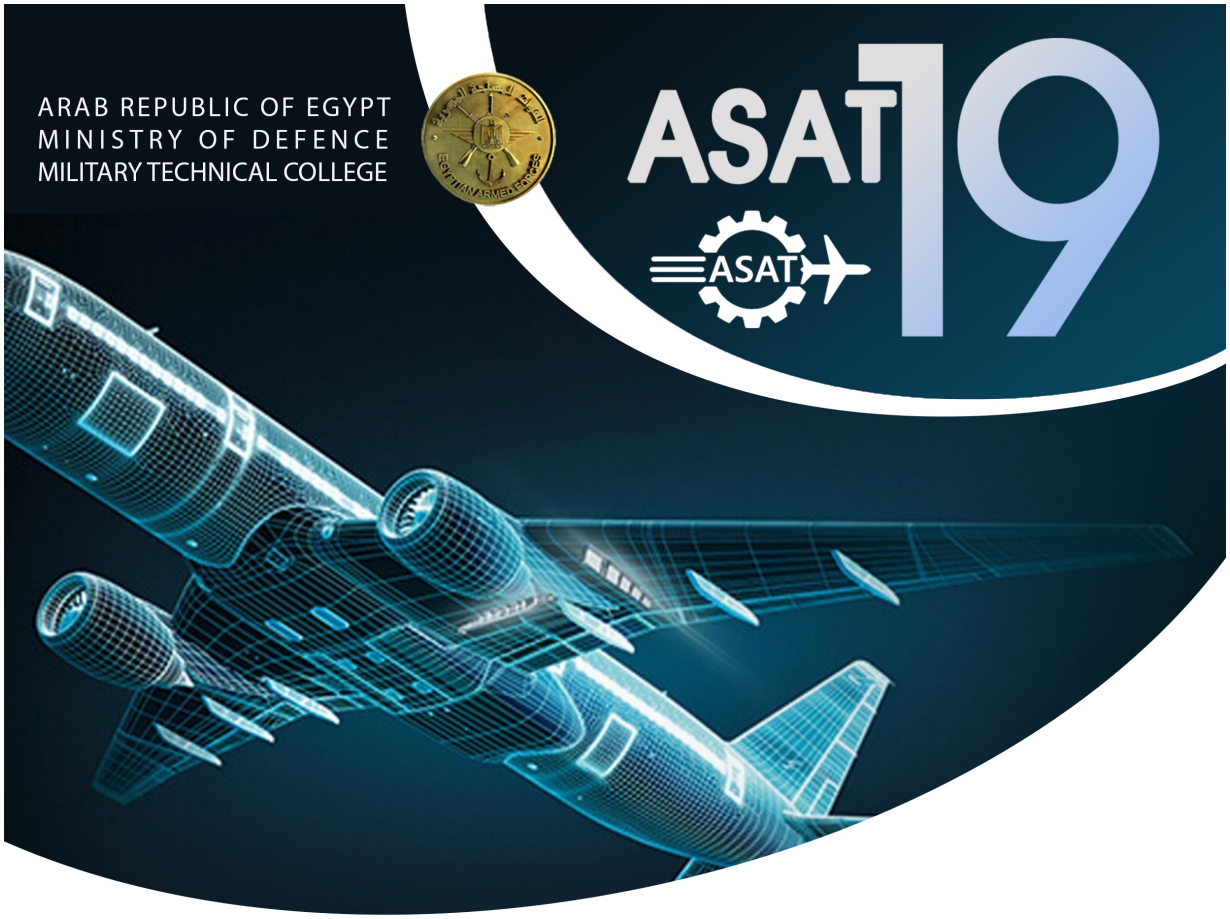
19th International Conference on Aerospace Sciences and Aviation Technology



19th International Conference on Aerospace Sciences and Aviation Technology

6-8 APRIL 2021

CAIRO , EGYPT

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Conference Program and Invited Talks

ASAT-19
The 19th International Conference on Aerospace Sciences & Aviation Technology (ASAT-19)
April 6-8, 2021, Cairo, Egypt

CONTENTS

PREFACE

The Military Technical College, Cairo, Egypt has the pleasure to organize the 19th International Conference on Aerospace Sciences & Aviation Technology (ASAT-19), APR 6 - 8, 2021, Cairo, Egypt, sponsored by the Egyptian Ministry of Defense.

The conference provides an academic platform for professionals and researchers from research, academia and, industrial sectors involved in Aerospace Science and Aviation Technology to exchange knowledge and gain an insight into the state of the art in the latest technology.

Confer-ence program includes 11th scientific sessions and 15th invited talks covering the following topics:

- Aerodynamics and Mechanics of flight
- Aerospace Combustion and Propulsion
- Communications and Networks
- Aerospace structures
- Aerospace Materials
- Remote sensing & image processing
- Renewable Energy
- Energetic Materials
- Aerospace Thermophysics
- Guidance, Navigation and Control
- Hydraulics and Fluid Power Systems
- Unmanned Systems
- Multidisciplinary Design Optimization
- Wind Energy

The (120) full manuscript submitted to the conference secretary, are re-viewed. Just (46) paper have been accepted for suitable publication in the conference.

These selected papers will be presented during the conference interval, APR 6 - 8, 2021, in different (11) scientific sessions. In addition to 15 invited talks.

PREFACE

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.

LIST OF COMMITEES

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- Col. Dr. Mohamed Yahia Zakaria

CONTRIBUTORS

- Department of Mechanical Engineering, College of Engineering, Taif University, Taif 21974, KSA
- Production and Mechanical Design Department, Faculty of Engineering, Mansoura University, Mansoura 35516, Egypt
- Civil Engineering Department, Military Technical College, Cairo, Egypt.
- Ships and Submarines Engineering Department, Military Technical College, Cairo, Egypt.
- Mechanical Engineering Department, Faculty of Engineering & Technology, Future University in Egypt, Cairo, Egypt
- Department of Aircraft Mechanics, Military Technical College, Cairo, Egypt.
- Mechanical Design and Production Department, Military Technical College, Cairo, Egypt.
- Rockets Department, Military Technical College, Cairo, Egypt
- Technical Research Centre, Cairo, Egypt
- Mechanical Engineering Department, Military Technical College, Cairo, Egypt.
- Computer Engineering, Pyramids Higher Institute for engineering & Technology
- (PHI), Giza, Egypt
- Computer Engineering, Arab Academy for Science, Technology & Maritime Transport (AASTMT) Cairo, Egypt
- Electronic Engineering Department, Military Technical College, Cairo, Egypt.
- Department of Communication Engineering, Military Technical College, Cairo, Egypt.
- NANO Master program, Faculty of Engineering. Cairo University, Giza, Egypt
- Avionics Department, Military Technical Collage, Cairo, Egypt
- Egyptian Academy for Engineering and Advanced Technology affiliated to ministry of Military Production, Cairo, Egypt.
- October 6 University, Cairo, Egypt.

CONTRIBUTORS

- Department of Civil Engineering, Military Technical College, Cairo, Egypt.
- Mechanical Engineering Department, Faculty of Engineering, Mataria-Helwan University in Cairo, Egypt.
- Mechanical Engineering Department, Faculty of Engineering and Technology, Badr University in Cairo (BUC), Cairo, Egypt.
- Key Laboratory of Power Station Energy Transfer Conversion and Sys-tem of Ministry of Education, School of Energy, Power and Mechani-cal Engineering, North China Electric Power University, Beijing 102206, China
- Mechanical Power Engineering Department, Faculty of Engineering – Mattaria, Helwan University, Cairo 11718, Egypt
- Centre for Renewable Energy Faculty of Engineering, British University in Egypt.
- Department of Chemical Engineering, Military Technical College, Cairo, Egypt.
- Department of Radar, Military Technical College, Cairo, Egypt.
- El-Nasr Company for Intermediate Chemicals, Industrial Area, Giza, Egypt.
- Radiation Chemistry Department, National Center for Radiation Research and Technology, P.O.Box 29, Nasr City, Cairo, Egypt.
- Engineering, Menoufia University, Egypt 32511
- Technical Research Center, Cairo, Egypt
- Mechanical Design and Production Engineering Department, Faculty of Engineering, Ain Shams University, Cairo, Egypt
- Chemistry Division, Faculty of Engineering, Ain Shams University, Cairo, Egypt
- Chemical Engineering Department, Military Technical College, Cairo, Egypt.

CONTRIBUTORS

- Drug Microbiology Laboratory, Drug Radiation Research Department, National Center for Radiation Research and Technology (NCRRT), Egyptian Atomic Energy Authority, Cairo, Egypt.
- Department of Mechanical Design and Production, Faculty of Engineering, Cairo University, Egypt
- Mechanical Engineering department, Faculty of Engineering at Shoubra, Benha University, Cairo 11629, Egypt.
- Department of Metallurgical Engineering, Faculty of Engineering, Cairo University, Cairo 12613, Egypt.
- Physics Department, Faculty of Science, Cairo University, Giza, Egypt
- Faculty of Engineering, Misr for Science and Technology, Cairo, Egypt.
- Space Technology Center (STC), Cairo, Egypt.
- Nuclear Engineering Department, Military Technical College, Kobry El-Koba, Cairo, Egypt
- Nuclear and Radiological Regularity Authority (ENRRA), Nasr City, Egypt
- Faculty of Engineering, 'Université Française d'Égypte, Cairo, Egypt
- Faculty of Energy Engineering, Aswan University, Aswan 81528, Egypt.
- School of Mechanical Engineering, Shanghai Jiao Tong University, Shanghai 200240, China.
- Science and Technology Center of Excellence, Military Production, Cairo, Egypt
- Naval Warning Engineering Department, Military Technical College, Cairo, Egypt
- Department of Computer Engineering and Artificial Intelligence, Military Technical College, Cairo, Egypt
- Guidance and Control Department, Military Technical College, Cairo, Egypt.
- Dept. of Computer Engineering, Military Technical College, Cairo, Egypt, 11766
- Aerospace Engineering Department, Military Technical College, Cairo, Egypt.

CONTRIBUTORS

- Department of Mechanical Power & Energy, Military technical college, Cairo, Egypt
- Department of Rockets, Military Technical College, Cairo, Egypt.
- Modern Academy for Engineering and Technology, Cairo, Egypt.
- Aircraft electrical equipment's, Military Technical College, Cairo, Egypt
- Department of Optoelectronics and Control, Military Technical College, Cairo, Egypt
- Aircraft Armament Department, Military Technical College,
- Nahda University, Egypt.
- Space Technology Centre, Cairo, Egypt.
- Faculty of Engineering, Zagazig University, Zagazig, Egypt.
- Rocket Department, Military Technical College, Egypt
- University of Science and Technology at Zewail City, Giza, Egypt
- National Centre for Combustion Research and Development & Department of Aerospace Engineering, Indian Institute of Technology Madras, Chennai, India

INVITED TALKS

Day	Room	9:00 – 10:00	10:15 – 11:15	11:30 – 12:30	12:45 – 13:45	14.00 – 15.00
Tue 6/4	C	**The Fourth Industrial Revolution "Industry 4.0":** **Aerospace Technology and Skills Challenges** Prof. Dr. Hany Moustapha • Fellow, ASME, CAE and CASI • Director of Innovation 4.0 Network, ÉTS, University of Québec • Siemens' Chair on Industry 4.0 Technology Integration • Senior Research Fellow, Pratt & Whitney Canada **Canada**		**Egyptian Space Agency: National Space Program and the Related Space Activities** Egyptian Space Agency **Egypt**	**Trade-Off Analysis of Low Earth Orbit Spacecraft Power Supply System by Genetic Algorithm** Space Technology Center **Egypt**	**Mobile Mapping Technology: Recent Advances and Proliferation in GNSS-Challenging Environments** Prof. Ayman F. Habib • Thomas A. Page Professor in Civil Engineering • Lyles School of Civil Engineering, Purdue University, USA **USA**
Chairman		Dr.Mohamed M. Elkhatib		Dr.Ahmed Esmat	Dr. Mahmoud Ashery	Dr.Mohamed Elkhatib

INVITED TALKS

Day	Room	9:00 – 10:00	10:15 – 11:15	11:30 – 12:30	12:45 – 13:45	14.00 – 15.00	15:15 – 16.15
Wed 7/4	C	**Integrated Sensors: The synergistic combination of materials and microelectronics** Prof. Khalid Nabil Salama Associate Dean, Computer, Electrical and Mathematical Science and Engineering KAUST, Kingdom of Saudi Arabia **KSA**	**Low power approaches to communication and computing system design.** Prof. Ahmed El-tawil University of California Irvine, USA **USA**	**New Trends in Fractional-Order Circuits and Systems** Prof. Ahmed Madian Nile University, IEEE secretary, Egypt section Prof. Lobna Said Faculty of Engineering and Applied Science, Nile University (NU) **Egypt**	**AeroMACS: Overview of the Technology & Its Deployment Status** Prof. Mahmoud T. Elhadidi Emeritus Professor of Computer Networks Department of Electronics & Electrical Communications Engineering Cairo University **Egypt**	**Advancing Industry 4.0: Digital Transformation from Theory to Real-Life Applications** Prof. Abdel-Moez Bayoumi • Professor and Associate Dean • Director, Mc-Nair Aerospace Center • University of South Carolina, Columbia South Carolina, USA **USA**	**Revolutionizing Lyophilization As We Know It: A Chance to Lead** Dr. Ahmed M. Abdelraheem • Ph.D. in Electrical & Computer Engineering from Purdue University • Asst. Prof. Department of Electronics Engineering at the Military Technical College **Egypt**
Chairman		Dr.Mohamed Elkhatib					Dr.Mahmoud Abdelrhaman

The 19th International Conference on Aerospace Sciences & Aviation Technology (ASAT-19)
April 6-8, 2021, Cairo, Egypt

INVITED TALKS

Day	Room	9:00 – 10:00	10:15 – 11:15	11:30 – 12:30	12:45 – 13:45	14.00 – 15.00
Thu 8/4	C	**Introduction to The Egyptian Knowledge Bank (Ekb)** Mahmoud Dawood Head EKB training Sector Egypt	**How to get published** Abdallah Mohmoud Asad IOP Egypt section UK	**Geofacets: Helping Engineers & Geo-scientists everywhere to discover** Dr. Yasmin AbdelRaouf Country Ambassador | Elsevier Engineering Solutions UK	**Optical Rotation Sensors: Challenges and Opportunities** Prof. Diaa Khalil Formal Acting Dean Faculty of Engineering Ain Shames University Egypt	**On-Chip Dynamic Power Supplies for Mixed-Signal SoCs** Prof.Ayman Fayed • Professor, Director, Power Management Research Lab (https://pmrl.osu.edu/), • Dept. of Electrical & Computer Engineering, • The Ohio State University, Columbus, Ohio, USA USA
Chairman		Dr.Mohamed Elkhatib		Dr.Nabil Nagy	Dr.Mohamed Elkhatib	

ASAT-19
The 19th International Conference on Aerospace Sciences & Aviation Technology (ASAT-19)
April 6-8, 2021, Cairo, Egypt

The Fourth Industrial Revolution "Industry 4.0"Aerospace Technology and Skills Challenges

Date: Tuesday, April 6, 2021 Time: 9:00 – 11:15

Abstract
The fourth industrial revolution "Industry 4.0" (Germany, 2011), with its automation, digitization and exponential technologies will change the landscape of the industry. It is characterized by optimization and management of assets, sharing and security of big data, tracking parts from cradle to grave: the "Digital Thread", data analytics, Internet of Things (IoT) and Artificial Intelligence (AI). It is the transformation from physical to digital: the "Digital Twin" and from clusters to cloud computing. It is the "Democratization of Technology" where humans, computers, machines and products collaborate digitally and communicate seamlessly through integrated and optimized processes across the total product value stream both within an enterprise, and upstream (suppliers) and downstream (customers) of an enterprise. Industry 4.0 will be affecting the total enterprise: marketing, engineering, manufacturing, etc. in order to achieve a "Digital Smart Enterprise". The four main research areas to achieve a Digital Smart Enterprise are: vertical networking, horizontal integration, through engineering and disruptive technologies. Compared to the previous three revolutions, Industry 4.0 is characterized by: real-time connectivity, speed of implementation and culture change. Industry 4.0 will drive a major change in tomorrow's workforce. Despite the greater use of robotics and automation, there will be a net increase in jobs. Some companies will suffer from "technology unemployment", unless they retrain their workforce on Industry 4.0 skills at a rate faster than the technology introduction. Some jobs will disappear; hence companies have to protect their workforce and not the jobs. Educational institutions need to respond to Industry 4.0 needs, provide broader skill sets and close the gap in Information and Communication Technology (ICT) skills. There will be a need for "Industrial Data

Scientists" with strong ICT and AI skills, user interface design, advanced analytics, root-cause-analysis skills and statistical programming. In addition, there will be a need for "Robot Coordinators" to oversee robots and respond to malfunction and emergency maintenance tasks. Embedded E-Learning tools to be used in real world situations and ICT skills need to be integrated in all technicians, engineering and business curricula.

Speaker

Prof. Dr. Hany Moustapha

Professor and Director, Innovation 4.0 Hub and Aerospace 4.0TM Siemens' Chair on Industry 4.0 Technology Integration Pratt & Whitney Canada (P&WC) Chair on Propulsion System Design École de technologie supérieure (ÉTS), Québec University P&WC Senior Research Fellow Chevalier de l'Ordre national du Québec (CQ), Fellow of American Society of Mechanical Engineers (ASME), Canadian Academy of Engineers (CAE), Canadian Aeronautics and Space Institute (CASI).

