phase i.e. after reaching to the final mission orbit. Inertial pointing of the satellite during nominal operating mode has been analyzed. The ACS ability to reorient and stabilize the satellite has been simulated during the inertial pointing submode (IPSM). Simulation results for the LQR control algorithm are introduced in two different scenarios . In the first scenario model uncertainty has not been included. Model uncertainty has been added in the second scenario. The robustness of the control algorithm has been clarified.

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1061-ICEENG

Enhancement of estimated stochastic errors using Allan Variance and Wavelet De-noising for inertial navigation systems

mohamed osama sadek*, abdelmageed abdelmageed, Hossam Hendy, Ahmed mohsen Kamal
Military Technical College, Cairo, Egypt

Abstract

Inertial Navigation Systems (INS) have an increasingly wide range of applications covering the navigation of cars, ships, aircraft, spacecraft. The precision of the inertial sensors is the most crucial aspect of INS. These sensors have different errors, that decrease performance of the INS system over time. Subsequently, it is vital to get a good estimate of these errors to reduce them and enhance the performance of the system. There are two types of inertial sensor failures: deterministic and stochastic errors. The paper aims to identify the stochastic error by using the most common techniques to estimate these random errors. Furthermore, because these noises contain both low-frequency and high-frequency noise (long-term and short-term noise), it is required to reduce both to improve the INS performance. The wavelet de-noising technique was employed due to its high effectiveness in removing high-frequency noises. Also, Allan variance (AV) was used to estimate errors in low-frequency noises. So, in this paper, a blend of the AV and wavelet de-noising methods are carried out and the results show a great improvement in the inertial sensor's accuracy.

1058-ICEENG

Loosely Coupled GNSS/INS for Android Platforms

Mohammed F El-Khalea*, Hossam M Hendy, Ahmed M. Kamel3, Ibrahim I Arafa
Military Technical College, Cairo, Egypt

Abstract

Recently, smartphones have begun to be equipped with a large number of sensors, some premium phones contain more than 15 sensors, this number will increase with the progress of Microelectromechanical systems (MEMS) technology which affects the improvement of other sensor technologies and lead to updated usage status. These sensors could be used in different activities during daily human life such as user interface healthcare, mobile gaming, survival, tracking, and navigation. Some of the integrated sensors form a completely Inertial Measurement Unit (IMU) which could be used to aid the Global navigation satellite system (GNSS) localization and also the implementation of an integrated navigation system (GNSS/INS). A 15-state Extended Kalman Filter (EKF) in a loosely coupled (LC) MATLAB algorithm was used to integrate the data from GNSS and smartphone sensors. The result of the field test has shown that the smartphone sensors can effectively fill the positioning gap and provide an accurate position during the presence of GNSS signal and short time GNSS outage, which gave a sufficient position error however this error increased when the GNSS outage increased.

Session No. 3

Power and Energy

Room: ***A7***

Date: Wednesday, March 30, 2022 **Time:** 8:30 - 10:00

Board:

Dr. Yasser Saeed Military Technical College.
Dr. Ibrahem Safwat Military Technical College.

1041-ICEENG	Spacecraft Nickel Hydrogen Storage Battery Experimental Model
1078-ICEENG	Optimal Unit commitment using heuristic technique considering environmental effect
1081-ICEENG	PV solar power forecasting based on hybrid MFFNN-ALO
1032-ICEENG	Evaluating the optical performance of Si-based solar cells with accumulated dust layer under harsh environmental conditions

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1041-ICEENG

Spacecraft Nickel Hydrogen Storage Battery Experimental Model

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[1]Military Technical College, Cairo, Egypt
[2]Beni-Suef University, Beni-suef, Egypt

Abstract

The spacecraft (SC) electrical power subsystem is one of the most important subsystems of the SC. The power subsystem is considered successful when all SC subsystems are provided with required power under the Worst-Case Scenario (WCS) of operation until End-of-Life (EOL). WCS means execution of customer requirements till the EOL under all degradations (battery degradation, radiation, etc.) and other external factors In this paper, the SC is provided with Nickel Hydrogen Storage Battery (NHSB). A real experimental model of the NHSB is built based on experimental data of the NHSB. The model is used to simulate the dynamic behavior of the NHSB through the worst-case scenario and during charging and discharging of acceptance tests using MATLAB. Also, the model will predict the behavior of the NHSB during the worst-case scenario and charging, discharging, of the acceptance test. The state of charge of the battery (SOC), the thermal emission, voltage and pressure of NHSB will be presented during the worst-case scenario and charging and discharging of the acceptance teste. This model will be validated by real telemetry.

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1078-ICEENG

Optimal Unit commitment using heuristic technique considering environmental effect

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Arab Academy For Science And Technology, Cairo, Egypt[١]
Ain Shams University, Cairo, Egypt[٢]

Abstract

The objective of this paper is to solve the unit commitment problem using the metaheuristic technique and compare the results with an old reliable technique as Dynamic Programing. The system optimal solution is not only about the minimum cost but also the effect on the environment and. So, in this paper, we are taking into consideration the renewable resources besides the thermal generators and also the effect of electrical vehicles with the renewable resources. The main objective of this study is to achieve an optimal solution of generation at each hour with the total lowest cost and lowest environmental effect. In order to approve the use of this proposed technique, results are compared to other well-known optimization techniques such as dynamic programming and other old reliable approved meta-heuristic technique such as Generic Algorithm. The evaluation shows that the proposed meta-heuristic technique can be used as a powerful and reliable tool in this field.

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1081-ICEENG

PV solar power forecasting based on hybrid MFFNN-ALO

Adel Alblawi*[1], Taghreed Said[2], Mohamed Talaat[3], Mahmoud Elkholy[3]
[1] Shaqra University College of Engineering
[2] Higher Technological Institute
[3] Zagazig University

Abstract

Clean energy sources such as photovoltaic (PV) panels are widely employed. However, their performance is affected by the surroundings. A hybrid optimization technique that comprised an ant lion optimizer (ALO) and artificial neural network (ANN) is presented in this study, to forecast the PV cell temperature and output power. The optimizer's major purpose was to create and improve an ANN approach that was based on training and forecasting. The ALO was used as MVO and GA to obtain the optimal hidden layers neurons number, weights and biases, of the proposed ANNs. The accuracy of the multilayer feed forward neural networks (MFFNN) was evaluated using the data from the MFFNN-MVO, MFFNN-GA and MFFNN-ALO models. The panel output power and temperature were regulated by three variables: solar irradiation, ambient temperature, and wind speed. The Saudi Arabia, Shaqra City PV station with 4-kW output power is the source of the two years testing and training. For the MFFNN-GA, MFFNN-MVO, and MFFNN-ALO models, the NRMSE for DC power predicting compared to 2019 observed data was 2.781E-3, 7.11E-4, and 6.08 E-04, respectively.

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1032-ICEENG

Evaluating the optical performance of Si-based solar cells with accumulated dust layer under harsh environmental conditions

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[2] Ain Shams University Cairo, Egypt

Abstract

In the current study, a monocrystalline Si photovoltaic (PV) was modeled using SCAPS to demonstrate the optoelectronic performance of the cell under harsh environmental conditions. Harsh conditions are simulated in terms of wind speed and temperature fluctuations within the presence of dust layer. All models are evaluated with respect to a bare model with no dust layer accumulated and operating under standard test conditions (STC). Following the proposed model, we have estimated the expected PV cell efficiency and performance parameters under continuous variation in wind speed and temperature. An interesting behavior for the cell operation under relatively high temperature with accumulated dust layer was observed. The short circuit current increased by 61.5% with decreasing open-circuit voltage by 47.3%, showing an overall positive trend for the power harvested. Such behavior is contradicting with the normal temperature performance of cells without dust layer accumulation. A detailed justification is illustrated, where the rate of heat transfer with dust accumulation highlighted incremental increase with respect to the bare cell by 14.57%.

Session No. 4

Control Systems and Automation (2)

Room: ***A7***

Date: Wednesday, March 30, 2022 **Time:** 10:15- 11:45

Board:

Prof. Dr. Mahmoud Ashy Military Technical College.
Dr. Mohamed Abu zaid Military Technical College.

1107-ICEENG	Development, Estimation, and Control of a Bio-Inspired Quadruped Robotic Leg
1025-ICEENG	A Robust Real-time Target Detection and Tracking Approach for UAV Guidance
1070-ICEENG	Dual Attitude-GNSS/INS Unscented Kalman Filter for Low Cost Integrated Navigation Systems

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1107-ICEENG

Development, Estimation, and Control of a Bio-Inspired Quadruped Robotic Leg

Tamer Attia*
Military Technical College, Cairo, Egypt

Abstract

This paper presents the design of a four-legged walking quadruped robot. The design is based on the basic locomotion requirements of mobile quadruped robots. We present the design and development of a bio-inspired quadruped robotic leg with integrated actuation and sensory systems. We first introduce the mechanical design concept of the actuator and leg components. The paper also presents kinematic and dynamic models of a single three Degree of Freedom (DOF) leg, establishes the description equation of the foot trajectory, and presents the development and control of a single lightweight low inertia leg. This paper also introduces the modularized structural design of a 12-DOF quadruped robot. The joint actuators were assembled into a leg prototype attached to a stand with a vertical linear sliding guide for practical experiments and testing. Results showed that the leg is able to achieve quarter gait trajectory tracking, vertical jumping and can hold weight up to 10 kg.

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1025-ICEENG

A Robust Real-time Target Detection and Tracking Approach for UAV Guidance

A. Fouad[*1], Ali Maher[2], Hossam Hendy[1], ibrahim arafa[2], Yehia Z. Elhalwagy[1]
[1]Military Technical College, Cairo, Egypt
[2] Defense Systems Studies Center

Abstract

Robust target detection and tracking are vitally important for accomplishing the guidance task of the UAV in the terminal phase. This importance comes from two aspects; firstly, the more the desired target is accurately localized (detected and tracked) the less the miss distance achieved. Secondly, the high dynamics impose speeding up the execution time for localizing the desired target to be in real-time. SIFT and SURF are of the most applicable features in reference-scene matching for target detection but still suffer from their large computation burden. In this work, a simple but efficient detector employs a fused ORB-BRISK to localize the desired target accurately in the first scene. After that, a decent Kernelized Correlation Filter KCF tracker is utilized to lock on the detected target until the localization accuracy drops below a certain threshold. At that time the proposed detector will aid the tracker again to lock on the missed target. Experimental results reveal that the proposed tracking system achieves a high detection accuracy and overcomes the terminal guidance challenges.

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1070-ICEENG

Dual Attitude-GNSS/INS Unscented Kalman Filter for Low Cost Integrated Navigation Systems

Ahmed H Hassaballa*, Ahmed M. Kamel, ibrahim arafa, Yehia Z. Elhalwagy
Military Technical College, Cairo, Egypt

Abstract

Accurate navigation parameters estimation are one of the main challenges in high dynamics situations for moving vehicles. In this work, an inertial and attitude estimation based dual unscented Kalman filter (DUKF) is proposed. DUKF is composed of two separate filters; one for orientation estimation with an adaptive external acceleration compensation model, and the other is for velocity and position estimation. The novelty of the proposed DUKF when compared to other model-based Kalman filters, is that the implementation of the covariance error models is inserted into the propagation model equations without state-augmentation. This yield to down size the matrix-state dimension which decrease the computational time when compared with the corresponding state of the art Kalman filter structures. The proposed algorithm is verified experimentally using a low-cost inertial sensor in various environmental dynamics conditions. The results analysis shows a great navigation performance and calculation effectiveness when compared with the traditional Kalman filter with state augmentation

Session No. 5

Computer Engineering and Artificial Intelligence (1)

Room: ***A7***

Date: Wednesday, March 30, 2022 **Time:** 12:00- 13:30

Board:

Prof. Dr.	Mohamed Mahmoud Fouad	Military Technical College
Dr.	Ahmed Saeed Abdelfattah	Military Technical College

1046-ICEENG	Bot Detection Using Multi-Input Deep Neural Network Model in Social Media
1048-ICEENG	Over-The-Air (OTA) Update from the Cloud
1073-ICEENG	Survey on IoT-based Big Data Analytics
1079-ICEENG	Detection Approaches for Position Falsification Attack in VANET

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1046-ICEENG

Bot Detection Using Multi-Input Deep Neural Network Model in Social Media

Sameh Mostafa Attia*, Ahmed Maher Matter, khaled Mahmoud Badran
Military Technical College, Cairo, Egypt

Abstract

Abstract— Recently, social media has been viewed as a critical tool for businesses to engage with other users, customers, and future consumers to build popularity, solicit ideas and opinions from users, or influence another user. This massive amount of data quickly becomes a valuable asset for businesses and organizations as a powerful tool for gaining insights and making critical decisions. Unfortunately, certain disinformation operations have been orchestrated by using bots, which are social media accounts operated by computer scripts that attempt to pass as actual human users to sway public opinion and disseminate misleading information. Bot identification is difficult since many bots deliberately strive to avoid detection. There are several approaches to distinguishing a bot from a legitimate account. This paper uses a multi-input deep neural network model with word embedding vectors to represent textual data for content-based bot detection, using fewer data and getting greater accuracy. Our proposed model, which includes two parallel convolutional neural network channels and fully connected neural networks to combine them, outperforms other newly proposed models in bot detection. We reached 93.25% accuracy in distinguishing between bot and human Twitter accounts using this novel technique.