B.Sc. from Cairo University (1970), M.Eng. and Ph.D. from McMaster University, Canada (1978). With Pratt & Whitney Canada (P&WC) from 1978 to 2010, Dr. Moustapha was Senior Manager of Technology, Collaboration and Technical Training Programs for P&WC from 1999 to 2009 and was named P&WC Senior Research Fellow in 2011. Joined ÉTS in 2010 as Professor and Director of Aerospace Programs (AEROÉTS).

ASAT-19
The 19th International Conference on Aerospace Sciences & Aviation Technology (ASAT-19)
April 6-8, 2021, Cairo, Egypt

Mobile Mapping Technology: Recent Advances and Proliferation in GNSS-Challenging Environments

Date: Tuesday, April 6, 2021 Time: 14:00 – 15:00

Abstract

The continuous developments in direct geo-referencing technology (i.e., integrated Global Navigation Satellite Systems – GNSS – and Inertial Navigation Systems – INS) and remote sensing systems (i.e., passive and active imaging sensors in the visible and infrared range – RGB cameras, hyperspectral push-broom scanners, and laser scanning) are providing the professional geospatial community with ever-growing opportunities to generate accurate 3D information with rich set of attributes. These advances are also coupled with improvement in the sensors' performance, reduction in the associated cost, and miniaturization of such sensors. Aside from the sensing systems, we are also enjoying the emerging of promising platforms such as Unmanned Airborne Vehicles (UAVs) and Unmanned Ground Vehicles (UGVs). This talk will provide an overview of recent advances in mobile mapping technologies and their ability to address a wide range of application domains. Imposed challenges by the proliferation of mobile mapping technologies in GNSS-challenging environments will be also discussed while highlighting potential approaches for the mitigation of the impact of lower accuracy of GNSS/INS trajectory on the mapping products.

ASAT-19
The 19th International Conference on Aerospace Sciences & Aviation Technology (ASAT-19)
April 6-8, 2021, Cairo, Egypt

Speaker

Prof. Ayman F. Habib

Thomas A. Page Professor in Civil Engineering Lyles School of Civil Engineering, Purdue University, USA

Dr. Habib is the Thomas A. Page professor of Civil Engineering at Purdue University and the Co-Director of the Civil Engineering Center for Applications of UAS for a Sustainable Environment (CECAUSE). He is also the Associate Director of Purdue University's Joint Transportation Research Program (JTRP). Dr. Habib's research interests span the fields of terrestrial and aerial mobile mapping systems. In this regard, he has been focusing on modeling the perspective geometry of non-traditional imaging scanners, automatic matching and change detection, automatic calibration of low-cost digital cameras, object recognition in imagery and point cloud data, LiDAR mapping, and integrating photogrammetric data with other sensors/datasets (e.g., GNSS/INS, GIS databases, multi- and hyper-spectral sensors, and LiDAR).

ASAT-19
The 19th International Conference on Aerospace Sciences & Aviation Technology (ASAT-19)
April 6-8, 2021, Cairo, Egypt

On-Chip Dynamic Power Supplies for Mixed-Signal SoCs

Date: Thursday, April 8, 2021 Time: 14:00 – 15:00

Abstract

The diminishing returns of semiconductor technology scaling in terms of power reduction is forcing the electronics industry to shift from the traditional approach of using a few centralized static power supplies to power a System-on-Chip (SoC) to a numerous distributed dynamic power supplies approach. In this approach, the SoC is divided into sub-components, each with its own independent on-chip power supply that is dynamically adapted to the real-time demand of each sub-component. As a result, the overall power consumption of the SoC can be significantly reduced. However, such approach requires a large number of dynamic on-chip power supplies, and it becomes quite challenging to implement them in a size- and cost-effective manner while also maintaining high power conversion efficiency, particularly in nanometer CMOS technologies where the voltage rating of transistors is quite low. This presentation discusses techniques used to implement a large number of on-chip dynamic power supplies in mixed-signal SoCs, including high-frequency buck converters with on-chip passives, and it introduces the multi-frequency multi-phase SIMO buck converter topology with on-chip outputs as an attractive method for designing dynamic on-chip power grids.

ASAT-19
The 19th International Conference on Aerospace Sciences & Aviation Technology (ASAT-19)
April 6-8, 2021, Cairo, Egypt

Speaker

Prof. Ayman Fayed

Ayman Fayed received his B.Sc. degree in Electronics & Communications Engineering from Cairo University in 1998, and his M.Sc. and Ph.D. degrees in Electrical & Computer Engineering from The Ohio State University in 2000 and 2004, respectively. From 2000 to 2009, he held several technical positions in the area of analog and mixed-signal design at Texas Instruments Inc., where he contributed to many product lines for wire-line, wireless, and multi-media devices. From 2000 to 2005, he was with the Connectivity Solutions Dept. at TI, where he worked on the analog frontend design of high-speed wire-line transceivers such as USB, IEEE1394b, and HDMI, and on fully integrated switching/linear regulators and battery chargers for portable media players. From 2005 to 2009, he was a member of the technical staff with the wireless analog technology center at TI, where he worked on delta-sigma data converters for various wireless standards, and on the development of fully-integrated power management solutions for mixed-signal SoCs with multi-RF cores in nanometer CMOS. Dr. Fayed joined the Dept. of Electrical & Computer Engineering at Iowa State University in 2009, where he held the Northrop Grumman Assistant Professorship. He then joined the Dept. of Electrical & Computer Engineering at The Ohio State University in 2015, where he is currently a professor. He is the founder and director of the Power Management Research Lab (PMRL) and his current research interests include on-chip power supplies for dynamic energy distribution in VLSI systems, high-frequency switching regulators with on-chip and on-package passives for SoCs, low-noise power supplies and power supply modulators for analog and RF circuits, energy-harvesting circuits for power-restricted & remotely-deployed devices/systems, and analog/mixed-signal and power converter design in SiC and GaN technologies. He is currently an associate editor for IEEE TCAS-I and previously for TCAS-II, and serves in the technical program committee of RFIC, ISCAS, APEC, and the steering committee of MWSCAS. He is the author/co-author of many publications in the field and holds 8 US patents. Dr. Fayed is a recipient of NSF CAREER Award in 2013, and a co-recipient of the 2015 Darlington Best Transactions Paper Award from the IEEE Circuits and System Society. Dr. Fayed is a senior member of IEEE.

ASAT-19
The 19th International Conference on Aerospace Sciences & Aviation Technology (ASAT-19)
April 6-8, 2021, Cairo, Egypt

Optical Rotation Sensors: Challenges and Opportunities.

Date: Thursday, April 8, 2021 Time: 12:45 – 13:45

Abstract
Optical rotation sensors are key elements in many strategic applications due to their very high performance however, the practical implementation of these sensors are usually limited to specific countries because of the restriction and availabilities of components with high end performance. Recently there have been many research directions that targets to overcome these restrictions and to develop relatively high end optical gyroscopes using on the shelf components. The objective of this talk is to scan these directions to illustrate the potential directions in this field as well as the challenges to be faced on both the theoretical and practical levels. The techniques investigated in this direction will be discussed supported by the experiments developed for this purpose. The study will cover the different technologies in this domain including the Fiber optic Gyro, the Ring laser gyro and also the integrated optic gyroscope. The basic theory as well as the main features of the technology will be addressed emphasizing on their effects on the sensor performance and its compatibility with the target application.

Speaker

Prof. Diaa Khalil

Prof. Diaa Khalil has over 35 years of experience in micro photonics systems, including integrated optoelectronics and optical MEMS technology. He obtained his PhD from INPG France in 1993.
Diaa Khalil is a Professor of photonics in the Faculty of Eng., Ain Shams University since 2004. In 2015 He was the Head of the ECE Dept., and in 2017 He

became the Vice dean of Research and Post Graduate. From 2019 to Feb. 2021, He was the Acting dean of the School of Engineering. He is leading a group of scientists working in the fields of Photonic microsystems. He supervised more than 60 MSc and PhD thesis in the fields of: Optics, Opto-electronics, Applied Spectroscopy, Optical MEMS and integrated Optics.

Diaa Khalil was also the CTO of the Optical MEMS Division in Si-Ware Systems from 2007 - 2020, leading a group of talented engineers developing an innovative FTIR MEMS spectrometer, a unique product that gained the Prism award in the Photonics West conference 2014 in SF USA. Prior to joining SWS, he worked with MEMScAP company as the head of the optical MEMS design group where he led the design and characterization of a 2×2 switch, and introduced a novel VOA (variable Optical Attenuator) achieving the world record of minimum PDL reported for wide dynamic range. Prof. Diaa Khalil is a holder of the Egyptian state incentive prize in engineering sciences in 1998. He is a senior member in the OSA, the SPIE, the IEEE Photonic Society, and URSI. He is currently the head of commission D in the National URSI committee, in Egypt. He is also a member in the editorial board of the journal, "Light: Science and Applications - Nature Publishing Group NPG. He is inventor of about 20 granted international patents and more than 10 other patent applications. He is author and co-author of more than 320 publications, in international journals and conferences, in addition to 3 book chapters and 1 ebook published by SPIE.

ASAT-19
The 19th International Conference on Aerospace Sciences & Aviation Technology (ASAT-19)
April 6-8, 2021, Cairo, Egypt

Egyptian Space Agency: National Space Program and the Related Space Activities

Date: Tuesday, April 6, 2021 Time: 11:30 – 12:30

Abstract

The Egyptian Space Agency was established in January 2018. According to the executive law no. 3 for the for 2018, The agency aims to create, transfer, localize, and develop space science and technology and possess the own capabilities to build satellites and launch them from the Egyptian lands in a manner that serves the country's strategy in the fields of development and achievement of the national security. The Agency is both legislative and executive body for space activities in Egypt. National Space Program was approved from the board of director in March 2020. The technical projects are carefully selected and planned to execute the national space program. The projects covers the six axes of the national space program which are capacity building, space systems, industrial development and infrastructure, space exploration, international cooperation, and legal and space standards. The present paper presents the current activities which include the technical and non-technical projects.

Speaker

Mohammed Khalil Ibrahim Iraqi

EgSA
وكالة الفضاء المصرية
Egyptian Space Agency

Egyptian Space Agency

ASAT-19
The 19th International Conference on Aerospace Sciences & Aviation Technology (ASAT-19)
April 6-8, 2021, Cairo, Egypt

How to get published.

Date: Thursday, April 8, 2021 Time: 10:15 – 11:15

Abstract
It is targeted at mainly Early Career Researchers with the aim of educating them about all aspects of publishing in journals, right the way through from choosing the right journal to promoting a paper after it is published. The main sections of the presentation are:

- Introduction to IOP and IOP journals
- Why publish at all?
- Choosing your journal
- Writing your paper
- Peer review process
- Publication ethics
- Post-acceptance
- Post-publication.

Speaker

Abdallah Mahmoud Asad

Abdallah Asad is currently working as "Regional Manager – Middle East and North Africa" for IOP Publishing, with more than 8 years of sales and training experience in academic publishing. He has conducted more than 100 platform, product and Guide to Getting Published sessions.

IOP Publishing

ASAT-19
The 19th International Conference on Aerospace Sciences & Aviation Technology (ASAT-19)
April 6-8, 2021, Cairo, Egypt

Geofacets: Helping Engineers & Geo-scientists everywhere to discover.

Date: Thursday, April 8, 2021 Time: 11:30 – 12:30

Abstract

- Agenda:
- What is Geofacets and how does it work?
- Search using Geofacets & Overlay Maps
- Reading Geoscience Papers
- Building Maps
- Use Case
- Practical Demo

Speaker

Dr. Yasmin AbdelRaouf

Dr. Yasmin AbdelRaouf is the country ambassador for Egypt covering Elsevier Engineering and Geo-science solutions (Engineering Village – Geofacets – Knovel). Dr. Yasmin has organized on-site & online training workshops for universities and research institutes in Egypt as part of the Egyptian Knowledge Bank initiative. Dr. Yasmin AbdelRaouf is an assistant professor in Faculty of Engineering Cairo University where she received her bachelor and masters degrees in Chemical Engineering. She received her PhD in Civil Engineering from University of New South Wales (UNSW) in Australia in 2017.

ASAT-19
The 19th International Conference on Aerospace Sciences & Aviation Technology (ASAT-19)
April 6-8, 2021, Cairo, Egypt

Introduction to The Egyptian Knowledge Bank (Ekb)

Date: Thursday, April 8, 2021 Time: 9:00 – 10:00

Abstract
EKB is one of the largest projects initiated by the Egyptian presidency under the patronage of his Excellency president Abdel Fattah Al-Sisi. This project main concern is enhancing the Scientific Research, Education and General Literacy by availing content from the most well-known publishers all over the globe to all Egyptians in Egypt for free. It can be accessed at any time and from anywhere. It has many general resources trying to reach out for the general public with easy and attractive pieces of information that is well reviewed. It has also specialized resources targeting specific specialties giving them the moil. Updated research information that they need to excel in their field. Full text resources were difficult to be reached by most of researchers where now using EKB made this reachable even from the researcher home. Also, citation and bibliographic databases are available to help researchers reach the best journals and articles in their field of interest. Regarding Basic Education, EKB availed many resources in different formats to allow students to study and understand better through videos, images, animations and many other formats. The target is to link what Students team in school with the real world to get them excited about education. To help in achieving the best use of the above content, tools and software's are provided to EKB users to utilize the best benefit of the EKB. One of the boil outputs of the EKB is the "Local System of Egyptian Scientific Output" with its different platforms serving the multiple functions required by the scientific community. Many specialized workshops like "Essentials of Leadership ", "Writing a Successful Research Grant Proposal", "Writing and Publishing a Research Article" and many more are being undertaken to young researchers to help them build their future in the scientific world. A lot of specialized projects are being done under the umbrella of the EKB like the "Egyptian Universities International

Ranking Project", "Medical Education Project" and more. The EKB Learning Management System" is currently used in all governmental schools targeting Secondary one as a Mart and preparing to go for all grades to help students and engage them more by adding the modem technology in their education system to help them be more organized to get better results. One of the biggest achievements of the EKB is the Arabic Citation Index which will help researchers to reach the Arabic scientific output in a better and easier way.

Speaker

Mahmoud Dawoud

Mahmoud Dawoud has been involved in the Academic sector moil of his life from being a mailer's degree student to a certified trainer for many high prestigious academic and scientific publishers. He started his career in the academic field as a trainer for scientific and academic publishers to train their users in Egypt, Africa and some Arab world countries on how to effectively use these publishers' platforms to find the required scientific information and use them in their researches and has gained a big experience in how to communicate with researchers from being doing so for 24 years. He also trains on the best methods to write and arrange scientific papers using the moil known citation managers in the scientific field. He enjoys being able to help scientists in their scientific research to give us a better world.

ASAT-19
The 19th International Conference on Aerospace Sciences & Aviation Technology (ASAT-19)
April 6-8, 2021, Cairo, Egypt

New Trends in Fractional-Order Circuits and Systems.

Date: Wednesday, April 7, 2021 Time: 11:30 – 12:30

Abstract

Optical rotation sensors are key elements in many strategic applications due to their very high performance however, the practical implementation of these sensors are usually limited to specific countries because of the restriction and availabilities of components with high end performance. Recently there have been many research directions that targets to overcome these restrictions and to develop relatively high end optical gyroscopes using on the shelf components. The objective of this talk is to scan these directions to illustrate the potential directions in this field as well as the challenges to be faced on both the theoretical and practical levels. The techniques investigated in this direction will be discussed supported by the experiments developed for this purpose. The study will cover the different technologies in this domain including the Fiber optic Gyro, the Ring laser gyro and also the integrated optic gyroscope. The basic theory as well as the main features of the technology will be addressed emphasizing on their effects on the sensor performance and its compatibility with the target application. Fractional calculus has been proved through numerous research examples to be a superior tool for system description than the narrow integer order domain. This is achieved through the extra parameters introduced via allowing the differential or integral orders to take non-integer values. The promising capabilities of fractional-order devices challenge the research to find a way to simulate its behavior until its off-shelf appearance. Diferent integer order approximation techniques to the fractional-order transfer functions are investigated in the literature. The main idea behind approximating the fractance device is to achieve a nearly constant phase response of the impedance. There are many categories of fractional order system approximations in analog and digital domains. Research in circuits and systems using fractional-order elements is con-

sidered as an interdisciplinary topic. It serves many areas of applications such as electrical engineering, medicine, physics, control system, chaos theory signal processing, and bio-impedance. In bioengineering, conventional lumped element circuit models of tissue were extended as fractional-order generalization through modification of the defining current-voltage relationships. Such fractional-order models provide an improved description of observed bio-impedance behavior. Electrical impedance measurements have been widely used to estimate plant health, maturity of fruits, fruit damages, and structural cellular variation during fruit ripening, freeze or chill damages, and measurement of tree root growth. These analyses may be used in the field of importing and exporting fruits and vegetables. Generalizing the chaotic system to the fractional-order domain increases the rate of complexity level and provides more degrees of freedom in both the time and the frequency domain. In order to get higher performance, fractional-order has emerged in diferent chaotic systems. The fractional-order chaotic systems increase the chaotic behavior in new dimensions and add extra degrees of freedom, which increases system controllability. Fractional-order chaotic systems parameter identification is an essential issue in chaos control and synchronization process.