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Over-The-Air (OTA) Update from the Cloud

Ahmed Nasr*, Maged Ghoneima, Bassem Abdullah
Ain Shams University, Cairo, Egypt

Abstract

Abstract — The automotive industry will have smarter and advanced technologies than before . Electronic Control Units (ECUs) in vehicles will be more complex due to containing more interfaces, more connections , more displays , more user demand features and more suppliers . This means there is a great need to supply system updates to improve functionality and fix software bugs . Over-the-Air (OTA) software updates will be highly important for future connected vehicles . The OTA update will enable upgrading the vehicle functionalities or bug fixations in the embedded software installed on its remotely . This paper presents an implementation of an OTA system, compatible for vehicles, receiving a new update from the cloud by using a GSM module and Wi-Fi module . Index Terms — Embedded Systems , OTA , IOT , GSM , Wi-Fi , Cloud , HTTP , FTP , Firmware , FOTA , Automotive

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Survey on IoT-based Big Data Analytics

mohamed abdelmonged shouaib*, Khaled abdelfatttah Metwally,
khaled Mahmoud Badran
Military Technical College, Cairo, Egypt

Abstract

Nowadays, the fast development of the internet and 5G technology encouraged the emergence of many technologies that enhanced the human lifestyle. Moreover, the wide spread of Internet of Things (IoT) gadgets contributed significantly to this technological transformation and provided individuals with pleasure and simplified their lives. Many systems have been developed using sensor-based devices, i.e., IoT devices, e.g., smart healthcare, smart transportation, smart agriculture…etc. Consequently, it became the main source of huge amount of data that are collected frequently, named Big Data. However, such collected data is useless without applying analytics that discover new insights. This data is massive, collected at a rapid speed, and in different formats, constituted the big data main characteristics; volume, velocity, and variety (3Vs). Performing analytics on big data, i.e., Big Data Analytics (BDA) has many challenges that are most probably related to its characteristics. This review paper will undertake a survey on Big Data technologies covering various IoT domains. The main objective is to enable and encourage knowledge transfer across BDA and IoT domains as a main source of big data. This survey discusses overview of IoT as the main source of big data, big data analytics mechanisms, methodologies, architecture, use cases, challenges and finally the existing frameworks and tools for analytics.

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Detection Approaches for Position Falsification Attack in VANET

Ibrahim Bassiony Elsaka*, Sherif morsy Hussein, Gouda ismail Salama
Military Technical College, Cairo, Egypt

Abstract

Intelligent Transportation System (ITS) employ Vehicular Ad Hoc Network (VANET) to increase road safety and decrease number of accidents. VANET uses Dedicated Short-Range Communications (DSRC) to allow driver to obtain reasonable awareness of surrounding vehicles. VANET reliability is affected by any degradation in communication channel or any lack of exchanged information between vehicles. Moreover, it is vulnerable to a wide range of malicious attacks due to its nature. Such issues might cause a complete failure in VANET services and hence cause accidents, injuries, or death. Thus, VANET reliability and security are very critical. This paper discuses briefly different types of malicious attacks in VANET and some of their detection techniques. It gives more attention to position falsification attack as it has a severe impact on different VANET services. Furthermore, it explores previously proposed detection approaches for this attack using either traditional or machine learning techniques. Finally, attention will be drawn to unresolved challenges and potential future research directions.

Session No. 6

Communications and Networks

Room: ***A7***

Date: Wednesday, March 30,2022 **Time:** 13:45- 15:15

Board:

Assoc. Prof	Hesham El-dahshan	Military Technical College
Dr.	Ahmed Fathy	Military Technical College

1071-ICEENG	Intensive performance comparison of SDN wireless network under Floodlight and POX Controllers
1088-ICEENG	A Ka-band 150 nm GaN-on-Si LNA with Multi-stage Noise Matching Technique for 5G Systems
1100-ICEENG	Improved RF Energy Harvesting Rectifier Targeting Ambient Local Sources of DTV, Cellular Networks and Wi-Fi
1096-ICEENG	Enhanced Learning for Recurrent Neural Network-Based Polar Decoder
1089-ICEENG	Optimized Harmonic Tuned High Efficiency S-Band Power amplifier

1071-ICEENG

Intensive performance comparison of SDN wireless network under Floodlight and POX Controllers

Ahmed El Sayed Fathy Ahmed Abd El Latif*, Hussien Abd El Aty El Sayed
Ain Shams University, Cairo, Egypt

Abstract

Abstract—Future networks consist heterogenous platforms of different types. Moreover, there is a great rapid growth in mobile communication, machine to machine (M2M) communications and Internet of Things (IoT) communications. All of these constitute burdens on legacy networks for managing heterogeneous network devices and elements. Software Defined Network (SDN) has been introduced to overcome legacy network limitations such as scalability and compatibility. SDN decouples the control and data planes and moves all control logics from network devices to a separate layer where all the intelligence of the network is moved to the SDN controller which plays as an orchestrator for managing these different networks technologies and to cope with the continuous increasing network devices. In this paper, the performance of two types of SDN controller is studied in different situations by examining the connectivity of a mobile wireless station with a fixed wired station during the motion through cellular network. The convergence time of the network, connectivity, available bandwidth delay and jitter of the moving station and packet loss during handover are collected during the experiment. Different experiments are run using Pox and Floodlight SDN controllers on different cellular network scenarios emulated by Mininet WiFi emulator. The study is repeated in different scenarios containing different number of wireless stations distributed across the network model.

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1088-ICEENG

A Ka-band 150 nm GaN-on-Si LNA with Multi-stage Noise Matching Technique for 5G Systems

Ahmed Abounemra*, Mohammad Darwish
Military Technical College, Cairo, Egypt

Abstract

This paper presents a two-stage Ka-band monolithic microwave integrated circuit (MMIC) low noise amplifier (LNA) designed using 150 nm GaN on Si technology for 5G front-end wireless systems. The LNA is designed based on a series inductive degeneration common source topology with a multi-stage noise matching technique. This technique is used for the active devices to achieve a low noise figure (NF) over a wider frequency band while maintaining high flat gain. The post-layout simulation indicates that the LNA has a typical small-signal gain above 8 dB, while the noise figure performance is less than 3 dB over the bandwidth of 24-36 GHz. The large-signal behavior demonstrates that the achieved peak output power of the designed LNA is 20 dBm. For linearity characterization, the designed LNA achieves an output 1-dB compression and third-order intercept point (OIP3) of 22 dBm and 27 dBm, respectively. The full dimensions of the Ka-band MMIC LNA die are 980x1950 µm^2.

1100-ICEENG

Improved RF Energy Harvesting Rectifier Targeting Ambient Local Sources of DTV, Cellular Networks and Wi-Fi

Omar Mahmoud Abdel Ghany*, Ayman Gamil Sobih, Ayman Mohamed El-Tager
Military Technical College, Cairo, Egypt

Abstract

This paper presents two prototype designs of dual band radio frequency energy harvester (RF-EH) rectifier circuits that can harvest RF energy from four different local RF ambient sources simultaneously. Both of the demonstrated prototype rectifier circuits are successfully tested at lab environment and shows improved results at low levels of incident radio frequency power (PRF). The 1st prototype dual band rectifier circuit is employing hybrid matching network topology designed to target two local RF ambient sources, a digital television broadcasting (DTV) channel UHF-32 at (558-566) MHz and GSM900 downlink (925-965) MHz, rectifier lab test achieves power conversion efficiency (PCE =27.5%) at incident (PRF = -15 dBm) measured at the rectifier terminals with load resistance (RL) of 10 KΩ. In addition, the 2nd developed rectifier prototype that targets GSM1800 downlink (1805-1880) MHz and ISM Wi-Fi (2400-2500) MHz, shows improved matched bandwidth (BW) of 80 MHz covering 100% of the targeted RF ambient source and achieves PCE of 24.3% at (RL) of 5 KΩ, the peak measured PCE ≈ 41% and 20% at 0 dBm input signal at the GSM-1800 and Wi-Fi frequency bands respectively when tested with a 30KΩ load.

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1096-ICEENG

Enhanced Learning for Recurrent Neural Network-Based Polar Decoder

Ziad Ibrahim*, Yasmine Fahmy
Cairo University, Giza, Egypt

Abstract

Several researchers are interested in polar codes for the sake of their capacity which nearly catches memoryless channels capacity. They have been used as part of the 5G technology. Polar decoders like belief propagation decoders showed unfavorable performance during limited iterations. Nowadays, Machine-learning (ML) techniques are used to enhance the efficiency of polar codes decoders. Recurrent neural network belief propagation (RNN-BP) decoders proved better efficiency in a lower number of cycles. In this paper, a performance scheduling learning technique is proposed. This technique enhanced the bit error rate for the RNN-BP decoder by 1.09 dB with signal to noise ratio (SNR) equal to 5. A new approach was also introduced in the quantization step. In this approach, the quantization is done after the learning process is finished instead of after each iteration. This approach fixed the issue of model convergence. These combined approaches showed a total improvement in bit error rate by 2.54 dB.

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1089-ICEENG

Optimized Harmonic Tuned High-Efficiency S-Band Power Amplifier

Ahmed Abounemra*, Mohammed Mahdi, Eslam N. Mohamed, Mohammad Darwish
Military Technical College, Cairo, Egypt

Abstract

In this paper, the design of broadband and high-efficiency Class B GaN HEMT RF power amplifier (PA) is introduced. We started by the investigation of the impact of the 2nd, and 3rd harmonics load variation on the power added efficiency (PAE) level. The proposed design is developed based on the selection of the optimum 3rd harmonic load values that result in achieving the required PAE level and high gain values. The aim of selecting the 3rd harmonic load matching instead of the conventional harmonic tuning method is to simplify the output matching circuit and to be easier to implement over a wider frequency range. The proposed PA design achieves a measured 40% bandwidth from 1 to 1.5 GHz while exhibiting a power gain of 14 dB, 60-63% PAE, and 44.8 dBm output power. Good agreement between simulation and measurement has been achieved due to the use of high order harmonic balance simulator and high accuracy implementation procedure.

Session No. 7

Aerospace Navigation Engineering (2)

Room: ***A7***

Date: Thursday, March 31, 2022 **Time:** 8:30 - 10:00

Board:

Dr. Hossam Hindi Military Technical College

Dr. Ashraf abu sekkin Military Technical College

1038-ICEENG	Terminal Guidance of Unmanned Aerial Vehicle Based on Visual Information
1043-ICEENG	Nonlinear Dynamics Modelling and Free-Launch Simulation of a Flying-Vehicle
1047-ICEENG	IMU-Error Estimation and Cancellation Using ANFIS for Improved UAV Navigation
1092_ICEENG	Modeling and Attitude Control of Cube Sat using Reaction Wheels

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1038-ICEENG

Terminal Guidance of Unmanned Aerial Vehicle Based on Visual Information

Ahmed Awed*[1], Mohammed Abozied[1], Ali Maher[2], Yehia Z. Elhalwagy[1]
[1]Military Technical College, Cairo, Egypt
[2] Center of defense systems studies

Abstract

The guidance system performance is critical particularly, during the terminal phase as the fast response and high accuracy are the most leading parameters. The aided navigation based on optical flow (OF) is mainly used to enhance the gimbaled-seeker accuracy during the terminal phase of un-manned aerial vehicles to precisely find its targets without sharing the problem of long execution time which leads to degrade the vision system overall performance. In this paper, the visual information is mapped and translated to the proportional navigation guidance law (PNG) to define target dynamics to help unmanned aerial vehicles accurately detect and chase its targets. Statistical simulation is accomplished to examine the influence of large displacements on optical flow algorithms. The visual information obtained by the optical flow technique is filtered and smoothed using the Kalman filter technique to increase its accuracy. The simulation is carried out on an unmanned vehicle model for verification and validation of the effect of visual information for minimizing the miss-distance. The visual information can successfully minimize miss-distance under certain conditions with lower computations and faster processing time make it appropriate for terminal guidance of unmanned aerial vehicles.