Speaker

Prof. Ahmed Madian

Ahmed Madian (SM'12) received his Ph.D. and M.Sc. degrees from Cairo University, Egypt, in 2007 and 2002, respectively. He is currently Professor at the Department of Electronics and computer Engineering, Faculty of Engineering and applied science, NILE University, Giza, Egypt. He is the director of Microelectronics System Design Master Program since sept. 2015. Also, He is the

director of Nanoelectronics Integrated System Design Research center (NISC) since 2016. He has published more than 150 papers in international conferences and journals. His H-index is currently 20. Also, he served in the many technical and organizing committee of many international conferences. He received many research grants as Principle Investigator (PI), CO-PI, or Consultant from different national/international organizations. He won the best researcher award (Dr. Hazem Ezzat award 2017) for his outstanding research profile. His research interests are in circuit theory; low-voltage analog CMOS circuit design, current-mode analog signal processing, Memristors, Fractional systems, VLSI, Encryption systems and mixed/ digital applications on field programmable gate arrays. Also, he is member of the national radio of science committee (NRSC) since 2018. Dr. Madian is actively serving as a reviewer in several journal and conference publications including IEEE conferences and journals. He served as guest associate editor for many international journals. He is the founder of IEEE Circuits and systems (CASS) Egypt technical chapter and co-founder of the IEEE Robotics and automations (RAS) Egypt technical chapter. He is currently the IEEE Egypt Section Secretary and member of Ex-COM.

Speaker

Assistant Prof./ Lobna A. Said

Lobna A. Said (Senior Member IEEE 2020) is a full-time Assistant Professor at the Faculty of Engineering and Applied Science, Nile University (NU). She received the B.Sc., the M.Sc., and the Ph.D. degrees in electronics and electrical communications from Cairo University, Egypt, in 2007, 2011, and 2016, respectively. She has over 100 publications distributed between high-impact journals, confer-

ences, and book chapters. Her research interests are interdisciplinary, including modeling, control, optimization techniques, and analog and digital integrated circuits, fractional-order circuits and systems, non-linear analysis, and chaos theory. She was involved in many research grants as a Senior Researcher/ Member such as JESOR-ASRT "wireless monitoring of fruit growth using an electrical bio-impedance sensor device," or STDF "Two Port Fractional-Order Oscillators and Filters Suitable for Tissue Modeling," or as a Co-PI as JESOR-ASRT "Smart Agriculture in the Internet Of Things Era,". She is the Vice-Chair of research activities at the IEEE Computational Intelligence Egypt Chapter 2018-present. She is the Counselor of the IEEE NU student branch 2018-present. She won the state encouragement award for the year 2019. She has received the Excellence Award from the Center for the Development of Higher education and Research in 2016. She is the winner of the Dr. Hazem Ezzat Prize for outstanding researcher, NU 2019, and 2020. She is one of the top 10 researchers at NU for 2018-2019 and 2019-2020. Her name was in the Top 2% Scientists According to Stanford Report for 2019, released in 2020. In 2019, she was selected as a member of the Egyptian Young Academy of Sciences (EYAS). In 2020, she was elected as the Co-Chair of EYAS. In 2020, she was selected to be an affiliate member of the African Academy of Science (AAS). In 2020, she was also chosen to be a Member of the Arab-German Young Academy of Sciences and Humanities (AGYA). Additionally, she is on the technical program committee for many International Conferences.

ASAT-19
The 19th International Conference on Aerospace Sciences & Aviation Technology (ASAT-19)
April 6-8, 2021, Cairo, Egypt

Low power approaches to communication and computing system design.

Date: Wednesday, April 7, 2021 Time: 10:15 – 11:15

Abstract
In this talk we discuss approaches to low power design for advanced communication and computing platforms. Specifically, we present the concept of cognitive power management, where contrary to common approaches that assume a 100% error free hardware, the algorithm is made aware of the statistical error performance of the underlying hardware platform. By accounting for hardware errors at the system level, the explorable power management design space is significantly expanded, leading to novel power saving schemes that deliver expected application performance at much lower power consumption. Sample case studies including LTE system design and in-memory computing platforms will be presented and discussed.

Speaker **Prof. Ahmed M. Eltawil**

Ahmed M. Eltawil has been a Professor at King Abdullah University of Science and Technology (KAUST) since 2019. Prior to that he was with the Electrical Engineering and Computer Science Department at the University of California, Irvine (UCI) since 2005. He is the founder and director of the Communication and Computing Systems Laboratory (CCSL) at KAUST and the inaugural founder and director of the Wireless Systems and Circuits Laboratory at UCI. His current research interests are in the general area of smart and connected systems with an

emphasis on mobile systems. He received the Doctorate degree from the University of California, Los Angeles, in 2003 and the M.Sc. and B.Sc. degrees (with honors) from Cairo University, Giza, Egypt, in 1999 and 1997, respectively. Dr. Eltawil has been on the technical program committees and steering committees for numerous workshops, symposia, and conferences in the areas of low power computing and wireless communication system design. He received several awards, as well as distinguished grants, including the NSF CAREER grant supporting his research in low power computing and communication systems. He is a senior member of the IEEE and a senior member of the National Academy of Inventors, USA.

ASAT-19
The 19th International Conference on Aerospace Sciences & Aviation Technology (ASAT-19)
April 6-8, 2021, Cairo, Egypt

Integrated Sensors: The synergistic combination of materials and microelectronics

Date: Wednesday, April 7, 2021 Time: 9:00 – 10:00

Abstract
In this talk we will present the design and implementation of monolithic and hybrid sensors using integrated circuits. We will discuss the advantages and shortcomings of sensors built in silicon-based fabrication processes and examine, in detail, their integrated circuit topologies. Next, we will provide a comprehensive study of the design and analysis of CMOS integrated image sensors, integrated biosensors, and electronic backbone of MEMS hybrid sensors. We will conclude with a survey of advanced research topics in the area of integrated sensors such as smart sensors, RF-IDs, and nano sensors.

Speaker

Prof. Khaled Nabil Salama

Prof. Khaled Nabil Salama is a full professor and associate dean of the Computer, Electrical, mathematical Science and Engineering Division at King Abdullah University of Science and Technology (KAUST). He received the B.S. degree from the Department Electronics and Communications, Cairo University, Cairo, Egypt, in 1997, and the M.S. and Ph.D. degrees from the Department of Electrical Engineering, Stanford University, Stanford, CA, USA, in 2000 and 2005, respectively. He was an Assistant Professor at Rensselaer Polytechnic Institute, NY, USA, between 2005 and 2009. He joined KAUST in January 2009 and was the founding Program Chair until August 2011. Currently, he is the director of the KAUST

SENSORS INITIATIVE a consortium of 9 universities (KAUST, MIT, UCLA, GATECH, Brown University, TU Delft, Swansea University, the University of Regensburg and the Australian Institute of Marine Science). In addition, he is the chair of winter enrichment program (WEP) for two consecutive years (2020–2021) at KAUST. His work on CMOS sensors for the National Institutes of Health (NIH) and the Defense Advanced Research Projects Agency (DARPA) was awarded the Stanford–Berkeley Innovators Challenge Award in biological sciences and was acquired by Illumina Inc. He is the author of 300 publications and the inventor/co-inventor of 49 issued US patents on low-power mixed-signal circuits for intelligent fully integrated biosensors.

ASAT-19
The 19th International Conference on Aerospace Sciences & Aviation Technology (ASAT-19)
April 6-8, 2021, Cairo, Egypt

Advancing Industry 4.0: Digital Transformation from Theory to Real-Life Applications

Date: Wednesday, April 7, 2021 Time: 14:00 – 15:00

Abstract
Industries across the world are realizing the benefits of Industry 4.0 and the University of South Carolina has been using Digital Transformation to transform processes in multiple industries. The University of South Carolina has established a roadmap for implementing Digital Transformation and will introduce multiple use cases that can be used in real-world applications from an idea, to a design, to a manufacturing process, to operations and to maintenance and repairs.

Speaker **Prof. Abdel-Moez Bayoumi**

Dr. Bayoumi has about 40 years teaching, research and industry experience. He is currently the Director of the McNair Aerospace Center, Director of the Center for Predictive Maintenance, Associate Dean for Corporate Relations and Professor of Mechanical and Biomedical Engineering. Prior to joining USC, he was Professor of Mechanical and Aerospace Engineering at North Carolina State University, a project manager at Hewlett-Packard Company, and Professor of Mechanical and Materials Engineering at Washington State University. He has been actively involved in developing strong programs in mechanical, biomedical, nuclear and aerospace engineering. His research activities have been focused in mechanical behavior of materials, tribology, diagnosis and prognosis and life predictions of mechanical systems, manufacturing processes, and health monitoring systems, condition-based maintenance, and digital transformation. Dr. Bayoumi has received more than $40 M in funding from the US Department of Defense, NASA, US Department of Energy, US National Science Foundation and various US industries. He has published over 150 journal and conference papers.

ASAT-19
The 19th International Conference on Aerospace Sciences & Aviation Technology (ASAT-19)
April 6-8, 2021, Cairo, Egypt

Trade-Off Analysis of Low Earth Orbit Spacecraft Power Supply System by Genetic Algorithm

Date: Tuesday, April 6, 2021 Time: 12:45 – 13:45

Abstract

The spacecraft electrical power system design process is a very complex task, it depends on multiple issues, which will have a great effect on the trade-off analysis of designing Spacecraft Electrical Power System, it should also meet various design objectives under certain constraints. The main goal of designing the spacecraft power supply system is to reach the optimal solution from the available technologies, which is used in the power system configuration. Power supply subsystem components under study are the solar cells, configuration of solar arrays, technology of batteries, and bus voltages. This workshop discusses some important issues such as automation, intelligent design and trade-off processes of the Spacecraft Electrical Power System implemented by the practical design processes using GENETIC ALGORITHM. The new method reflects that simulation and optimization techniques can be effectively used for improving and automating the designing method. Multi-objective of optimal design solutions unnaturally evolved in the result of the interfacing with Genetic algorithm techniques with system sizing or examination tools under the supervision of the practical constraints.

ASAT-19
The 19th International Conference on Aerospace Sciences & Aviation Technology (ASAT-19)
April 6-8, 2021, Cairo, Egypt

Speakers

Ahmed Mokhtar

Received a B.S. in Engineering from Military Technical College, Cairo in 2005. Completed Master degree in 2017, currently a PhD candidate since 2021. Worked in the field of aeronautics since graduation and currently working in the field of space specialized in satellite power supply systems.

Ahmed M. Mahareek

Received a B.S. in Engineering from faculty of electronic engineering, alminofyia in 2013. Worked in the field of industrial electronics since graduation and currently working in the field of space specialized in electrical tests.

Hossam H. Kenawy

Received a B.S. in Engineering from faculty of electronic engineering, alminofyia in 2015. Worked in the field of industrial electronics since graduation and currently working in the field of space specialized in electrical tests.

ASAT-19
The 19th International Conference on Aerospace Sciences & Aviation Technology (ASAT-19)
April 6-8, 2021, Cairo, Egypt

AeroMACS: Overview of the Technology & Its Deployment Status

Date: Wednesday, April 7, 2021 Time: 12:45 – 13:45

Abstract
In 2007, a study by the International Civil Aviation Organization (ICAO) has recommended the use of WiMAX as the technology of choice for the future airport communications system. During the same year, the ITU-WRC-07 has allocated the frequency spectrum: 5091-5150 MHz for the new technology, what was named: Aeronautical Mobile Airport Communications System (AeroMACS). Since then, developments took place continuously and rapidly, paving the way for AeroMACS to become the predominant communication technology adopted by modern airports. In this presentation we highlight the issues that motivated the quest for a new airport communications system, the reasons for choosing WiMAX as the parent technology of AeroMACS, and the main technical features of AeroMACS. We also review the major benefits of using AeroMACS and the current status of its deployment worldwide.

Speaker **Prof. Mahmoud T. El-Hadidi**

Dr. Mahmoud T. El-Hadidi was born in Giza (Egypt) on 18 May 1952. He received his B.Sc. and M.Sc. in Electrical Engineering from Cairo University in July 1973, and October 1975, respectively. He pursued his studies at Princeton University (New Jersey – USA), from which he obtained his M.A. and Ph.D. in Electrical Engineering, in October 1977 and October 1979, respectively. During the period October 1979 till September 1980, Dr. El-Hadidi was a visiting researcher at C & C Central Research Laboratories of NEC (Kawasaki City, Japan). He joined the Teaching Staff

at the Department of Electronics and Elec. Communications Engineering (EECE) in Cairo University since October 1980, where he assumed the positions of Assistant Professor (in 1980), Associate Professor (in 1985), and Professor (in 1992). During the period August 2009 till July 2012, Dr. EL-HADIDI was appointed as the Head of EECE Department. Dr. El-Hadidi's areas of interest cover a wide scope, including: Modeling and Analysis of Computer Networks, Modeling and Analysis of Telephone Networks, Wireless Networks, and Information Security. He has been the national representative of Egypt in Technical Committee 11 (TC11) of IFIP from 1995 till 2006. In 2002, Dr. El-Hadidi organized the 17th International Conference on Information Security, sponsored by IFIP, and served as its Secretary General. He has also helped organizing the series of International Conferences on Information and Communication Technology (ICICT) - sponsored by the Information Technology Institute (ITI) in Egypt – from 2003 till 2010, where he has served as its Secretary General and Technical Program Chair. Starting 2012 Dr. El-Hadidi was selected as a member of the National Radio Science Committee (NRSC) – affiliated with the Egyptian Academy for Scientific Research and Technology (ASR&T), where he currently serves as its Vice-Chair. He is also a member of International Union of Radio Science (URSI). Dr. El-Hadidi contributed more than 120 publications, ranging from books, technical reports, journal papers, conference papers, and short courses. In addition, Dr. El-Hadidi has been active as a consultant for the Egyptian Government and the Egyptian private sector, in relation to many computer network projects. Among these are: Ministry of Education (MOE), Ministry of Housing (MOH), Egyptian Universities Network (EUN), Housing and Building Research Center (HBRC), Egyptian Organization for Standards (EOS), National Telecommunication Institute (NTI), the Computer Network for Engineering Libraries (CNEL), Cairo Governorate, and others. Most recently, Dr. El-Hadidi has supervised the design and implementation of the information network for the New Central Library of Cairo University, the information network for the Egyptian National Railway (ENR), and the modernization of the information network for Al-Azhar Tunnel.

ASAT-19
The 19th International Conference on Aerospace Sciences & Aviation Technology (ASAT-19)
April 6-8, 2021, Cairo, Egypt

Revolutionizing Lyophilization as we know It: A Chance to Lead

Date: Wednesday, April 7, 2021 Time: 15:15 – 16:15

Abstract
The need for mass-produced injectable pharmaceutical products is growing massively especially with the most recent unfortunate pandemic of COVID-19. In 2019, the lyophilization equipment market exceeded USD 5 billion. Rising demand for lyophilized products and technological advancement in lyophilization methods are the major market driving forces. In its current form utilized in industry, lyophilization has not encountered a major change in the method since the 1960s. The process is still batch-based and has a very poor energy efficiency (~5%). In this talk, we present a key contribution that carries a lot of potential for the process of lyophilization, namely RF/RF-assisted lyophilization. A new method for conducting RF/RF-assisted lyophilization is presented that is directly applicable to the pharmaceutical and biological industry sectors. This would not only boost the process efficiency and reduce the time to market, but also enable the continuous process as opposed to the current batch-based process.

Speaker

Dr. Ahmed M. Abdelraheem

Ahmed M. Abdelraheem is a faculty member at the Department of Electronics Engineering at the Military Technical College, Egypt. He received his B.Sc. and M.Sc. degrees in Electrical & Computer Engineering from the Military Technical College in 2009 and 2015, respectively, and his Ph.D. in Electrical & Computer Engineering from Purdue University in 2020. Dr. Abdelraheem is a recipient of the IEEE

IMS Flexible Energy Harvesters Design Competition Award in 2018. He is a co-recipient of the Egyptian Ministry of Defense (MoD) research grant. He authored and co-authored several research papers and contributed as a speaker/invited speaker in multiple international conferences. His current research is focused on bringing new electromagnetic techniques to the industry. He is the lead inventor in three US patents that brings new electromagnetic methods to enhance multiple industrial sectors that include, but not limited to, pharmaceutical and biological industries, wireless monitoring of industrial processes in harsh environments, and controlled industrial electromagnetic heating.

ASAT-19
The 19th International Conference on Aerospace Sciences & Aviation Technology (ASAT-19)
April 6-8, 2021, Cairo, Egypt

SCIENTIFIC SESSIONS

Session - Room	Subject	Day	Time	Paper ID	Paper Title	Session Board
S1-A	aerospace structures	06/04/2021	11:30 - 12:30	001_ASAT19	Dimensional structural mass optimization of forged steel connecting rod for aircraft piston engine	Brig. Prof. Mahmoud Yahia, MTC, Cairo, Egypt. Col. Assoc. Prof. Mohamed Zakria, MTC, Cairo, Egypt. Lt. Co. Assoc. Prof. Ashraf Kamal, MTC, Cairo, Egypt.
				002_ASAT19	Static and modal analysis of sine-wave-shaped spar	
				003_ASAT19	Vibration analysis of composite wing with geometric and material coupling	
				004_ASAT19	Numerical simulation of temperature field in a C/C composite multidisk brake during aircraft braking	
			12:45 - 1:45	005_ASAT19	Stress analysis of multi-layered composite cylinders subjected to various loadings.	
				006_ASAT19	Effect of damping material thickness on vibration analysis in pretension layer damping process	
				007_ASAT19	Vibration damping of aircraft propeller blades using shunted piezoelectric transducers	

SCIENTIFIC SESSIONS

Session - Room	Subject	Day	Time	Paper ID	Paper Title	Session Board
S2-A	Communications and Networks	06/04/2021	14:00 - 15:00	008_ASAT19	Design of a smart energy efficient IoT wireless node	Col. Assoc.Prof. Tamer Nabil MTC, Cairo, Egypt. Col. Assoc.Prof. Mahmoud Karm MTC, Cairo, Egypt. Assoc.Prof. Mohamed Hussein, MTC, Cairo, Egypt.
				009_ASAT19	Comparative study between cognitive radio techniques in FM broadcasting band	
				010_ASAT19	A satellite-based quantum key distribution using decoy-state protocol	

ASAT-19
The 19th International Conference on Aerospace Sciences & Aviation Technology (ASAT-19)
April 6-8, 2021, Cairo, Egypt

SCIENTIFIC SESSIONS

Session - Room	Subject	Day	Time	Paper ID	Paper Title	Session Board
S3-B	Image Processing/Remote sensing	06/04/2021	11:30 - 12:30	011_ASAT19	Enhanced image encryption algorithm by quantum key distribution	Maj. Gen. Prof. Fawzy Eltohamy MTC, Cairo, Egypt. Brig. Prof. Mohamed Samir MTC, Cairo, Egypt. Brig. Prof. Sherif Elgamel MTC, Cairo, Egypt
				012_ASAT19	SAR image formation enhancement using effective velocity estimation method	
				013_ASAT19	Frequency analysis of SAR system design for small satellite	
			12:45 - 1:45	014_ASAT19	Updating land use and land cover classes of Blue Nile basin using landsat-8 images	
				015_ASAT19	Assessment of top of atmosphere reflectance generation algorithm for world view-2 high resolution images	
				016_ASAT19	Hybrid fusion using Gram Schmidt and Curvelet transforms for satellite images	

ASAT-19
The 19th International Conference on Aerospace Sciences & Aviation Technology (ASAT-19)
April 6-8, 2021, Cairo, Egypt

SCIENTIFIC SESSIONS

Session - Room	Subject	Day	Time	Paper ID	Paper Title	Session Board
S5-A	Aerospace Materials	07/04l/2021	9:00 - 10:00	020_ASAT19	Effective electromagnetic interference shielding using polyurethane / graphite composite foam materials	Brig. Prof. Ahmed Barka MTC, Cairo, Egypt Brig. Prof. Mohamed Gobara MTC, Cairo, Egypt. Col.Prof. Sherif El-basuney MTC, Cairo, Egypt.
				021_ASAT19	Parametric optimization of non-prismatic micro-plates to reduce stiffening and curling initiated during fabrication	
			10:15 - 11:15	022_ASAT19	On the effect of post-processing techniques of the additively manufactured aluminum alloy parts	
				023_ASAT19	Factors affecting Failure mode and load of rubber polyester composite joint	
				024_ASAT19	Water recycling system based on adsorption by activated carbon synthesised from c. verum for space exploration; an estimated design	

SCIENTIFIC SESSIONS

Session - Room	Subject	Day	Time	Paper ID	Paper Title	Session Board
S6-A	Aerospace Materials	07/04l/2021	10:15 - 11:15	025_ASAT19	An investigation of plasma sprayed nickel-based and pure aluminum coatings on austenitic stainless steel AISI 304	Brig. Prof. Ahmed Barka MTC, Cairo, Egypt Brig. Prof. Mohamed Gobara MTC, Cairo, Egypt. Col.Prof. Sherif El-basuney MTC, Cairo, Egypt.
				026_ASAT19	Studying the distribution of hardness values in friction drilled 7075 Al-alloy sheets at different conditions	
				027_ASAT19	Low thermal emissivity coating based on aluminium / acrylic composite coatings	
			12:45 - 1:45	028_ASAT19	Enhancement of carbon fiber/ epoxy composite electrical, optical and thermal properties by using different types of nano-additives.	
				029_ASAT19	Non-destructive aerial and terrestrial analysis of uranium isotopic activity by sensitive γ-spectrometer for El-Sella site	
				030_ASAT19	Investigation of foamcrete mechanical and physical properties	

SCIENTIFIC SESSIONS

Session - Room	Subject	Day	Time	Paper ID	Paper Title	Session Board
S7-A	Energetic Materials/Aerospace Thermophysics	07/04/2021	2:00 - 3:00	031_ASAT19	On the unsteady behaviours of the adiabatic endwall film cooling effectiveness	Maj. Gen. Prof. Hossam Elsaid Mostafa MTC, Cairo, Egypt Brig. Prof. Ahmed Barka MTC, Cairo, Egypt Brig. Prof. Chesham Ramzy Tantawy MTC, Cairo, Egypt
				032_ASAT19	Enhancing the propulsion characteristics of rockets by adding the energetic Ni-tro-hydroxyl-terminated polybutadiene	

SCIENTIFIC SESSIONS

Session - Room	Subject	Day	Time	Paper ID	Paper Title	Session Board
S4-B	Renewable Energy	06/04/2021	2:00 - 3:15	017_ASAT19	Output power boosting of a photovoltaic panel based on various back pipe structures: a computational study	Maj. Gen. Prof. Moahmed Amin MTC, Cairo, Egypt. Brig. Prof. Ali Elmahi MTC, Cairo, Egypt. Brig. Prof. Ayman Gomma MTC, Cairo, Egypt.
				018_ASAT19	Numerical investigation of four photovoltaic/thermal integrated structures from energetic point of view	
				019_ASAT19	Comparison of dust and high-temperature effects on mono and poly photovoltaic panels	

ASAT-19
The 19th International Conference on Aerospace Sciences & Aviation Technology (ASAT-19)
April 6-8, 2021, Cairo, Egypt

SCIENTIFIC SESSIONS

Session - Room	Subject	Day	Time	Paper ID	Paper Title	Session Board
S8-B	Guidance, Navigation and Control	07/04l/2021	9:00 - 10:00	033_ASAT19	Acoustic threat detection and direction finding system	Brig. Prof. Mamoud Ashry MTC, Cairo, Egypt Col. Prof. Ahmed Taimour MTC, Cairo, Egypt Col.Prof. Mohamed Atef MTC, Cairo, Egypt .
				034_ASAT19	Tactics Overview for Implementing High-Performance Computing on Embedded Platforms	
				035_ASAT19	Modelling and simulation of two axes gimbal fuzzy PI stabilization system in the presence of feedback sensors noise	
			10:15 - 11:15			

ASAT-19
The 19th International Conference on Aerospace Sciences & Aviation Technology (ASAT-19)
April 6-8, 2021, Cairo, Egypt

SCIENTIFIC SESSIONS

Session - Room	Subject	Day	Time	Paper ID	Paper Title	Session Board
S9-B	Guidance, Navigation and Control	07/04/2021	11:30 - 12:30	036_ASAT19	Performance comparison among popular implementations of H.264 encoders	Maj. Gen Prof. Ibrahim Elsherif MTC, Cairo, Egypt. Col. Assoc.Prof. Hossam Hendy MTC, Cairo, Egypt Lt. Col. Assoc. Prof. Mohammed Abozied MTC, Cairo, Egypt
				037_ASAT19	Modelling and transient response study of hydraulic servo actuator	
			12:45 - 1:45	038_ASAT19	Modeling, simulation and controller design for a typical bent axis electrohydraulic servo motor	
				039_ASAT19	Obstacle avoidance for multi-UAV path planning based on particle swarm optimization	

Session - Room	Subject	Day	Time	Paper ID	Paper Title	Session Board
S10-B	Unmanned Systems	07/04/2021	2:00 - 3:00	040_ASAT19	PID tuning approaches for quadrotors unmanned aerial vehicles	Brig. Prof. Ahmed Mohsen MTC, Cairo, Egypt. Col. Assoc. Prof. Basem Sheta MTC, Cairo, Egypt.
				041_ASAT19	Formation configuration of unmanned cooperative quadrotors via PID tuning approaches	

ASAT-19
The 19th International Conference on Aerospace Sciences & Aviation Technology (ASAT-19)
April 6-8, 2021, Cairo, Egypt

SCIENTIFIC SESSIONS

Session - Room	Subject	Day	Time	Paper ID	Paper Title	Session Board
S11-A	Aerodynamics/Aerospace Combustion and Propulsion	08/04/2021	9:00 - 10:00			Brig. Prof. .Mahmoud Yahia MTC, Cairo, Egypt. Col. Assoc. Prof. Ahmed Nemnem MTC, Cairo, Egypt. Col. Assoc. Prof. Mohamed Zakria, MTC, Cairo, Egypt.
				042_ASAT19	l Impact of nozzle profile on ballistic performance and structural loads	
				043_ASAT19	Design, test and build of a monopropellant thruster using 85% hydrogen peroxide	
			10:15 - 11:15	044_ASAT19	Parametric study of solid propellant slotted grain	
				045_ASAT19	Application of the level set method in solid propellant grain burnback with dogbone grain as a case study	
				046_ASAT19	Experimental Investigation of Recirculation Zone Characteristics of a Pre-filming Airblast Injector	

S1-A	Aerospace Structures
001_ASAT19	Dimensional structural mass optimization of forged steel connecting rod for aircraft piston engine
002_ASAT19	Static and modal analysis of sine-wave-shaped spar
003_ASAT19	Vibration analysis of composite wing with geometric and material coupling
004_ASAT19	Numerical simulation of temperature field in a C/C composite multi-disk brake during aircraft braking
005_ASAT19	Stress analysis of multi-layered composite cylinders subjected to various loadings.
006_ASAT19	Effect of damping material thickness on vibration analysis in pretension layer damping process
007_ASAT19	Vibration damping of aircraft propeller blades using shunted piezoelectric transducers

S2-A	Communications and Networks
008_ASAT19	Design of a smart energy efficient IoT wireless node
009_ASAT19	Comparative study between cognitive radio techniques in FM broadcasting band
010_ASAT19	A satellite-based quantum key distribution using decoy-state protocol

S3-B	Image Processing & Remote Sensing
011_ASAT19	Enhanced image encryption algorithm by quantum key distribution
012_ASAT19	SAR image formation enhancement using effective velocity estimation method
013_ASAT19	Frequency analysis of SAR system design for small satellite
014_ASAT19	Updating land use and land cover classes of Blue Nile basin using landsat-8 images
015_ASAT19	Assessment of top of atmosphere reflectance generation algorithm for world view-2 high resolution images
016_ASAT19	Hybrid fusion using Gram Schmidt and Curvelet transforms for satellite images

S4-B	Renewable Energy
017_ASAT19	Output power boosting of a photovoltaic panel based on various back pipe structures: a computational study
018_ASAT19	Numerical investigation of four photovoltaic/thermal integrated structures from energetic point of view
019_ASAT19	Comparison of dust and high-temperature effects on mono and poly photovoltaic panels

S5-A	Aerospace Materials
020_ASAT19	Effective electromagnetic interference shielding using polyurethane / graphite composite foam materials
021_ASAT19	Parametric optimization of non-prismatic micro-plates to reduce stiffening and curling initiated during fabrication
022_ASAT19	On the effect of post-processing techniques of the additively manufactured aluminum alloy parts
023_ASAT19	Factors affecting Failure mode and load of rubber polyester composite joint
024_ASAT19	Water recycling system based on adsorption by activated carbon synthesised from c. verum for space exploration; an estimated design

S6-A	Aerospace Materials
030_ASAT19	Investigation of foamcrete mechanical and physical properties
025_ASAT19	An investigation of plasma sprayed nickel-based and pure aluminum coatings on austenitic stainless steel AISI 304
027_ASAT19	Low thermal emissivity coating based on aluminium / acrylic composite coatings
026_ASAT19	Studying the distribution of hardness values in friction drilled 7075 Al-alloy sheets at different conditions
028_ASAT19	Enhancement of carbon fiber/epoxy composite electrical, optical and thermal properties by using different types of nano-additives.
029_ASAT19	Non-destructive aerial and terrestrial analysis of uranium isotopic activity by sensitive γ-spectrometer for El-Sella site

S7-A	Energetic Materials &Aerospace Thermo-physics
031_ASAT19	On the unsteady behaviours of the adiabatic endwall film cooling effectiveness
032_ASAT19	Enhancing the propulsion characteristics of rockets by adding the energetic Nitro-hydroxyl-terminated polybutadiene (NHTPB) in the propellant compositions

S8-B	Guidance, Navigation and Control
033_ASAT19	Acoustic threat detection and direction-finding system
034_ASAT19	Tactics Overview for Implementing High-Performance Computing on Embedded Platforms
035_ASAT19	Modelling and simulation of two axes gimbal fuzzy PI stabilization system in the presence of feedback sensors noise

S9-B	Guidance, Navigation and Control
036_ASAT19	Performance comparison among popular implementations of H.264 encoders
037_ASAT19	Modelling and transient response study of hydraulic servo actuator
038_ASAT19	Modeling, simulation and controller design for a typical bent axis electrohydraulic servo motor
039_ASAT19	Obstacle avoidance for multi-UAV path planning based on particle swarm optimization

S10-B	Unmanned Systems
040_ASAT19	PID tuning approaches for quadrotors unmanned aerial vehicles
041_ASAT19	Formation configuration of unmanned cooperative quadrotors via PID tuning approaches

S11-A	Aerodynamics & Aerospace Combustion and Propulsion
042_ASAT19	I Impact of nozzle profile on ballistic performance and structural loads
043_ASAT19	Design, test and build of a monopropellant thruster using 85% hydrogen peroxide
044_ASAT19	Parametric study of solid propellant slotted grain
045_ASAT19	Application of the level set method in solid propellant grain burnback with dogbone grain as a case study
046_ASAT19	Experimental Investigation of Recirculation Zone Characteristics of a Pre-filming Airblast Injector

ASAT-19
The 19th International Conference on Aerospace Sciences & Aviation Technology (ASAT-19)
April 6-8, 2021, Cairo, Egypt

ABSTRACTS

Dimensional structural mass optimization of forged steel connecting rod for aircraft piston engine

M Helal[1,2], B F Felemban1 , A Alharthi[1], S Almalki1, E Fathallah [3,4] , A A Elsherbiny[2] and H Eleashy[5]
[1]Department of Mechanical Engineering, College of Engineering, Taif University, Taif 21974
[2]Production and Mechanical Design Department, Faculty of Engineering, Mansoura University, Mansoura 35516, Egypt
[3]Civil Engineering Department, M.T.C. Kobry Elkobba - Cairo, Egypt
[4]Ships and Submarines Engineering Department, Military Technical College, Cairo, Egypt.
[5]Mechanical Engineering Department, Faculty of Engineering & Technology, Future University in Egypt, Cairo, Egypt
E-mail: saidhabib2000@hotmail.com

Abstract. The connecting rod is an important component of the engine. It conveys the kinetic energy from the piston to the crankshaft. All cars and aircraft engines contain at least one connecting rod, which differs from one motor to another in terms of length, size and shape. Hence, it is subjected to massive alternating load. This research aims to improve the connecting rod design by reducing its mass without sacrificing durability and safety especially for aircraft applications. Therefore, a static stress analysis is carried out on forged steel connecting rod using ANSYS APDL. Geometric modelling of the connecting rod was created using ANSYS APDL.Additionally, von-Mises stress and strain, principal stresses and strains, shear stress and the deflation results of the connecting rod are investigated. The results showed a great opportunity for mass weight reduction. Thus, a dimensional structural mass optimization was performed. The optimization results were promising, which reduced the mass by 55.13% (in the tensile case) and 56.7% (in the compression case) from the initial design. Therefore, the efficiency of aircraft engine can be maximized.

ASAT-19
The 19th International Conference on Aerospace Sciences & Aviation Technology (ASAT-19)
April 6-8, 2021, Cairo, Egypt

ABSTRACTS

Static and modal analysis of sine-wave-shaped spar

E Elshazly[1], M Kassem[1], M A Elshafei[1], and M Kamel[1]
[1] Department of Aircraft Mechanics, Military Technical College, EGYPT
E-mail: m_kassem@mtc.edu.eg

Abstract. Sine-Wave-shaped Spar (SWS) is recently involved in wing design as one of the
corrugated shaped spars that highly improve the torsion and buckling resistance. SWS is an Ibeam made of sine wave shaped vertical web fixed to upper and lower flanges. The current research evaluates the behavior of SWS in comparison to the traditional straight-web spar in resisting two cases of loading; static bending loading and static torsion loading. For each case, deformation and stress are analyzed. Modal analysis is also performed for the two spar configurations. For this purpose, a finite element model is developed using Ansys Workbench software for the SWS and the straight web spar. To reach a fair comparison, similar weight is considered for the two spar structures. A parametric study is performed to investigate the effect of web thickness and flange thickness on the bending and torsion deformation and stresses. The effect of thickness variation on the natural frequencies and mode shapes is also considered. The current study can be considered a base to design wing spars that combine the merits of the two spar configurations.

ASAT-19
The 19th International Conference on Aerospace Sciences & Aviation Technology (ASAT-19)
April 6-8, 2021, Cairo, Egypt

ABSTRACTS

Vibration analysis of composite wing with geometric and material coupling

A Magdy[1], M. Kamel[1], M. A Elshafei[1] and M Kassem1
[1]Department of Aircraft Mechanics, Military Technical College, Egypt
E-mail: a.magdy@mtc.edu.eg

Abstract. Composite wing design is complicated but inevitable to enlighten modern airplanes while maintaining the required performance. Using the dynamic transfer method, this paper discusses intensively the dynamic characteristics of a cantilever composite wing with both torsion and bending coupling to represent both material and geometric coupling. The governing differential equations are obtained based upon the principle of Hamilton and are solved analytically using a harmonic oscillation assumption. For this purpose, a MATLAB code is developed and results are validated in comparison with published work. Such a comparison shows a good agreement between both results. Finally, a parametric study is carried out to show the influence of the variation of both geometric coupling and torsion bending coupling rigidity on the free vibration analysis of the composite wing. The study shows the crucial effect of both factors on the dynamic behavior of the composite wing. The current research can be considered as a base for aeroelasticians while designing composite structures.