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1043-ICEENG

Nonlinear Dynamics Modelling and Free-Launch Simulation of a Flying-Vehicle

Abdallah Mamdouh Abu El-Wafa*, Mohammed Hassan Abozied,
Hossam Mohammed Hendy, Yehia Zakarya Z. Elhalwagy
Military Technical College, Cairo, Egypt

Abstract

the development of guided systems, always requires several subsystems laboratory and real tests during the Research and Development (R&D) phase. Since conducting real flight test is limited and expensive for the purpose of guided system development and production. Researchers and developers resort to adopting verified and valid dynamic models, that enables them to complete the development and research processes in a more logical and less costly manner. In this paper, a 6-DOF nonlinear mathematical model for the dynamics of a subsonic flying vehicle is developed, simulated, and validated with referenced data (Velocity, Range, and Normal Acceleration). The flying vehicle body configuration through this study is symmetrical around its vertical plane and initially impulse trusted during its boost phase. The aerodynamic coefficients of the flying body are developed using Missile DATCOM and formed in look-up tables in the Simulink-Model. The entire semi-empirical model of the flying body aerodynamics is comprehensively described as a function of (Mach-Number, Angle-of-Attack and Side-Slip Angle). The model is simulated under certain flight conditions using the AeroSim Blockset nonlinear equations which are solved by the Runga-Kutta method (ODE) using MATLAB/Simulink.

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1047-ICEENG

IMU-Error Estimation and Cancellation Using ANFIS for Improved UAV Navigation

Ahmed Elgbily Mahdi*, Ahmed Azouz, Ahmed Elsaid Abdalla, Ashraf Abosekeen
Military Technical College, Cairo, Egypt

Abstract

The inertial navigation system (INS) is the main source of navigation information in autonomous vehicle (AV) applications. The main component of the INS is the inertial measuring unit (IMU) which is responsible for providing the INS with both angular rates and accelerations. However, the IMU suffers from several types of errors. Some of these errors are deterministic such as bias offset and scale factor while other errors are stochastic such as bias instability, bias drift, and noise. Therefore, the IMUs especially the low-cost micro-electro-mechanical systems (MEMS) provide the INS with drifted raw measurements. Thus, a growing error over time affects the INS navigation solution. Recently, machine learning (ML) techniques are introduced to model and mitigate the errors associated with IMU. In this paper, an adaptive neuro-fuzzy inference system (ANFIS) is introduced to improve the performance of low-grade IMUs by estimating and removing the associated errors. A high-fidelity simulated UAV trajectory was conducted to evaluate the effectiveness of the proposed algorithm. The results show the improvement in the INS navigation solution after utilizing the proposed ML_ANFIS algorithm compared to the traditional INS. An improvement solution of 84.2% and 87.5% in the 2D-positioning and 3D-positioning respectively. Furthermore, 86% and 88.8% in the 2D-velocity and 3D-velocity respectively is achieved compared to the traditional INS solution.

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1092_ICEENG

Modeling and Attitude Control of Cube Sat using Reaction Wheels

mostafa helmy mohamed*, Ahmed T. hafez, mahmoud ashry
Military Technical College, Cairo, Egypt

Abstract

Attitude control system of a Cube Satellite has been modeled. Reaction wheels are used as an actuator. Two types of controllers have been designed for Attitude Control System (ACS). The two controllers are genetically tuned proportional integral derivative (PID), Modified proportional integral derivative (PI-D). The two controllers are compared without external disturbances. Also, the comparison takes into consideration the existence of sensor's noise. The advantages and disadvantages of each controller are presented with the simulated results.Cube satellites (CubeSats) allow new technological advancements to be demonstrated at a fraction of the expense of traditional large satellite programs. Numerous advantages have arisen as a result of the cost difference. While attempting to fit components that permit, difficulties arose. Big satellites' important capabilities in terms of size, weight, and power The environment is power-constrained. CubeSats are a class of nanosatellites that range in size from 10x10x10 cm and higher, in 10cm increments of length . It is made up of numerous subsystems that are critical to the success of the tiny satellite mission. In order for the mission to be successful, these subsystems, which include the communication system, power supply, and data handling, must be able to work together as one system.

Session No. 8

Computer Engineering and Artificial Intelligence (2)

Room: ***A7***

Date: Thursday , March 31 ,2022 **Time:**10:15 - 11:45

Board:

Prof. Dr.	Khaled Mahmoud	Military Technical College
Dr.	Sherif Morsi	Military Technical College

1075-ICEENG	Artificial intelligence-based approach for Univariate time-series Anomaly detection using Hybrid CNN-BiLSTM Model
1097-ICEENG	MPTCP-based Security Schema in Fog Computing
1055-ICEENG	How to Manage the Emergent Imaging Requests and Urgent Situations in Satellite Constellations
1024-ICEENG	Securing Big Data: A Survey on Security Solutions

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1075-ICEENG

Artificial intelligence-based approach for Univariate time-series Anomaly detection using Hybrid CNN-BiLSTM Model

moamen*, khaled Mahmoud Badran, Ahmed Esmat Hussien
Military Technical College, Cairo, Egypt

Abstract

Anomaly detection is a critical issue that has been extensively researched across a wide range of study fields and application domains. The main purpose of an anomaly detection model is to determine which instances stand out as being dissimilar to all others. Such instances are known as anomalies. Due to the common need for analyzing huge real-world data sets, automated data-driven models based on artificial intelligence techniques have become the most trending field of research. Deep learning techniques outperform other traditional machine learning and statistical methods as the scale of data increases. They have the power to learn very complex hierarchical feature relations within high-dimensional input data. In this paper, we suggested a hybrid deep learning technique that combines one-dimensional convolutional neural networks (1D CNN) with bidirectional long short-term memory (BiLSTM) for anomaly detection in univariate time-series sequences. The suggested model (1D CNN-BiLSTM) was tested and verified by the benchmark datasets and compared to state-of-the-art algorithms. The experimental results ensured that the proposed method delivers on its promises.