ASAT-19
The 19th International Conference on Aerospace Sciences & Aviation Technology (ASAT-19)
April 6-8, 2021, Cairo, Egypt

ABSTRACTS

Numerical simulation of temperature field in a C/C composite multidisk brake during aircraft braking

E M Ramadan[1].*, A E Hussien [1]. , A M Youssef [1]., and T M Abd El-Badia [1].
[1] Military technical college, Mechanical Design and Production Department, Cairo, Egypt.
E-mail: eramadan@mtc.edu.eg

Abstract. This article presents a finite element method for simulating the heat production during stopping the aircraft. Thermal analysis and simulation in the finite element model are based on the theory of energy transformation and transportation. A commercial software COMSOL Multiphysics 5.5a is used for simulating the braking operation. The internal temperatures of the brake disks were obtained and the variation in temperatures between disks were discussed. Thermomechanical behaviour is studied to show the effect of thermal energy on the contact mechanics for the friction surfaces between the brake disks. Aircraft mass, initial velocity and deceleration rate are responsible for heat generation and consequently the maximum reached temperature during braking. The friction surfaces between disks were the main heat energy source where the heat was concentrating on these layers of friction surfaces. For the selected braking operation, the maximum reached temperature was 1020K. The finite element odel was validated against historical data for a Boeing737-400 at constant deceleration for new disk brakes and for RTO brake energy.

ASAT-19
The 19th International Conference on Aerospace Sciences & Aviation Technology (ASAT-19)
April 6-8, 2021, Cairo, Egypt

ABSTRACTS

Stress analysis of multi-layered composite cylinders subjected to various loadings.

M H Elgohary[1], M I El-Geuchy[2], H M Abdallah[1] and S S Sayed[1]
[1] Rockets Department, Military Technical College, Cairo, Egypt
[2] PhD., Technical Research Centre, Cairo, Egypt
E-mail: Gohary1@live.com

Abstract: Composite cylinders are widely used in many applications, common examples for these applications are power drive shafts, chemical storage tanks, rocket motor cases and pressure vessels used in aerospace vehicles. The structure of the composite cylinder can be represented as a cylinder composed of coaxial orthotropic layers. In this paper, an analytical method is used to calculate stresses, strains and displacements through the wall thickness of multi-layered composite cylinder made of orthotropic material. The method is based on the theory of elasticity of bodies having cylindrical anisotropy. This method permits accurate stress analysis of thin and thick-walled composite cylinders subjected to axial load, torsional load and bending moment. The analytical method is modified to incorporate internal and external pressure loads beside the prescribed load cases. A numerical example is presented for a composite cylinder subjected to internal pressure load with a tensile axial load. The resulted stresses and strains are used to validate 3-dimensional finite element model. A parametric study has been performed using the analytical method to investigate the influencing parameters on stress distribution within the cylinder thickness and the results are found to be beneficial to look into during the preliminary design phase.

ASAT-19
The 19th International Conference on Aerospace Sciences & Aviation Technology (ASAT-19)
April 6-8, 2021, Cairo, Egypt

ABSTRACTS

Effect of damping material thickness on vibration analysis in pre-tension layer damping process

A Mohamed[1], A A Omer[1] and A Hassan[1]
[1] Mechanical Engineering Department, Military Technical College, Cairo, Egypt.
E-mail: anwer_mohamed@mtc.edu.eg,

Abstract. Vibration reduction is a critical necessity in many fields of engineering, technology, and industry. As a result, there is a need for vibration management. To restrict or adjust the system's vibration response, a variety of techniques are employed. In recent years, there has been a lot of enthusiasm for the easy implementation of these vibration-control structures. The damping properties of viscoelastic materials tend to be excellent. Damping is determined by the material's ability to dissipate energy. To minimise the vibration of vibrating surfaces, isco-elastic materials are commonly used. In this study, viscoelastic material (Dyad 606) is applied on the AL plate in the form of free layer damping and pretension layer damping. First aluminium structure using free layer damping and another one using pretension layer damping by applying tension load (two layers of damping plates, one on the top surface of the Al alloy and the other on the lower face). Passive vibration damping of the plate is achieved. These layers are influenced by axial uniform distributed load. The damping behaviour of the AL Plate is discussed in relation to the thickness variation of the pre-tension damping material. The results show that the loss factor and the attenuation percentage of the structure with pretension layer damping are increased as compared to free layer damping. It is also found that the most effective thickness of the damping material to increase the damping capacity of the framework is around half the base plate thickness

ASAT-19
The 19th International Conference on Aerospace Sciences & Aviation Technology (ASAT-19)
April 6-8, 2021, Cairo, Egypt

ABSTRACTS

Vibration damping of aircraft propeller blades using shunted piezoelectric transducers

A M Morad [1], M Kamel [2], and M K Khalil [2]
[1] Egyptian Armed Forces, Cairo, Egypt
[2] Aircraft Mechanical Engineering Department, MTC, Cairo, Egypt
E-mail: alaa_morad@yahoo.com

Abstract. Gas turbine engine blades experience vibrations due to the flow disturbances, these vibrations are critical to the engine durability and performance. Piezoelectric transducers (sensors and actuators) have been used for engine blade vibrations damping either through a passive or active vibration control. The propeller blades are part of turboprop engine and considered as one of the main source of turboprop engine vibrations. Piezoelectric blade damping ideas have been studied by other researchers for fan blades and compressor blades. In this research a vibration damping procedure using piezoelectric transducers applied to an unmanned aerial vehicle (UAV) composite propeller. Experimental investigation introduces an approach for the propeller vibration damping using piezoelectric transducers in conjunction with appropriate shunt circuit. Three thin piezoelectric transducers macro fiber composite (MFC) type PZT-5A are surface-mounted on the propeller, one at each blade. These transducers are placed at locations of high modal strain areas for the propeller first mode at each blade, where these locations are identified by finite element numerical simulation. Electronic resonance shunt circuit, resistor-inductor-capacitor type, for the piezoelectric transducers is designed and experimentally developed such that effective vibration suppression of the propeller is achieved. The experimental and numerical investigations in this research illustrate that piezoelectric transducers with appropriate shunt circuit reduces the aircraft propeller vibrations.

ASAT-19
The 19th International Conference on Aerospace Sciences & Aviation Technology (ASAT-19)
April 6-8, 2021, Cairo, Egypt

ABSTRACTS

Design of a smart energy efficient IoT wireless node

M S Nabil[1], A F Tammam[2]and M M ElKhatib[3]
[1] Computer Engineering, Pyramids Higher Institute for engineering & Technology (PHI), Giza, Egypt
[2]Computer Engineering, Arab Academy for Science, Technology & Maritime Transport (AASTMT) Cairo, Egypt
[3]Senior IEEE member, Electronic Engineering Department, Military Technical College (MTC) Cairo, Egypt
E-mail: mohamed.m.elkhatib@ieee.org

Abstract. The Internet of Things (IoT) is gaining greater effect in our life from day to day. Wireless sensor networks (WSN) are embedded into the "Internet of Things" and power saving is one of the problems that it faces. This study introduces a new circuit design for a DC-DC Buck-Boost converter for controlling the output voltage of Energy Harvester (EH) via adaptive Neuro-Fuzzy inference systems (ANFIS) controller. It has proven that there is an effective changes regarding settling time almost being zero, overshoot being negligible and steady state voltage. As an application for the proposed design, an implementation for Precision Agriculture (PA) self-sustainable Wireless Sensor-Node (WS-N) with low power consumption has been presented. A solar power management for Precision agricultural in internet of things system proved to enhance cost-efficiency and increased lifetime for the device. The simulation results are determined by means that of MATLAB/Simulink software. The cloud service of Blynk IoT has been implemented to monitor the collected data on real time. Data on solar cells, batteries and soil were regarded reliable and precise.

ASAT-19
The 19th International Conference on Aerospace Sciences & Aviation Technology (ASAT-19)
April 6-8, 2021, Cairo, Egypt

ABSTRACTS

Comparative study between cognitive radio techniques in FM-broadcasting band

I Hamed[1], M A Elmenyawi[2], and A Y Hassan[3]
[1] MSc student, Benha faculty of engineering, Benha University, Egypt
[2] Lecturer, Benha faculty of engineering, Benha University, Egypt
[3] Associate professor, Benha faculty of engineering, Benha University, Egypt
E-mail: ashraf.fahmy@bhit.bu.edu.eg

Abstract. Optimum usage of the existing frequency spectrum is a major requirement due to the large increase in the number of subscribers at the same frequency. The cognitive radio scheme has become an important application used to optimize spectrum utilization, detects spectrum bands that are not occupied by primary users to create communication links between secondary users in the same band. These non-occupied bands are described as white space. In this paper, a spectrum sensing method that is an important stage in cognitive radio communications is discussed. Various spectrum sensing methods such as energy detection (ED) and cyclostationary feature detection (CFD) are used to sense the spectrum in the FM broadcasting band. A comparison of energy detection and cyclostationary feature detection spectrum sensing methods is made to determine the empty bands in the FM broadcasting band. This enables secondary users to transfer information in these empty bands without affecting the primary users of the FM broadcasting system.

ASAT-19
The 19th International Conference on Aerospace Sciences & Aviation Technology (ASAT-19)
April 6-8, 2021, Cairo, Egypt

ABSTRACTS

A satellite-based quantum key distribution using decoy-state-protocol

A M Sofy[1], M Y Shalaby[2] and H M Dahshan[1]
[1] Military Technical College, Department of Communication Engineering, Cairo,
Egypt
[2] Ministry of Defence, Cairo, Egypt
E-mail: myousef73@hotmail.com

Abstract. An ideal QKD implementation that provides the promising unconditional security using single photon laser source is not practically easy, also sending these photons over a fiber channel affects the maximum distance of link up to few hundreds of kilometers because of the receiver's detectors losses. Therefore, the achievement of a global quantum network is not easy, and the need to use LEO satellites [1,2] for establishing quantum links makes the job easier as quantum free space link provides much less losses to the link than fiber links. Nowadays, a quantum communication link can be established by satellites through free space. in this paper, we propose an implementation [3] of a satellite-based quantum key distribution using decoystate protocol [4], we then compare this protocol with the BB-84 protocol [3] against security and the key length of the generated shared key.

ASAT-19
The 19th International Conference on Aerospace Sciences & Aviation Technology (ASAT-19)
April 6-8, 2021, Cairo, Egypt

ABSTRACTS

Enhanced image encryption algorithm by quantum key distribution

M A Mahmoud[1] ,T Mekkawy[2]and A D Elbayoumy[3]
[1]NANO Master program, Faculty of Engineering.Cairo University,Giza, Egypt
[2]Avionics Department, Military Technical Collage, Cairo, Egypt
[3]Communication Department, Military Technical Collage, Cairo, Egypt
E mail: Mohamed.khalifa84@eng1.cu.edu.eg

Abstract. Quantum Key Distribution (QKD) is one type of Quantum Cryptography (QC) which is based on quantum mechanics fundamentals such as Heisenberg's uncertainty principle and No-cloning theory. The usage of QKD warns the legitimate communicated parties to any attack attempt and this is the most interesting security parameter. Therefore, QKD provides unconditional secure communication method and supports a powerful encryption scheme. The combination between classical communication and QKD creates a new technique called semi quantum key distribution SQKD. Unfortunately, SQKD increases the schemes complexity and requires two steps for ciphering, scramble and encryption. In this paper an enhance image encryption algorithm is proposed based on QKD that eliminates most of the drawbacks of SQKD. The proposed algorithm is simpler than other encryption schemes as it exploits only one encryption step based on the power and the randomness of the generated secret key, which decreases the chance to be cracked. The correctness and efficiency of the proposed algorithm are validated by numerical simulations.

ASAT-19
The 19th International Conference on Aerospace Sciences & Aviation Technology (ASAT-19)
April 6-8, 2021, Cairo, Egypt

ABSTRACTS

SAR image formation enhancement using effective velocity estimation method

M A Fouad1, A Azouz[1], A A Mashaly[1] and A E Abdalla[1]
[1]Electrical Engineering, Military Technical College, Cairo, Egypt.
E-mail: mfouad10282@gmail.com

Abstract: Synthetic Aperture Radar (SAR) presents powerful tools for grounding mapping and remote sensing applications. Effective velocity is a vital index that controls the quality of SAR image formation. An accurate calculation of effective velocity provides a particular value of azimuth frequency modulated (FM) rate. The resultant azimuth FM rate could be used to produce a focused SAR image with sharp details. In this paper, SAR image formation enhancement is proposed using two guided methods based on precise effective velocity estimation. Firstly, effective velocity is estimated based on Sentinel-1data parameters extracted from selected image raw data. Secondly, an iteration method applies output image contrast, sharpness and entropy measurements to estimate the optimum value of the effective velocity based on the initial velocities calculated in the first method. Results are compared with extracted SAR images ignoring the effect of the effective velocity, to identify the performance of the proposed methods.

ASAT-19
The 19th International Conference on Aerospace Sciences & Aviation Technology (ASAT-19)
April 6-8, 2021, Cairo, Egypt

ABSTRACTS

Frequency analysis of SAR system design for small satellite

I Douidar[1], M Safy[2] and A Saleh[3]
[1] Egyptian Armed Forces, Cairo, Egypt.
[2] Egyptian Academy for Engineering and Advanced Technology affiliated to ministry of Military Production, Cairo, Egypt.
[3] October 6 University, Cairo, Egypt.
E-mail: Ibrahim.douidar@gmail.com

Abstract. Great interest is given in recent years to the small satellites as their main advantages are the low development cost and the reduced deployment time, which give attention to develop payloads that can be mounted on the platform of these satellite. the platform of small satellites imposes constraints on the sensor design to fit in the size, mass and power limitations, which leads to necessary trade-offs between the design parameters of the sensor. The selection of the operating frequency is dependent mainly on the mission requirements as each frequency band gives different information about the scene and has different penetration capabilities. However, the SAR sensors used on small satellites come with limitations, so other parameters should be considered during the design. After going through the SAR design process, a frequency analysis is presented at L, C and X bands, which is used to evaluate the effect on the size of the antenna (length and width) and the average power consumption that suit the constraints of small satellite.

ASAT-19
The 19th International Conference on Aerospace Sciences & Aviation Technology (ASAT-19)
April 6-8, 2021, Cairo, Egypt

ABSTRACTS

Updating land use and land cover classes of Blue Nile basin using landsat-8 images

A S Shobary[1], A S Elsharkawy[1], H E M El-Hanafy[1] and O M Moussa1
[1]Department of Civil Engineering, Military Technical College, Cairo, Egypt.
E-mail: a.s.shobary@mtc.edu.eg

Abstract. Land Use and Land Cover are considered as a main input layer for the estimation of surface runoff along with the soil maps, rainfall data, DEM. The main purpose of this research paper is to update the Land Cover and Land Use of the Blue Nile basin that can be used for further processing to estimate the surface runoff of the Blue Nile basin. Recent satellite images of Landsat 8, dated May and June, 2020, were used with less than 10% clouds covering the full scene of the study area. Six land cover classes were targeted namely; water, urban, barren land, forest, grass and agricultural crops. Supervised (maximum likelihood) classification method was used and accuracy assessment with the help of google earth as ground truth was performed.With the aid of 30-m DEM, the Blue Nile basin was divided into fourteen sub-watersheds. Classification scheme was applied to each of the fourteen sub-watersheds and the classification results were introduced as a percentage of the total area of each sub-watershed. Moreover, confusion matrices were formed for the subwatersheds.

ASAT-19
The 19th International Conference on Aerospace Sciences & Aviation Technology (ASAT-19)
April 6-8, 2021, Cairo, Egypt

ABSTRACTS

Assessment of top of atmosphere reflectance generation algorithm for world view-2 high resolution images

M Allam[1], T Mahmoud[1], A Elsharkawy[2] and B Sheta[1]
[1]Electrical Engineering, Military Technical College, Cairo, Egypt.
[2]Civil Engineering, Military Technical College, Cairo, Egypt.
E-mail: eng.ma.mo.allam@gmail.com

Abstract. Recently, there are many developments in remote sensing techniques using satellite imagery as a result of the variety of remotely sensed image sources with different spatial and spectral resolutions and from different sensors. Optical satellite products are affected by an error of payload, atmosphere (scattering and absorption), and variations relative to positions of Sun, Earth, and satellite during capturing data. Top of Atmosphere (TOA) correction is the process of removing the effects of variations relative to sensor error and positions of Sun, Earth, and satellite. In this paper, maximum benefits from high spectral and spatial resolution images are demonstrated and analyzed or compared with images from different. TOA correction algorithm, which was implemented using Python environment, is applied to high resolution images from WorldView-2 (WV-2) satellite. TOA reflectance is considered the first step in any algorithm dedicated to the change detection process. Reflectance conversion is also performed on the same images using Orfeo ToolBox (OTB), the open-source software. The performance and efficiency of the proposed algorithm are compared with that of the Orfeo ToolBox (OTB) TOA reflectance output. The achieved results show that the proposed algorithm, which is automatically performed, is faster and provides significant results for WV-2 images, and can be adapted to be applied on different optical satellite sensors.