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1097-ICEENG

MPTCP-based Security Schema in Fog Computing

Hossam Youssef ELMansy*, Khaled Habbak Metwally, khaled Mahmoud Badran
Military Technical College, Cairo, Egypt

Abstract

Recently, in the last decade, Cloud Computing be- comes one of today's great innovations for provisioning Information Technology (IT) resources in different business models. It reduces the large upfront costs for purchasing hardware infrastructure by delivering resources on-demand. Moreover, a new model has been introduced named Fog Computing, which addresses Cloud Computing paradigm issues regarding time delay and high cost. These issues arise from transmitting the data all the way from the Edge-devices to the centralized Cloud data centers. However, security challenges are still a big concern about the vulnerabilities to both Cloud and Fog Computing systems. Man-in-The-Middle (MiTM) is considered one of the most destructive attacks in a Fog Computing context. It allows attackers to spoof, capture, and replicate flows targeted at Fog Nodes and Edge Devices. Moreover, it's very complex to detect MiTM attacks as it is performed passively at the SDN level, also the Fog Computing paradigm is ideally suitable for MiTM attacks. In this paper, a MiTM mitigation scheme will be proposed consisting of an SDN network (Fog Leaders) which controls a layer of Fog Nodes. Furthermore, Multi-Path TCP (MPTCP) has been used between all edge devices and Fog nodes to improve resource utilization and security. The proposed solution performance evaluation has been carried out in a simulation environment using Mininet, Ryu SDN controller, and MPTCP Linux kernel. The experimental results showed that the proposed solution improves security, network resiliency and resource utilization without any significant overheads compared to the traditional TCP implementation.

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1055-ICEENG

How to Manage the Emergent Imaging Requests and Urgent Situations in Satellite Constellations

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[1]Military Technical College, Cairo, Egypt
[2] Research and Development Department, Ministry Of Defence

Abstract

Nowadays, the demand for emergent satellite images became very high. The information collected from these images supports making fast decisions in case of disasters or military operations. A specific mission planning and scheduling system is customized to deal with such requests to fulfill this demand. The proposed planning and scheduling system is capable of managing the emergent requests as well as the urgent situations (like temporary or permanent out of charge for one or more satellites in the constellation, or canceling one or more requests during creating the plan). The emergent requests can be inserted into the system during its running without stopping and restarting it again. The system creates an integrated output plan including as much as possible of the emergent requests in a reasonable time. The output plan contains the selected imaging opportunity and downloading opportunity for each strip taking into consideration all the operational and technical constraints for the satellites, the ground stations and the requests. The used algorithm for solving this problem is a combination of local search algorithms with some modifications to get better results. The system is using three planning variables for each strip, which are the imaging start time, the downloading start time and a Boolean variable for determining the selection of an opportunity. The Boolean selection variable has a probability of change three times higher than the other two variables.

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1024-ICEENG

Securing Big Data: A Survey on Security Solutions

Hany Habbak Elshall*, Khaled Metwally, Ahmed Maher Mattar
Military Technical College, Cairo, Egypt

Abstract

Abstract—Big Data is the amalgamation of many technological revolutions that address the gathering, processing, and storing of massive heterogeneous data. The rapid growth of the Internet of Things (IoT) and other technologies are the main culprits behind this sustained growth. Moreover, the analysis of this data requires high-performance servers for advanced and parallel data analytics. Thus, data owners with their limited capabilities and resources may outsource their data to a powerful but untrusted environment, i.e., the cloud. Moreover, the data analytic techniques performed on the external cloud may also pose many security threats regarding the privacy and the confidentiality of the aforementioned; transferred, analyzed, and stored data. To countermeasure these security issues and challenges, several techniques have been addressed. This survey paper aims to summarize and emphasize the security threats within the big data framework, in addition, it is worth mentioning research work related to the big data analytics framework.

Session No. 9

Image processing

Room: ***A7***

Date: Thursday, March 31,2022 **Time:** 12:00 - 13:30

Board:

Prof.Dr.	Gouda Esmail	Military Technical College
Dr.	Ahmed Saleh	Military Technical College

1066-ICEENG	Response-time enhancement of a hybrid controller of unmanned aerial vehicles using parametrization
1044-ICEENG	Visual Drone Detection In Static Complex Environment
1012-ICEENG	Optical Characterization of Biological Tissues in Visible and Near-Infrared Spectra
1003-ICEENG	Breast Tumors Delineation for Mammogram Investigations Exploiting k-Means Algorithm and Associated Image Processing

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1066-ICEENG

Response-time enhancement of a hybrid controller of unmanned aerial vehicles using parametrization

Eslam Mostafa Fawzy*
Military Technical College, Cairo, Egypt

Abstract

Unmanned aerial vehicles UAVs perform missions that require precise, fast, and robust maneuvers regardless of the external environmental disturbances. Simple controllers are not adequate enough to meet these constraints. Thus more accurate and complex controllers can be used, however, these complex controllers constitute high computational complexity calculations which deplete the UAV's battery more quickly and affect the duration of the conducted missions. In this paper, we propose to apply a parameterization technique to efficiently simplify the calculations of a complex hybrid controller, while preserving the accuracy. By parameterizing the control trajectory of the UAV, we can represent the control signals using fewer number of parameters, an idea that is similar to signal down sampling. We evaluated the proposed parameterization technique on four different reference trajectories with three different solvers. The results show that the parameterization introduces a speed-up of 40\% with no practical effect on the controller performance and accuracy.

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13th International Conference on Electrical ENGINEERING, March 29-31, 2022,
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1044-ICEENG

Visual Drone Detection In Static Complex Environment

Mohamed Ahmed Elsayed[*1], Ahmed saleh Mashaly[1], Mohamed Reda[1], Ahmed Saleh[2]
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Abstract

Abstract— Drone applications are gaining traction in both lawful and unlawful fields. Different techniques have been introduced to monitor sky horizon and provide protection for high-risk areas. Electro-Optical (EO) sensors for drone detection are promising from a cost-to-quality perspective. However, visual drone detection faces several difficulties such as the differentiation between the other flying objects and the necessity of real-time detection. This paper introduces a visual drone detection approach based on captured video camera for a static background. The proposed method is divided into two phases that are detection phase and the enhanced detection by tracking phase. For the detection phase, it employs two background subtraction methods. The ViBe background subtraction and enhanced three-frame difference methods are used to separate the foreground object from the background. CNN then is used to classify foreground objects. Moreover, the tracking phase handles the missed detection tracks. The experiment results show that the proposed method has a significant accuracy and low computational power performance.