ASAT-19
The 19th International Conference on Aerospace Sciences & Aviation Technology (ASAT-19)
April 6-8, 2021, Cairo, Egypt

ABSTRACTS

Hybrid fusion using Gram Schmidt and Curvelet transforms for satellite images

M Hammad[1], T Ghoniemy[1], T Mahmoud[1] and A Amein[2]
[1]Electrical Engineering, Military Technical College, Cairo, Egypt.
[2]Electrical Engineering, Senior IEEE, FISCS, October 6 University, Cairo, Egypt.
E-mail: Radok2003@hotmail.com

Abstract. Optical satellites generally provide high-resolution panchromatic but low-resolution multispectral images which provide structural details of features and spectral information respectively. Nowadays, fusion of the two types of resolutions, to have complementary information, becomes increasingly essential for many applications such as microscopic, astronomical and satellite imagery. In this paper, a novel hybrid pixel-level image fusion method is proposed for benefiting from both panchromatic (PAN) and multispectral (MUL) images. The proposed method integrates Gram Schmidt (GS) and curvelet transforms (CVT), by the aid of local energy and maximum fusion rules, for reducing individual method limitations and achieving both better spectral consistency and spatial details preservation. After a pre-processing stage, orthonormal bases are obtained for low spatial resolution images by using GS transform. Then, high-resolution and low-resolution images are fused using CVT by the aid of histogram matching. Finally, the fused image is obtained by applying both curvelet and GS inverse transforms. The performance of the proposed method is evaluated using publicly available Pleiades benchmark-datasets. Consequently, the spectral and spatial qualities of the fused images are assessed subjectively as well as objectively using different quality metrics. Moreover, the proposed method is compared with state-of-the-art fusion techniques and results show the robustness of the proposed method that has the best result in spatial and spectral evaluation metrics such as, Quality with No Reference (QNR), Peak Signal to Noise Ratio (PSNR), Standard Deviation (SD), Entropy (ENT) and Spectral Correlation Coefficient (SCC) metrics.

ASAT-19
The 19th International Conference on Aerospace Sciences & Aviation Technology (ASAT-19)
April 6-8, 2021, Cairo, Egypt

ABSTRACTS

Output power boosting of a photovoltaic panel based on various back pipe structures: a computational study

A Bayoumi[2], G M Abdo[2], and A A Emara[1,2]
[1] Mechanical Engineering Department, Faculty of Engineering, Mataria-Helwan University in Cairo, Egypt.
[2] Mechanical Engineering Department, Faculty of Engineering and Technology, Badr University in Cairo (BUC), Cairo, Egypt.
E-mail: gamal.abdo@buc.edu.eg

Abstract. The efficiency of photovoltaic panels (PV) drops due to the rise in temperature, which leads to a decrease in the PV output power. A PV/Thermal system is therefore used as a solution to increase the output power from the PV panels. Comsol Multiphysics software program, a simulator-based Finite Element Method (FEM) tool, and Matlab program simulations are used to perform this electro-thermal model. The simulation process for different back pipes follows a serpentine, and a new shape of pipes called (square shapes) which are attached under the PV module. These shapes were specifically chosen for higher conversion efficiency and increase the heat transfer of the system. Additionally, a comparison between electrical parameters and heat transfer characteristics of water and CuO/water nanofluid in a PV cooling system has been studied. The new shape leads to improve the photovoltaic (PV) module parameters, such as short circuit current ISC, open-circuit voltage VOC, and maximum power Pmax for a new shape more than the serpentine shape. These parameters are calculated under Air Mass 1.5 G (AM1.5G) with 1000 W/m2 of irradiance which is considered the average irradiance at the MENA (The Middle East and North Africa) region throughout the year. The results exhibit the PV module's total enhancement by using the new shape with CuO nano-fluid about 24.7 %.

ASAT-19
The 19th International Conference on Aerospace Sciences & Aviation Technology (ASAT-19)
April 6-8, 2021, Cairo, Egypt

ABSTRACTS

Numerical investigation of four photovoltaic/thermal integrated structures from energetic point of view

M. Abd El-Hamid[1, 2], Sherin. M[1], 2and Gaosheng Wei[1]
[1] Key Laboratory of Power Station Energy Transfer Conversion and System of Ministry of Education, School of Energy, Power and Mechanical Engineering, North China Electric Power University, Beijing 102206, China
[2] Mechanical Power Engineering Department, Faculty of Engineering – Mattaria, Helwan University, Cairo 11718, Egypt
E-mail: eng.mohamed.abdelhamed90@gmail.com

Abstract. Photovoltaic/Thermal (PV/T) module is considered to be one of the most recent technologies which offers harness and production of both electric and thermal energy. In the current study an energetic analysis is carried out to compare between four different configurations which are: the single pass single glazed (PV/T-I), the single pass double glazed with air gap (PV/T-II), the single pass double glazed with argon gap (PV/T-III) and the double pass double glazed (PV/T-IV) hybrid photovoltaic/Thermal air collector systems. A 3 dimensional numerical model is built up and validated with both the numerical and experimental results coming from the literature. The numerical simulations have been accomplished to investigate the energetic performance with a detailed thermal and electrical study taking in account an inlet coolant temperature the same as the ambient temperature for a coolant (air) mass flow rate equals to 0.025 kg/s of a typical day in August from 9:00 to 17:00 under the ambient conditions of Beijing, China. The results show that the single pass single glazed configuration has the highest electrical efficiency, whereas the double pass configuration has the greatest thermal and energy efficiencies among the proposed configurations. The average daily energy efficiencies are 53.14%, 75.92%, 77.63% and 82.19% for the (PV/T-I), (PV/T-II), (PV/T-III) and (PV/T-IV) configurations, respectively.

ASAT-19
The 19th International Conference on Aerospace Sciences & Aviation Technology (ASAT-19)
April 6-8, 2021, Cairo, Egypt

ABSTRACTS

Comparison of dust and high-temperature effects on mono and poly photovoltaic panels

E Elshazly[1], A Abd El-Rehim[1] and I El-Mahallawi[1]
[1]Centre for Renewable Energy Faculty of Engineering, British University in Egypt (BUE),El-Sherouk 11837, Cairo, Egypt
E-mail: iemahallawi@bue.edu.eg

Abstract. Solar Photovoltaic Panels are considered as one of the most powerful alternative renewable and sustainable energy sources. However, a major challenge is the effect of dust accumulation on the photovoltaic panels in natural outdoor environment as it reduces the transmissivity of the light on the surface of the solar panels. For many small communities, the decision of implementing mono or polycrystalline PVs should consider economic aspects. This study is a case study that is held at The British University in Egypt at El Sherouk city to study the effect of different parameters such as dust accumulation, water cooling and coating on the performance of both mono- and poly-crystalline panels at El-Sherouk City. The effects of high temperature and dust accumulation on different solar panels placed in natural outdoor conditions at El- Sherouk City are studied and the electrical performance of the solar panels is represented by measuring several characteristic parameters of dusty and cooled PV panels compared to cleaned and non-cooled panels. The effect of the tilt angle on the accumulation of dust on the surface of the solar panels is, also, studied. The mono-crystalline solar panels are installed at tilt angles 0°, 15°, 30°, 45°, and 60° for one month without cleaning, by any method. The results shows that the power reduction percentage is 17%,20%,25%,27% and 30% for tilt angles 60°,45°,30°,15° and 0°; respectively. Tilt angles 15° and 30° show to be optimal for the installation of the PV solar system, as they produce the highest amount of output power. It is found from the study that the accumulation of dust on the surface of different types of solar panels can reduce the efficiency by 30%. While the high temperature can reduce the efficiency by up to 10 %.

ASAT-19
The 19th International Conference on Aerospace Sciences & Aviation Technology (ASAT-19)
April 6-8, 2021, Cairo, Egypt

ABSTRACTS

Effective electromagnetic interference shielding using polyurethane / graphite composite foam materials

H Oraby[1], H R Tantawy[1], I Naeem[1], M Magdy[2], A A Ezz[3] and M Senna[4]
[1]Department of Chemical Engineering, Military Technical College, Cairo, Egypt.
[2]Department of Radar, Military Technical College, Cairo, Egypt.
[3]El-Nasr Company for Intermediate Chemicals, Industrial Area, Giza, Egypt.
[4]Radiation Chemistry Department, National Center for Radiation Research and Technology, P.O.Box 29, Nasr City, Cairo, Egypt.
E-mail: hussein.mohamed4544@yahoo.com

Abstract. Conversely, to metallic based electromagnetic interference (EMI) shielding materials; composite polymer-based foams are normally lightweight, cheaper than metals, and less sensitive to types of environmental degradation. In this work polyurethane - Graphite composite (PU-G) foam materials were prepared with different filler concentrations. Different characterization tools such as Fourier Transform Infra-Red (FTIR) and scanning electron microscope (SEM), were used to identify the structural and topological construction of the prepared composites. Further mechanical properties for the prepared samples were studied to elucidate the opportunity of utilizing these composites in applied applications, specifically for electromagnetic interference (EMI) shielding efficiency (SE) for aerospace applications. Also, in order to adjust this research in the area of aerospace EMI SE, the evaluations were executed in the X-band at (8-12) GHz. The obtained data indicated that the moreover in filler concentration enhanced the compressive strength and compressive modulus of the prepared samples. Moreover EMI SE reached -44 dB with 30 wt % graphite concentration. Finally polyurethane – graphite composite foam material can be taken into consideration a gratifying material to be utilised in EMI SE.

ASAT-19
The 19th International Conference on Aerospace Sciences & Aviation Technology (ASAT-19)
April 6-8, 2021, Cairo, Egypt

ABSTRACTS

Parametric optimization of non-prismatic micro-plates to reduce stiffening and curling initiated during fabrication

B Bakeer[1], A Elsabbagh[1] and M Hedaya[1]
[1]Design and Production Engineering Department, Ain Shams University, Cairo, 11517, Egypt
Email: bahi.bakeer@eng.asu.edu.eg

Abstract. Microelectromechanical devices such as accelerometers, gyroscopes, pressure sensors, and radiofrequency (RF) switches are widely used in aerospace applications. Reduction of stiffening and curling initiated during fabrication of these devices is one of the challenging issues in MEMS design. Reducing response time is also favorable in some applications such as RF MEMS switches. This paper aims at reducing stiffening, curling, and increasing the natural frequency for three well-known designs of micro-plates with fixed-fixed supports. To achieve these objectives, a parametric size optimization is carried out. For comparison purposes, same volume is set as a constraint for all three designs. Compared to conventional rectangular microplate, a reduction of 34% in stiffening in design 2, and 44% in curling in design 3. Design 1 showed the maximum fundamental natural frequency. Thus, it is predicted to have the lowest switching time. Moreover, design 2 showed the maximum critical buckling temperature, extending the operation range of the device. The effect of changing micro-plate material is also studied in this paper.

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April 6-8, 2021, Cairo, Egypt

ABSTRACTS

On the effect of post-processing techniques of the additively manufactured aluminum alloy parts

A H Maamoun[1]
[1] Technical Research Center, Cairo, Egypt
E-mail: maamouna@mcmaster.ca

Abstract. Additive manufacturing (AM) or 3D printing of metals promises a significant impact on the upcoming industrial revolution "Industry 4.0" as it is considered one of its main pillars. However, some challenges related to high initial cost and the fabricated part's quality still existed. Selective laser melting (SLM) is one of the effective techniques used for additive manufacturing to fabricate metal products. This paper presents the impact of different postprocessing treatments on the microstructure and surface quality of the AlSi10Mg parts fabricated using SLM. This work illustrates the analytical view of the results obtained from two studies in a previous work by the author. A process map is presented for thermal post-processing treatment to customize the required quality and material characteristics of the AlSi10Mg parts. In addition, the shot peening results in a significant improvement for both surface roughness and hardness is illustrated. This work is a part of developing the manufacturing process of additively manufactured lightweight parts in some critical applications specifically for the metallic mirrors used in high power laser systems or wide view space telescopes.

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ABSTRACTS

Factors affecting Failure mode and load of rubber polyester composite joint

B H Mousa[1], N A Azab[1], G Bassioni[2] and M H Abdellatif[1]
[1]Mechanical Design and Production Engineering Department, Faculty of Engineering, Ain Shams University, Cairo, Egypt
[2]Chemistry Division, Faculty of Engineering, Ain Shams University, Cairo, Egypt
E-mail: bassant.hany@eng.asu.edu.eg

Abstract. The joining of rubber polyester composite is affected by design and geometry parameters. These parameters affect the failure load of the composite joint and the failure mode. Catastrophic failure modes should be avoided, and the optimum parameters are selected to achieve a progressive failure that could be observed. Geometry parameters such as the edge distance and the center distance between holes are tested under tensile loading to get the optimum values. Design parameters such as tightening torque of bolt and washer size are also tested under tensile loading, and their effect on the failure load is obtained and studied. The failure modes are investigated under the digital microscope in each case. It is found that the failure load increases by increasing the edge distance, the tightening torque, and decreasing the center distance between holes. The optimum washer size is varied according to the used tightening torque. The optimum obtained failure mode in tests is a mixed - mode of bearing and net tension modes.

ASAT-19
The 19th International Conference on Aerospace Sciences & Aviation Technology (ASAT-19)
April 6-8, 2021, Cairo, Egypt

ABSTRACTS

Water recycling system based on adsorption by activated carbon synthesised from c. verum for space exploration; an estimated design

M N Ettish[1], O Abuzalat[1], G S El-Sayyad[2] and M A Elsayed[1]
1Chemical Engineering Department, Military Technical College, Kobry Elkobbah, Cairo, Egypt.
[2] Drug Microbiology Laboratory, Drug Radiation Research Department, National Center for Radiation Research and Technology (NCRRT), Egyptian Atomic Energy Authority, Cairo,Egypt.
E-mail: mnasr4810@gmail.com

Abstract. Water recycling is a crucial component of space flights. In this study, c.verum, a lowcost agricultural by-product abundant in Egypt, which was not utilized before for the preparation of porous carbons, and its ability for recycling water in space stations was estimated. The prepared samples show high porosity and surface area by physical activation. The influences of the pyrolysis temperature and activation hold-up time on the activated carbon's porosity were studied. The BET surface area and the total pore volume of the prepared carbon were used as the criteria for selecting the optimum preparation parameters. The optimum temperature for pyrolysis was found to be at a temperature of 900°C, hold-up time of two-hour, a nitrogen flow rate of 150 cm3/min, and a heating rate of 10°C/min. However, the optimum activation conditions were at a temperature of 900°C, a CO2 flow rate of 150 cm3/min, a heating rate of 20°C/min, and a hold-up time of 120 min. Equilibrium data is used for fitting to Freundlich, Langmuir, and Temkin isotherms models. The result revealed that the Langmuir model was the finest match for the equilibrium data, with an extreme monolayer adsorption capability of 12.37 mg/g at 25°C. The maximum monolayer adsorption capacity decreased with increasing temperature confirmed the exothermic character of the adsorption interaction.

ASAT-19
The 19th International Conference on Aerospace Sciences & Aviation Technology (ASAT-19)
April 6-8, 2021, Cairo, Egypt

ABSTRACTS

An investigation of plasma sprayed nickel-based and pure aluminum coatings on austenitic stainless steel AISI 304

K. Hamed[1], N. El-Mahallawy[2] and M.O.A. Mokhtar[3]
[1] M.Sc. Student, Design and Production Engineering Department, Faculty of Engineering, Ain Shams University, Egypt
[2] Professor Dr., Design and Production Engineering Department, Faculty of Engineering, Ain Shams University, Egypt
[3] Professor Dr., Department of Mechanical Design and Production, Faculty of Engineering, Cairo University, Egypt
E-mail: 13084@eng.asu.edu.eg

Abstract Atmospheric Plasma Spray (APS) is one of the most leading industrial techniques for protective coating, by improving the performance of parts in the thermal barrier, and wear resistance. Ni-Al alloys are very effective players in the field of design of protective coatings. Accordingly, mixed Al, Ni/Al, and Ni5Al powders were applied on 304stainless steel substrate to develop plasma sprayed coatings. The effect of different compositions on microstructure, microhardness, and porosity was measured. The microstructures of the as-deposited films were characterized utilizing X-ray diffraction (XRD), scanning electron microscopy (SEM), and microhardness measurements. The results showed the formation of two intermetallic compounds, namely: NiAl and Ni3Al. The existence of NiAl is inevitable in all samples, despite the amount of Ni-based alloys in mixtures, or even the atomic percentage of nickel, where the appearance of Ni3Al depends only on increasing the amount of the Ni-based alloy to 50 % percent in mixtures. As regards the steel substrate, the microhardness of the interdiffusion zone of the substrate has been significantly enhanced. Results have shown that the microhardness of the different tested coatings is increased directly with the increment of Ni-based percentage in the coating mixture. The average porosity of the plasma sprayed coatings has proven to be within the normal range.

ASAT-19
The 19th International Conference on Aerospace Sciences & Aviation Technology (ASAT-19)
April 6-8, 2021, Cairo, Egypt

ABSTRACTS

Studying the distribution of hardness values in friction drilled 7075 Al-alloy sheets at different conditions

N Hamzawy [1], MKhedr [1], T S Mahmoud [1], I El-Mahallawi [2] and T A Khalifa [1]
[1] Mechanical Engineering department, Faculty of Engineering at Shoubra, Benha University, Cairo 11629, Egypt.
[2] Department of Metallurgical Engineering, Faculty of Engineering, Cairo University, Cairo 12613, Egypt.
E-mail: Mahmoud.khedr.mk@gmail.com

Abstract. The thickness of sheet metal parts can be locally increased by friction drilling technology via forming of a hole with a bush by a special drilling tool. Here, a 7075 Al-alloy was drilled by friction using tool cone angles with values of 40, 45 and 50° under different feed rates (100, 200 and 315 mm/min) and rotational speeds (1000, 1250 and 1600 rpm). The present study investigates the hardness distribution in the thermally-formed bush and in the heat-affected zone around the bush. It was found that the hardness of the bush was slightly increased with increasing of the tool cone angle and reduction of the tool rotational speed. However, the hardness of the thermally-induced bush showed values lower than the parent metal. The hardness near the drilling surface was approximately 65±10 HV, while it recorded hardness values of 75±10 HV at 5 mm away from the drilling surface. In addition, the microstructure of the friction drilled specimens showed a very fine structure in the drilling zone due to crushing of the original structure during the friction drilling process.