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1012-ICEENG

Optical Characterization of Biological Tissues in Visible and Near-Infrared Spectra

Mohamed Hisham Fouad Aref[*1], Mohamed A. Abbass[1], Abou-Bakr M. Youssef[2], Abdallah Abdelkader Hussein[3], Sara Abd El-ghaffar[4], Ramy Abdlaty[1]

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Abstract

The rapid development and continuous progress of optical imaging in the medical field require a profound knowledge of the biological tissue`s optical signature. Toward this goal, an investigation for different biological soft tissues is performed to capture their optical signatures. These signatures were captured using an imaging spectrometer. The imaging spectrometer encompasses a hyperspectral camera operating in the range of 380 to 1050 nm. The former range is used; to capture the tissue`s light transmission and diffuse reflectance (Rd), respectively. Two exploratory (Transmission / Reflection) arrangements were used to study three biological organs: kidney, heart, and liver. In this study, 30 samples were optically investigated in the visible and near -infrared (VIS-NIR) spectrum. To recognize the ideal wavelength, we utilized one-way variance analysis, followed by a Tukey's test for the generated groups (Kidney vs Heart: group#1 / Kidney vs Liver: group#2 / Heart vs Liver: group#3). The optimal spectral range of the measured light Tr was 640~680 nm for the three groups. Although, the ideal spectral range for the measured light Rd was 720~760 nm for both group#1 and group#2. On the other hand, group #3 result was dissimilar 520~560 nm. The presented investigation provides a characterization of the biological soft tissues (kidney, liver, and heart) regarding their optical properties to help in the oncology diagnostic and therapeutic techniques

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1003-ICEENG

Breast Tumors Delineation for Mammogram Investigations Exploiting k-Means Algorithm and Associated Image Processing

Mohamed Hisham Fouad Aref[*1], Ayman A. Nassar[2], Amr A.R. Sharawi[3], Mohamed A. Abbass[1], Ahmed M. Awadallah[1], Mohamed Rabie[1], Ayman Mohammed Farag[4], Sara Abd El-ghaffar[5], Yasser H. Elsharkawy[1]

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Abstract

Breast cancer early detection is critical for life-saving and fast healing. Radiologists can misdiagnose many cases due to the modality's low accuracy, or lack of experience. We aim to assist radiologists in early malignant discovery. This study involved 150 mammograms for patients with various breast masses thru two mammography: (GE Sys., USA) (N = 80) and MAMMOMAT Revelation (Siemens, Germany) (N = 70)). Normal cases (n = 30) were the system control to evaluate the specificity from false positives (FP) and true negatives (TN) results. Mammogram images were processed by a custom algorithm (Normalization, moving average filtering, and K-means clustering) to automatically differentiate between normal and malignant regions. Although, experimental results were validated by the "Lunit inc. online software" to compare the tumor detection accuracy. However, all cases were re-checked and assessed by two qualified radiologist readers. The system presents reasonable outcomes concerning computer-aided detection (CAD) for breast tumors regarding the qualified radiologist, where out of the 150 patients, twelve were missed by the custom CAD algorithm and five were missed by at least one of the radiologists, although the CAD sensitivity and specificity were 92.5% and 90%, respectively. The presented framework improves breast cancer detection from the mammogram investigation regarding two qualified radiologist readers with an overall accuracy of 92%. The presented CAD system could assist the radiologist to avoid missing the recognition of breast tumor cases, in addition to offering the possibility to improve careful tumor resection during surgery

Part II:

WORKSHOPS AND SEMINARS

WS-1-ICEENG

Polarization Imaging in Computer Vision

Prof. Dr Zhao Yong-Qiang

Room: Maj. Gen. Abd Elhamed Shawky
Date: Wednesday, March 30,2022 **Time:**08:30 - 10:00
Board:
Dr. Mohamed Reda Military Technical College

Summary:
Advances in sensing technology enable acquisition of a large amount of information from the physical world. Vision techniques have played a key role in information sensing, but with a limitation that most vision systems can only perceive partial information beyond the visible spectrum. For instance, one cannot perceive the information carried by a polarized light since human vision systems are not sensitive to polarization. On the other hand, however, some marine and terrestrial animals and insects demonstrate their abilities to sense and utilize polarized lights to navigate, locate, and hunt for prey in their daily activities. Polarization is a unique characteristic of transverse wave, which is the asymmetry phenomenon of vibration direction and propagation direction. Comparing with conventional image techniques, the polarization imaging technique can detect the polarization information of targets, which will be beneficial to subsequent applications in computer vision task.In this report, I will introduce some new results on how to utilize the polarization information in computer vision task, such as underwater imaging, reflection remove and object detection.

WS-2-ICEENG

Developing Entrepreneurial Talents for Aerospace of the Future

Dr. Christina Yan Zhang

Room: Maj. Gen. Abd Elhamed Shawky
Date: Wednesday, March 30,2022 **Time:** 10:15-11:45
Board:
Dr. Mohamed Reda Military Technical College

Traditionally, major breakthroughs in the aerospace industries are led by governments. Increasingly, the private sector are playing a more and more important role. In the talk we will discuss how to best develop entrepreneurial talents for the aerospace, increasing led by the private sector. We will start with the importance of cultivating entrepreneurial talents in the sector. This will be followed by creative thinking on how to sow the seeds for aerospace talents, and how to best communicate with the public to raise the interest among students for working in the aerospace industry. Recommendations will be put forward on how we develop future talents through embracing the 4th industrialisation, innovating teaching and creating multidisciplinary talents.

WS-3-ICEENG

Japan Society for the Promotion of Science (JSPS); Functions, Structures and Strategies

Prof. Dr Naoko Fukami

Room: Maj. Gen. Abd Elhamed Shawky
Date: Wednesday, March 30,2022 **Time:**12:00 - 13:30
Board:
prof. Mahmoud A. Abdalla Military Technical College

The lecture by JSPS will be on JSPS's funding strategies to support basic research and scientific breakthroughs, focusing on international research collaborations between Egypt and Japan and to invite researchers to Japan. The former is consisted of 1)Bilateral Cooperation and 2)Core to Core program, and the latter is consisted of 3)Hope Meeting, 4)Fellowship Program and 5)Ronpaku program.

1)For Bilateral Cooperation with Egypt: Based on MoUs, JSPS concluded the agreement with Ministry of Higher Education / Ministry of Scientific Research to implement joint research projects and seminars. In addition to our traditional bilateral programs, we have launched a scheme that allows bilateral cooperation with agencies that do not have MOUs with JSPS. It provides funding to the Japanese researchers, and their counterpart researchers are expected to secure matching funds on their own from any funding agencies.