ASAT-19
The 19th International Conference on Aerospace Sciences & Aviation Technology (ASAT-19)
April 6-8, 2021, Cairo, Egypt

ABSTRACTS

Low thermal emissivity coating based on aluminium / acrylic composite coatings

E E Ateia[1], M A Metwaly[1], H R Tantawy[2]
[1] Physics Department, Faculty of Science, Cairo University, Giza, Egypt
[2] Chemical Engineering Department, Military Technical College (M.T.C)
E-mail: cap.mahmoud2011@gmail.com

Abstract. Low emissivity coatings were synthesized by using fine flake Aluminium (Al) powder as a filler within acrylic resin to from the desired composite coatings. In the current work, ball milling was applied to prepare Al with different shapes and sizes. The technical parameters of prepared Al powders with respect to the initial raw Al are characterized by scanning electron microscope (SEM), X-Ray diffraction (XRD), and Energy Dispersive X-Ray Analysis (EDX). Moreover, parameters that affect the emissivity of the coating was investigated; such as coating thickness, particle size, spin coating, ball milling time and the content of coated Al powder. The thermal signature is highly affected by the variation in Al content (5%, 20%, 25%, 35%, 40% and 60%) at different temperatures (50ºC, 70ºC, 90ºC). The results indicate that the perfect percentage for the filler (Al) in the matrix within the range (35 wt. - 40 wt. %) and Al fine flake powder particle, which gives the lowest infrared emissivity of 0.385 μm and 0.412 μm for (3-5) μm, (8-12) μm, respectively.

ASAT-19
The 19th International Conference on Aerospace Sciences & Aviation Technology (ASAT-19)
April 6-8, 2021, Cairo, Egypt

ABSTRACTS

Enhancement of carbon fiber/epoxy composite electrical, optical and thermal properties by using different types of nano-additives.

L Bassiouny[1], T Samir[2], S Abdallah[2], H Ashour[1] and A Anwar[3]
[1] Faculty of Engineering, Misr for Science and Technology, Cairo, Egypt.
[2] Faculty of Engineering, Benha University, Shobra, Cairo, Egypt.
[3] Space Technology Center (STC), Cairo, Egypt.
E-mail: msc.a.anwar@gmail.com.

Abstract. Environmental space threats are becoming more critical as they affect the optical, thermal, and electrical properties of the reinforced fiber polymeric-based materials in spacecraft. Three different Nano-particles Alumina (Al)$_2$, MO$_3$ultiwall Carbon Nanotubes (MWCNT), and Reduced Graphene Oxide (RGO) were added to the epoxy matrix and then reinforced by bidirectional carbon fiber plain to form carbon fiber/epoxy by hand lay-up using autoclave curing technique to make three different reinforced materials. In this paper, the electrical, optical, and thermal properties of the carbon fiber/Epoxy Nanocomposite were studied. Fourier transform infrared (FTIR) was performed to evaluate the structural changes in the newly synthesized materials. The optical, thermal, and electrical properties were tested by UV-visible Spectroscopy, Photo-acoustic spectroscopy (PA), and Keithley 2635A respectively. The results showed an enhancement in the electrical, optical, and thermal properties of the epoxy matrix after the addition of Nano-particles. The optical test showed that the neat epoxy and epoxy/Nano-particles absorption spectra were in the infrared range. The thermal test indicated that the three thermal parameters diffusivity, effusivity, and conductivity showed the best enhancement after the addition of MWCNTs. The electrical test pointed out that after the addition of Nano-particles, neat epoxy changed from an insulating material to a semi-conductive material.

ASAT-19
The 19th International Conference on Aerospace Sciences & Aviation Technology (ASAT-19)
April 6-8, 2021, Cairo, Egypt

ABSTRACTS

Non-destructive aerial and terrestrial analysis of uranium isotopic activity by sensitive γ-spectrometer for El-Sella site

M Sabry[1], A Omar[1], M A Abdel-Rahman[1] and S A El-Mongy[2]
[1] Nuclear Engineering Department, Military Technical College, Kobry El-Koba, Cairo, Egypt
[2] Nuclear and Radiological Regularity Authority (ENRRA), Nasr City, Egypt
E-mail: mohy_sabry@mtc.edu.eg

Abstract. Any comprehensive radioactivity surveillance for a specific site should be carried out by a sensitive airborne system (e.g. carried on aircraft) together with terrestrial sampling and analysis. In the framework of ore, environmental and nuclear materials monitoring and investigation, the activity and isotopic compositions signature are considered crucial factors that must be considered, determined and evaluated. In this work and based on previous aerial monitoring, a very sensitive hyper pure germanium detector (Hp-Ge) of 50% efficiency with the Genie2000 software has been used for spectroscopic non-destructive assay (NDA) of radioactivity content for samples collected from the Egyptian eastern desert (El-Sella Site). The identification of specific signature isotopes through their characteristic gamma lines and a calculation of their specific activities, activity ratios of 235U/238U and 234U/238U and mathematically estimation of the natural enrichment percentage are very vital and nuclear forensic targets. The results of measurements, analysis and calculations show that the Site samples have high radioactivity, natural enrichment origin and high uranium concentration. The obtained results are given tabulated, depicted, discussed and compared with the recent nationally published work and the international levels and limits.

ASAT-19
The 19th International Conference on Aerospace Sciences & Aviation Technology (ASAT-19)
April 6-8, 2021, Cairo, Egypt

ABSTRACTS

Investigation of foamcrete mechanical and physical properties

T. Youssef [1], Y Elsayed [2], T A Elsayed [2] and S M Lawaty [2,3],
[1] Faculty of Engineering, l'Université Française d'Égypte, Cairo, Egypt
[2] Faculty of Engineering (Mataria), Helwan University, Cairo, Egypt
[3] Faculty of Engineering & Technology, Badr University in Cairo, Egypt
E-mail: Tarik.youssef@ufe.edu.eg

Abstract. Engineered Material Arresting Systems (EMAS) serve as a substitutional alternative/solution to airport runways when the Runway Safety Area (RSA) does not meet international Federal Aviation Administration (FAA) standards. The length of the runway can be shortened if an EMAS is installed on both ends of the runway. This paper provides experimental test results on foamcrete material used for such an important safety application. The objective of the paper is to present the required and measured properties of foamed concrete (density, compressive strength and water absorption) and results of an evaluation of a first phase of testing. In this study, a total of fourty eight mixes were conducted; yielding a range of densities, compressive strength(s) and water absorption characteristics that are: 554 to 1528 kg/m3, 1.1 to 21 MPa and 7.4 to 28.3 %, respectively. It is demonstrated herein – though the Analysis of Means statistical method – that foam volume is predominantly the main factor affecting the observed output characteristics. This is followed by Sand/Filler and Filler/Cement that yield marginal effect compare to the former foam volume ingredient.

ASAT-19
The 19th International Conference on Aerospace Sciences & Aviation Technology (ASAT-19)
April 6-8, 2021, Cairo, Egypt

ABSTRACTS

On the unsteady behaviours of the adiabatic endwall film cooling effectiveness

M Qenawy [1], Y Liu [2] andW Zhou [2]
[1] Faculty of Energy Engineering, Aswan University, Aswan 81528, Egypt.
[2] School of Mechanical Engineering, Shanghai Jiao Tong University, Shanghai 200240, China.
E-mail: m_qenawy@aswu.edu.eg.

Abstract. The film cooling technique is introduced in modern gas turbines to protect the blade from the high temperature of the incoming hot gases by forming a thin coolant blank over the blade surface. However, it is known as a jet in cross-flow (JICF), where coolant and mainstream interact intensively and generate complex vortices leading to highly unsteady coolant coverage over the blades surface. In this study, a fast-response pressure-sensitive paint technique (fast-PSP) was used to measure the coolant unsteadiness with a high-resolution camera. The measurements were performed in a novel single-passage transonic wind tunnel to uncover the unsteady effectiveness of the endwall surface. Such effectiveness was dramatically influenced by the blowing ratios (M), showing attached flow at a low blowing ratio and lift-off at a high blowing ratio. The effectiveness was asymmetrically distributed due to the pressure gradients, jet compounding angle, and associated complex flows. The unsteady effectiveness was highly influenced by the energetic vortical structures, which interacted with the mainstream flow immediately behind the holes. It was featured by secondary structures (horseshoe, passage, and counter vortices) beside the JICF structures. Meanwhile, the unsteadiness was originated from the middle of the passage behind the holes. It is suggested to pay close attention to the locations of the holes for further optimization. This study could help the designers to understand the characteristics of unsteady effectiveness, promoting advanced cooling strategies for enhanced protection of future gas turbines.

ASAT-19
The 19th International Conference on Aerospace Sciences & Aviation Technology (ASAT-19)
April 6-8, 2021, Cairo, Egypt

ABSTRACTS

Enhancing the propulsion characteristics of rockets by adding the energetic Nitro-hydroxyl-terminated polybutadiene (NHTPB) in the propellant compositions

A Azazy[1], A Saleh[1], W F Aly[2], A Elbeih[2], A K Hussein[2], T Elshenawy[3], M Abdelhafiz[2], T Z Wafy[2], M G. Zaki[2] and H S Ahmed[1]
[1] Science and Technology Center of Excellence, Military Production, Cairo, Egypt
[2] Military Technical College, Kobry Elkobbah, Cairo, Egypt
[3] Technical Research Center, Cairo, Egypt.
E-mail: asaleh@stce-egypt.org

Abstract: Replacing the inert binder by an energetic one could increase the specific impulse of the propellants and enhance the propulsion characteristics of rockets. In this study, Nitrohydroxyl- terminated polybutadiene (NHTPB) was prepared by a simple method. The prepared NHTPB in addition to HTPB binder were characterized. FTIR spectra of both HTBP and NHTPB was determined and compared. The thermal behavior of the prepared NHTPB was studied using DSC technique at heating rate 5 degree/min. A composite propellant based on AP/NHTPB was prepared and the specific impulse was measured for AP/NHTPB using two inch motor. It was concluded that the energetic nitro-hydroxyl-terminated polybutadiene has a clear max. exothermic peak at 203 0C with heat release of 323 J/g. By comparing the results, the prepared propellant AP/NHTPB has specific impulse higher than the traditional AP/HTPB propellant. NHTPB is a promising binder for the application of rocket propellants and needs more tests for its approval.

ASAT-19
The 19th International Conference on Aerospace Sciences & Aviation Technology (ASAT-19)
April 6-8, 2021, Cairo, Egypt

ABSTRACTS

Acoustic threat detection and direction finding system

A Abdallah[1] and H Tork[1]
[1] Naval Warning Engineering Department, Military Technical College, Cairo,Egypt
Email: adel.abdallah@mtc.edu.eg

Abstract. In this paper, an acoustic threat detection system is investigated as preliminary study of one of the anti-terrorism systems. The proposed system is a prototype of acoustic threats detection, classification, and direction finding system. For this purpose, an experiment is performed to test the capability of a proposed warning system to perform the task accurately. The direction of the sound source is determined by means of two microphones. The angle to the acoustic threat is calculated based on time difference of arrival (TDOA). The limitations of the system are discussed and some possible solutions are introduced to improve the performance of the system.

ASAT-19
The 19th International Conference on Aerospace Sciences & Aviation Technology (ASAT-19)
April 6-8, 2021, Cairo, Egypt

ABSTRACTS

Tactics Overview for Implementing High-Performance Computing on Embedded Platforms

A Elshazly [1], A Elliethy [1] and M A Elshafey [1]
[1]Department of Computer Engineering and Articial Intelligence, Military Technical College, Cairo, Egypt
E-mail: ahmedelshazly@mtc.edu.eg

Abstract. Future space missions will rely on novel high-performance computing to support advanced intelligent on-board algorithms with substantial workloads that mandates rm realtime and power constraints requirements. Consequently, these advanced algorithms require signicantly faster processing beyond the conventional space-grade central processing unit capabilities. Moreover, they require careful selection of the target embedded platform from a diverse set of available architectures along with several implementation tactics to map the algorithms to the target architecture to fully unlock its capabilities. In this paper, we present a study of dierent architectures and embedded computing platforms for the satellite on-board computers. Moreover, we present a comprehensive overview of recent implementation tactics such as source code mapping and transformations. Additionally, we highlight some optimization techniques such as partitioning and co-designing using hardware accelerators. Finally, we discuss several implementation analysis methodologies to derive optimized code implementations. The top ranked YOLO-v3, as a deep learning based object detection algorithm, is selected as a case study model to be optimized using OpenVINO toolkit. The experimental results show an improvement ratios up to 73%, 41%, and 34% in terms of frames per second, CPU utilization, and cache memory, respectively. The study presented in this paper aims to guide the researchers in the eld of high performance embedded computing in terms of dierent hardware architectures along with several implementation tactics.

ASAT-19
The 19th International Conference on Aerospace Sciences & Aviation Technology (ASAT-19)
April 6-8, 2021, Cairo, Egypt

ABSTRACTS

Modelling and simulation of two axes gimbal fuzzy PI stabilization system in the presence of feedback sensors noise

A Fathi [1], A M Kamel[1], A O Elfarouk[1], Y Elhalwagy[1]
[1]Military Technical College, Cairo, Egypt.
E-mail: ahmedfathy111980@gmail.com

Abstract. The missile guidance in terminal phase is an optimization problem as the miss distance should be minimized. The optimization of missile miss distance is highly affected by the missile seeker performance. Design of gimbal control system suffers always from feedback sensors noise which leads to system instability. In this paper, a promising design of the fuzzy PID controller for a missile seeker gimbal is proposed considering the feedback sensor noise with practical gyro transfer function calculated based on real experimental measurements utilizing MATLB system identification toolbox. Also, the mathematical model of two stabilized axes gimbal. Stabilization is achieved considering the missile motion parameters such as rates, torques and coupling between yaw and roll channels. A Matlab simulation is carried out for evaluating the proposed system modelling and to test the robustness of the fuzzy PID controller in the presence of feedback sensor noise. A comparative analysis with PI based controller is conducted to evaluate the performance of the proposed controller which presents sufficient enhancement to the missile gimbal stability parameters.

ASAT-19
The 19th International Conference on Aerospace Sciences & Aviation Technology (ASAT-19)
April 6-8, 2021, Cairo, Egypt

ABSTRACTS

Performance comparison among popular implementations of H.264 encoders

H Y El-Arsh, A S Elliethy, A M Abdelaziz and H A Aly
Dept. of Computer Engineering, Military Technical College, Cairo, Egypt, 11766
E-mail: hassan.yakout@ymail.com

Abstract. Remote sensing videos captured by Unmanned Aerial Vehicle (UAV) air-born highresolution cameras require an ecient compression scheme that preserves the details of the visual contents of the videos while reducing the total size of the data to be managed in real-time. This paper presents a detailed comparison between dierent open-source implementations for the H.264 video compression scheme. While the high-resolution videos allow analysts to extract more descriptive interpretations and draw more conclusive results, the increase in the consequent data size consumes more storage, resulting in more channel bandwidth, more power, and encounters an extra delay in transmission time. An ecient implementation of video compression can alleviate these large data size eects. In this paper, we analyze and compare the JM-encoder, the X264, the FFmpeg, and Cisco's OpenH264 open-source implementations in terms of compression eciency, video quality, and computational load. Moreover, we present the rate-distortion curves in terms of PSNR as a quality metric against the bit-rate for a combination of 20 videos with various resolutions and dynamic contents. Albeit H.64 is superseded by H.265, till now H.264 is used in more than 65% of video coding applications. For example, YouTube only allows H.264 for live streaming.

ASAT-19
The 19th International Conference on Aerospace Sciences & Aviation Technology (ASAT-19)
April 6-8, 2021, Cairo, Egypt

ABSTRACTS

Modelling and transient response study of hydraulic servo actuator

E E Ibrahim[1], T Elnady[1] ,I Saleh[1] and S Hassan[1]
[1]Department of Mechanical Power & Energy, Military technical college, Cairo, Egypt
E-mail: ezzbos@gmail.com

Abstract. This paper presents a mathematical model of electro hydraulic servo system (EHS) using two-stage electrohydraulic servovalve (EHSV), by the aim of Matlab-simulink-simscape multibody to predict the flow characteristics (pressure/flow rate) with changing the parametric configuration of (EHSV), these parameters could be used to estimate the error at different operating conditions. It includes establishing mathematical model, controller model and validating the performance of the (EHSV) by experimental result of published work using the data of servovalve labelled B.31.210.12.1000.U2V (mechanical feedback) manufactured by PPT – Trstenik. The effect of changing servovalve orifice diameter (0.25, 0.30, and 0.35) mm, show that increasing the orifice diameter of the servovalve leads to increase the transient time but decrease the system overshoot. The pressure behaviour is plotted and shows that increasing the orifice diameter leads to increasing the pressure inside the system as to reach the relieve pressure.

ASAT-19
The 19th International Conference on Aerospace Sciences & Aviation Technology (ASAT-19)
April 6-8, 2021, Cairo, Egypt

ABSTRACTS

Modeling, simulation and controller design for a typical bent axis electrohydraulic servo motor

M A Yousef[1], M El-Sanabawy[2], G Rabie[3] and R A Rateb[4]
[1] Department of Rockets, Military Technical College, Cairo, Egypt.
[2] Department of Rockets, Military Technical College, Cairo, Egypt.
[3] Modern Academy for Engineering and Technology, Cairo, Egypt.
[4] Egyptian Armed Forces, Cairo, Egypt.
E-mail: mohamed_abdelwahab@mtc.edu.eg

Abstract. Bent axis electrohydraulic servo motors are one of the Electrohydraulic Servo Motors (EHSMs) family which are used in high frequency, speed, and precision applications such as aerospace applications as well as many military weapon system applications. Therefore, it is essential to understand how such motors affect the whole performance of the system which makes modeling of these motors is an important task to be achieved. Once an accurate model is obtained, an optimum controller can be applied. This paper introduces detailed mathematical modeling of a typical bent axis (EHSM). MATLAB SIMULINK package is used to simulate and control such (EHSM) using PID controller. The PID controller gains were tuned using PD-PI controller to obtain the precision response for the (EHSM). The validity of mathematical modeling was reviewed through some practical experiments.