2)In the Core-to-Core Program, we fund multilateral initiatives by universities and research institutions in order to create a consortium of world class research hubs. Collaborations that include Egypt is eligible for both type A, Advanced Research Networks and type B, Asia-Africa Science Platform. Each project is required to have two or more partner countries.

3)To foster future scientific leaders in the Asia-Pacific as well as to build networks among them, JSPS has been holding HOPE Meetings since 2008. These meetings provide excellent PhD students in the region with opportunities to engage in interdisciplinary discussions with Nobel laureates and with their peers from other countries and areas.

4)JSPS fellowship programs are the main instruments for inviting foreign researchers to the Universities and other research institutions in Japan. JSPS carries out a variety of invitation fellowship programs that are designed to coincide with the researchers' various career stages and purposes for coming to Japan. For example, JSPS's postdoctoral fellowships invite promising young researchers from overseas to Japan for a period of 1-2 years. JSPS supports their roundtrip international airfare, monthly maintenance allowance, and a settling-in allowance. Basically, fellows are selected based on the scientific value of their research plans, irrespective of their fields or nationalities.

5) JSPS Ronpaku Program is quite unique. This allows selected fellows to usually stay in their own country, and to visit Japan to prepare for their dissertation with their Japanese supervisors for a certain days a year till they receive PhD degree within 3 years. The Japanese supervisors are also allowed to visit the fellow in return.

Before introducing the topic, the lecture will start with a brief introduction of JSPS and our mission, what we do. The lecture will also touch upon JSPS Cairo Station's activities.

WS-4-CEENG

Anticipatory Radio Resource Management for 5G Networks and Beyond

Prof. Dr Hossam Hassanein

Room: Maj. Gen. Abd Elhamed Shawky
Date: Wednesday, March 30,2022 **Time:**13:45- 15:15
Board:
Dr. Ashraf Abo seken Military Technical College

5G wireless networks have brought about a technological transformation in modern societies by providing an ultra-reliable high-speed communications infrastructure that will serve billions of devices, machines and vehicles. These devices will contribute massive amounts of data that will need to be pipelined over future 5G networks under the umbrella of future smart cities, connected autonomous cars, and IoT applications. The complexity of 5G networks will hence be unprecedented, due to the very diverse applications, ultra-low latency requirements for critical vehicle communication, growing demand for high positioning accuracy for location-based services, and dense, heterogeneous architectures.

In this talk, we address our efforts towards developing a smart management solution suite for future 5G networks based on innovative machine learning and big data analytics techniques. In particular, we discuss data-driven radio resource management functions that are mobility- and context-aware. In this domain we discuss the design of a predictive resource allocator that leverages individual user-level mobility information to opportunistically

plan data transmissions in advance. We also discuss how to autoconfigure 5G mobility management network settings of cell selection and handover. The solutions will enable networks to be self-diagnosing and self-organizing and will enhance network capacity and user service while reducing capital and operating expenditures.

WS-5-ICEENG

IoT Hardware Security: Using Physically Unclonable Functions (PUFs) for Authentication and Secure Key Exchange

Dr Fayez Gebali

Room: Maj. Gen. Abd Elhamed Shawky
Date: Thursday, March 31,2022 **Time:**08:30 - 10:00
Board:
Dr. Mahmoud Karem Military Technical College

Physically Unclonable Functions (PUFs) are essential to secure IoT systems through facilitating authen- tication and secure key exchange in IoT infrastructure systems. Authentication and secure key exchange form the basis for all other facets of system security. In IoT infrastructure systems the weakest link in the system is the edge devices since they are located in unsecured locations and have limited processing and energy resources. Implementing PUFs in IoT edge devices is an inexpensive solution that endows the edge device with unique fingerprints (unique ID), immunity to tampering, reverse engineering, counterfeiting and session keys that can not be hacked or duplicated. In this presentation we will review the five most commonly used PUFs and how their performance can be analyzed. We also review the basic algorithm used for authentication and secure key exchange. We then propose two more powerful algorithms that provide more security.

WS-6-ICEENG

A Journey in Design, Synthesis and Development of Novel Anticancer and Antimalarial Agents

Dr Ibrahim Tantawy

Room: Maj. Gen. Abd Elhamed Shawky

Date: Thursday, March 31,2022 **Time:**10:15 - 11:45

Board:

Dr. Mohamed Abbas Military Technical College

This lecture will be focused on two parts. In the first part, we will present diarylphosphonate inhibitors for urokinase-type plasminogen activator (uPA) with anticancer activity. Urokinase-type plasminogen activator (uPA) is a serine protease which is situated on the cell surface and can be bound to its receptor (uPAR). The role of uPA/uPARsystem in human cancer was demonstrated (Thromb. Haemostasis 2005, 93, 641). We have designed and developed peptidicdiphenyl phosphonate inhibitors of uPA.. A first potent and selective lead compounds were identified and a lead optimization program was started to modify the compounds to a small non-peptidicdiaryl phosphonate irreversible inhibitor of uPA (J. Med. Chem. 2006, 49, 5785, ibid,J. Med. Chem. 2007, 50, 6638, J. Iran. Chem. Soc. 17, 1211 (2020). Biomedicines 9, 1767, 2021). Potent and selective uPA inhibition was obtained (IC50< 10 nM; selectivity toward a set of other trypsine like

serine proteases more than 1000 fold). The synthetic approach, structure activity relationship (SAR) and in vivo animal studies of these selective inhibitors will be presented. While the Part II of my lecture will deal with the development of neocryptolepine scaffolds as a novel antimalarial active agents.As part of a larger project for developing more potent and safer antimalarial lead compounds based on natural product, we have developed robust and efficient synthetic method for the natural product alkaloid, neocryptolepine (J. Med. Chem. 52, 2979, 2009), ibid, 56, 1431, 2013) isolated from the shrub Cryptolepissanguinolenta used in Central and West Africa in traditional medicine for the treatment of malaria. A lead optimization program was started to modify the compound and a wide range of neocryptolepine analogues with diversified frameworks and drug-like properties were synthesized. Potent and selective analogues against malaria as well as cancer with IC50 in the low nanomolar range were obtained (Med. Chem. Commun.5, 927, 2014), European Journal of Medicinal Chemistry 64, 498, 2013, Medicinal Chemistry Research 25, 879 (2016), Molecules 22, 1954 (2017), ibid, 24, 2121(2019), ibid, 26, 754, (2021). The synthetic routes of these molecules, their anticancer and antimalarial activities as well as the proposed mechanism of action will be illustrated from both our own research and literature.

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