ASAT-19
The 19th International Conference on Aerospace Sciences & Aviation Technology (ASAT-19)
April 6-8, 2021, Cairo, Egypt

ABSTRACTS

Obstacle avoidance for multi-UAV path planning based on particle swarm optimization

E N Mobarez [1], A Sarhan [2], and M M Ashry [1],
[1]Department of Optoelectronics and Control,
[2]Aircraft electrical equipment's, Military Technical College, Cairo, Egypt.
E-mail: mmaashry@mt c.edu.eg

Abstract. Traffic Collision Avoidance System aims to help aircraft to avoid collision with any object or other aircraft .One of the functions of this system is that it avoids threatening UAV to collide, it also addresses each threat separately with the best collision avoidance and the best suitable horizontal separation with other aircraft in the optimal path. In this paper the flight path planning for UAVs was designed to avoid obstacles depending on how the particle swarm was improved. Optimization problems are improved by using swarm dynamics (evolutionary computational technology). This is by describing avoiding obstacles and adapt the path planning for UAVs. The concept of concurrent restructuring has been integrated into path planning to stay away from both static obstacles. This optimization technique designed to decrease processing time and the shortest route of the path planning.

ASAT-19
The 19th International Conference on Aerospace Sciences & Aviation Technology (ASAT-19)
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ABSTRACTS

PID tuning approaches for quadrotors unmanned aerial vehicles

M Mahfouz [1], A Taiomour [2], M M Ashry [1]and G Elnashar [1]
[1]Department of Optoelectronics and Control, Military Technical College,
[2]Aircraft Armament Department, Military Technical College,
E-mail: m.mahfouz.trc@gmail.com,

Abstract. In this paper, a comparative study between different PID tunning techniques is presented. The proposed techniques are applied to solve the formation configuration problem for a cooperative team of unmanned vehicles. The formation problem for the cooperative team is divided into two levels of control, one is the backstepping control technique for the stabilization of the team members positions as a higher controller. Simultaneously, PID controller receives the desired position to stabilize the attitude control as a lower controller to track the desired planning trajectories. The main contribution of this paper is the comparison between the different control approaches in tunning the PID gains to stabilize attitude control for the leader quadrotor. Simulation results present the assessment of the proposed PID control technique compared with different PID tuning approaches such as local optimal control, fraction order, Ziegler–Nichols and genetic algorithm. Moreover, disturbance rejection and white noise attenuation criterions are inspected to evaluate the ability of the proposed controllers to preserve the stability of the system.

ASAT-19
The 19th International Conference on Aerospace Sciences & Aviation Technology (ASAT-19)
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ABSTRACTS

Formation configuration of unmanned cooperative quadrotors via PID tuning approaches

M Mahfouz [1], A Taiomour [2], M M Ashry [1]and G Elnashar [1]
[1]Department of Optoelectronics and Control, Military Technical College,
[2]Aircraft Armament Department, Military Technical College,
E-mail: m.mahfouz.trc@gmail.com,

Abstract. Formation configuration is one of the major intrinsic strategies used in cooperative Unmanned Air Vehicles field. In this paper, Backstepping-PID control technique for cooperative quadrotors unmanned aerial vehicles are developed to solve the formation problem. The proposed controller is divided into couple of parts working together. Backstepping controller is used to stabilize the position control as a higher controller. Simultaneously, PID controller receives the desired position to stabilize the attitude control as a lower controller to track the desired planning trajectories. The main contribution of this paper is using Fraction Order Approach, and Local Optimal Approach to refine the PID lower controller gains. The tunning of the PID gains through the proposed PID tuning approaches guarantee the stabilization of the attitude control for all the team members. Simulation results present the success of the proposed PID tuning approaches in solving the formation problem for cooperative unmanned quadrotors tracking a desired path. Moreover, the simulation results present the ability of the proposed approaches to handle disturbance rejection and noise attenuation while preserving the stability of the system.

ASAT-19
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ABSTRACTS

Impact of nozzle profile on ballistic performance and structural loads

M Saleh[1], S Saleh[1], A Zayed[2] and M Y M Ahmed[1]
[1] Department of Rockets, Military Technical College, Cairo, Egypt.
[2] Nahda University, Egypt.
E-mail: saleh_uchiha@ymail.com

Abstract. A nozzle is a device that is designed to regulate the direction and characteristics of the combustion gas products of jet engines. So, the nozzle performance has a significant impact on the mission achievement. This paper is concerned with the internal ballistics of the nozzle aiming to estimate pressure and thermal loads on its walls. Computational fluid dynamics is applied to analyse the effect of changing nozzle internal profile on the resulting thrust, flow energy losses, and nozzle wall structure. Area ratios at the inlet, critical, and exit sections are considered as constraints for the examined design. Two different sets with 4 different profiles for each are investigated. The results show thrust, entropy losses across the nozzle and the static pressure and temperature at nozzle wall. Bell shape profiles produce better performance compared to other profiles. Changing the internal profile of the nozzle causes significant change in pressure and temperature loads acting on nozzle wall structure.

ASAT-19
The 19th International Conference on Aerospace Sciences & Aviation Technology (ASAT-19)
April 6-8, 2021, Cairo, Egypt

ABSTRACTS

Design, test and build of a monopropellant thruster using 85% hydrogen peroxide

Ah Deif[1], Ah El-S Makled[2], Mohamed K Khalil[3], and Y Elshaar[3]
[1] Space Technology Centre, Cairo, Egypt.
[2] Faculty of Engineering, Zagazig University, Zagazig, Egypt.
[3] Military Technical College, Cairo, Egypt.
E-mail: Deifmoh@yahoo.com

Abstract. The objective of this research is to design, build, and test about a 5N Hydrogen Peroxide(H2O2) monopropellant thruster (MPT). It is utilized in remote sensing satellites for attitude control and orbit manoeuvres. The MPT uses high test peroxide (HTP) of 85 % concentration. Firstly, H2O2 ≈85% concertation by weight is prepared in the laboratory. A distillation and filtration units are built. The distillation and filtration processes are performed. Next, the design of the monopropellant thruster is done based on the developed mathematical model using NASA CEA rocket performance code. The test facility is developed which consists of the thruster, the feeding system, static test stand and data acquisition system with measuring sensors. An experimental test stand is designed and fabricated with Pendulum thrust mechanism for measurements of thrust. Finally, the silver catalyst is prepared and packed inside the MPT chamber where silver screens of high purity 99.96 % are used. The 10-firing tests are conducted under atmospheric conditions. The firings performed without heating are not completely successful. The analysis of the results shows that the thruster has a thrust range from 3.8-4.2 N. The performance of thruster starts to decay after consuming 6 kg of stabilized H2O2. The specific impulse (Is) is evaluated to be ≈ 93-97s at decomposition pressure of ≈10 bars and mass flow rate ≈4.18 g/s. The performance evaluation is judged to be successful. However, using the whole potential of the 85 % concentrated H2O2, is expected to increase (Is) up to ≈111.5s.

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April 6-8, 2021, Cairo, Egypt

ABSTRACTS

Parametric study of solid propellant slotted grain

M El-Naggar[1], H Belal[2] and H M Abdalla[3]
[1] M.Sc. Student, Rocket Department, Military Technical College, Egypt
[2] Independent Researcher, AIAA Member, Egypt
[3] Associate Professor. Rocket Department, Military Technical College, Egypt
Email: khatab80@hotmail.com

Abstract. One of the goals in solid rocket motor design is to have as large volumetric loading as possible keeping the basic requirements unaffected. Slotted grain can achieve this goal as it has the advantages of sliver-free and no stress-concentration regions that occur in other internal burning grains as star grain and wagon wheel grain. It has the disadvantage of exposing the motor wall to hot gases. In this paper, the geometry of slotted grain is discussed and the effect of design parameters (e.g., number of slots, dimensions of the slot, etc.) of slotted grain on grain burn back is explained. Also, a comparison between results and experimental data is performed.

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ABSTRACTS

Experimental investigation of recirculation zone characteristics of a pre-filming airblast injector

M N Darwish[1], K P Shanmugadas[2]and S R Chakravarthy[2]
[1] Aerospace Engineering Department, University of Science and Technology at Zewail City, Giza, Egypt
[2] National Centre for Combustion Research and Development & Department of Aerospace Engineering, Indian Institute of Technology Madras, Chennai, India
Email: s-mohammednady@zewailcity.edu.eg

Abstract. The toroidal flow at the recirculation zone has a vital role in combustion process as it helps in mixing hot combustion products with incoming fresh air and fuel which increases combustion efficiency. In the present work, characteristics of recirculation zone are investigated using a pre-filming airblast injector. Particle Image Velocimetry is used to characterize the swirl flow field generated by the airblast injector. Moreover, olive oil is used as a tracer to be captured by a high-speed camera. Different flow rates are investigated in order for finding out the effect of varying flow rates on the characteristics of the recirculation zone. Results for recirculation zone shape, velocity field and shear strength at the primary zone of combustion are represented. Additionally, results show that recirculation zone is almost symmetrical with increasing trend in shear strength with increasing flow rates.

ASAT-19
The 19th International Conference on Aerospace Sciences & Aviation Technology (ASAT-19)
April 6-8, 2021, Cairo, Egypt

REVIEWERS LIST

Reviewer Name	Affiliation
Abalola, Adel	Prof. o Electric Power Engineering Department, Monufia University, Engineering College
Abdalla, Ahmed	Prof. of Electrical Eng., MTC, Cairo, Egypt.
Abdel Latif Soliman, Mohamed Samir	Assoc. Prof. of Electrical Eng., MTC, Cairo, Egypt.
Abdel-Rahman, Mohamed	Prof. Nuclear Engineering Department, MTC, Cairo, Egypt, Military Technical College
Abdelrahman, Mostafa	Egyptian atomic energy authority Cairo University
Abdo, Mohamed	Prof. of Physics Engineering Science, MTC
Aboazm, Ahmed	Prof. at Navy Engineering Branch, MTC, Cairo, Egypt
Aboelfotoh, Mohamed	Head of Chemical Warfare MTC, Dept.
Abozeid, Mohammed	Prof. Navigation, Guidance, and Control, MTC, Cairo, Egypt.
Ahmed, Hesham	Prof. of Elect. Eng. , MTC, Cairo, Egypt
Allam, Mohamed	Prof. of Rocket Mechanical, MTC
Almazy, Khaled	Prof. at Mechanical Eng. Branch, MTC, Cairo, Egypt
Arafa, Ibrahim	Prof. Guidance, Navigation and Control
Ashry, Amr	Prof. of Communications and Networks, MTC
Ashry, Mahmoud	Prof. Automatic Control , MTC, Cairo, Egypt.
Atef Kamel, Mohamed	Prof. of Mechanical Eng., MTC, Cairo, Egypt.
Atef, Mohamed	Automotive Engineering, MTC, Cairo, Egypt.

REVIEWERS LIST

Reviewer Name	Affiliation
Ateya, Ibrahim	Prof. at A/C Mechanical Dep. MTC, CA, Egy.
Atta, Mohamed	Prof. Communication Signal Analysis , MTC, Cairo, Egypt.
Azouz, Ahmed	Prof. SAR Digital Signal Processing , MTC, Cairo, Egypt.
Baraka, Ahmed	Head of Chemical Branch, MTC
Basuney, Sherif	Prof. Chemical Engineering, MTC
Bazan, Taher	Assoc. Prof. of Optoelectronics, MTC, CA, EG.
Bennay, Mohamed	Prof. of Mechanical Eng., MTC, CA, EG.
Dahshan, Hisham	Prof. Cryptography and Networks Security, MTC, Cairo, Egypt
Desouky, Ashraf	Prof. Navigation , MTC, Cairo, Egypt.
El_Khatib, Mohamed	Prof. of Electrical Eng., MTC, Cairo, Eg.
El-Dalil, Omar	Communication Engineering Alexandria University, Alexandria, Egypt
Elmahihy, Ali	Prof. Mechanical Power, MTC, Cairo, Egypt
Elmahy, Wesam	Astronomy and space science Department – Faculty of science, Cairo University
Elmasry, Mohamed	Material science and technology , MTC, Cairo, Egypt.
Elmayyah, Wael	Mechatronics Engineering, MTC, Cairo, Egypt.
Elrewainy, Ahmed	Prof. of statistical Signal Processing, Avionics Department, MTC, Cairo, Egypt.
El-Sayyad, Gharieb	Egyptian Atomic Energy Authority
Elshafey, Mohamed	Faculty Member in Computer Engineering Dept., MTC,-Cairo, Egypt

REVIEWERS LIST

Reviewer Name	Affiliation
Elsherif, Ahmed	Engineering Mathematics, MTC, Cairo, Egypt.
Eltahlawy, Mohammed	Prof. Laser Physics
Eltalabawy, Waleed	Prof. material science and engineering, MTC, Cairo, Egypt.
Esmail, Ahmed	Engineering Mathematics, MTC, Cairo, Egypt.
Fathallah, Elsayed	Department of Civil Engineering, Military Technical College, Cairo, Egypt.
Foad, Mohamed	Prof. at Computer Eng. Dept., MTC, Cairo, Egypt.
Gobara, Mohamed	Prof. Material Properties, MTC, Cairo, Egypt
Hanna, Waleed	Material science and technology , MTC, Cairo, Egypt.
Hegazy, Shawky	Automotive Dept., MTC, Cairo, Egypt.
Hendy, Hossam	Prof. of Satellites, Attitude Determination and control system, MTC, Cairo, Egypt
Hussein, Ahmed	Prof. at Department of Mechanical Engineering, College of Engineering, University of Babylon, Babylon City, Hilla Republic of Iraq
Ibrahim, Mohamed	Dr., Electrical Eng. Dept., UAV Automation
Ismail, Gouda	Prof. of Computer Engineering
Kamal, Ashraf	PhD
Kamal, Osama	Prof. of Mechanical Engineering Rocket Applications
Kamel, Ahmed	Prof. Navigation, Guidance, and Control, MTC, Cairo, Egypt.
Kamel, Hazem	MTC Deputy Commandant for PGS & Researches
Kamel, Hisham	Automotive department, MTC
Kassem, Mohammed	Department of Aircraft Mechanics, Military Technical College, Cairo, Egypt

ASAT-19
The 19th International Conference on Aerospace Sciences & Aviation Technology (ASAT-19)
April 6-8, 2021, Cairo, Egypt

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Reviewer Name	Affiliation
Khalil, Mohamed	Prof. of Aerospace, MTC, Cairo, Egypt
Kotb, Wael	Automotive Engineering, MTC, Cairo, Egypt.
Magdy, Mohamed	Military Technical College
Mahr, Mahmoud	Prof. of Material Science, MTC, CA, EG.
Mashaly, Ahmed	Prof. Elect. Eng. ACB. Dept.
Mekkawy, Tamer	Prof. of Elect. Eng, MTC, Cairo, Egypt
Mokhtar, AYMAN	Prof. of Optoelectronics, MTC
Morsy, Sherif	Prof. of Computer Eng., MTC, CA, EG.
Mostafa, Hosamm	Prof. at Chemical Eng. Branch, MTC, Cairo, egypt
Nabiel, Tamer	Prof. Optical Wireless Communication , MTC, Cairo, Egypt.
Nagy, Amr	Cairo
nemnem, Ahmed	Prof. A/C Mechanical Dept., MTC, CA, Egy.
Ola, Mohamed	Mechatronics Engineering, MTC, Cairo, Egypt.
Omer, Adel	Prof. of dynamics, MTC, Cairo, Egypt.
Othman, Mohamed	Material science and technology , MTC, Cairo, Egypt.
Paravan, Christian	Space Propulsion Laboratory, Aerospace Science and Technology Dept., Politecnico di Milano
Ragheb, Hossam	Automotive Dept., MTC, Cairo, Egypt.
Raid, Ahmed	Prof. at Mechanical Engineering Branch, MTC, Cairo, Egypt
Rashad, Ayman	Dean of Faculty of Engineering at Shoubra
Rateb, Ragee	Assoc. Prof. Rocket Propulsion
Saaed, Tamer	Mechanical Engineering Branch, MTC, Cairo, Egypt
Safwat, Ehab	Head of Armament Navy Dept.

REVIEWERS LIST

Reviewer Name	Affiliation
Sanad, Ibrahim	Dr, EE, MTC, Cairo, Egypt
Shamekh, Mohamed	Prof. Science and Technology of Materials , MTC, Cairo, /Egypt
Sharaf, Alhossein	Prof., Automotive Dept., MTC, Cairo, Egypt.
shokry, khaled	PhD, Chemical Engineering,
Tork, HOSSAM	Head of Navy warning Dept.
Yacoub, Mustafa	Prof., Automotive Dept., MTC, Cairo, Egypt.
yahia, Mahmoud	Prof. of Rocket Mechanics
Zakria, Mohamed	Prof. Aerospace Mechanical Eng., MTC, Cairo, Egypt

ASAT-19
The 19th International Conference on Aerospace Sciences & Aviation Technology (ASAT-19)
April 6-8, 2021, Cairo, Egypt

AUTHORS INDEX

ASAT-19
The 19th International Conference on Aerospace Sciences & Aviation Technology (ASAT-19)
April 6-8, 2021, Cairo, Egypt

AUTHORS INDEX

ASAT-19
The 19th International Conference on Aerospace Sciences & Aviation Technology (ASAT-19)
April 6-8, 2021, Cairo, Egypt

AUTHORS INDEX

ASAT-19
The 19th International Conference on Aerospace Sciences & Aviation Technology (ASAT-19)
April 6-8, 2021, Cairo, Egypt

AUTHORS INDEX