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Abstract Book




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Abhilash Chandy

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Design and Demonstration of the Sabatier Micro-channel Reactor for Space Applications

Abstract

The Sabatier reaction plays a crucial role in the conversion of carbon dioxide (CO2) and hydrogen (H2) into methane (CH4) and water (H2O) using a heterogeneous catalyst. This well-known catalytic process has gained considerable attention for its applications in both space missions and power-to-gas (P2G) technologies. The development of a microchannel reactor for the Sabatier process further enhances reaction efficiency by improving heat and mass transfer, offering a compact design, and achieving a high surface-area-to-volume ratio. In space applications, the Sabatier reaction is integral to life support systems. In the current experimental study, the Sabatier process is demonstrated in a microchannel reactor setup at different operative conditions. In particular, the reactor performance will be evaluated by investigating experimentally, the effect of reactor pressure, temperature and space velocity. The performance evaluation of the Sabatier microchannel reactor using 0.5 wt% Ru/γ-Al2O3 catalyst was carried out and revealed several key observations. The wash coat's adherence and stability were confirmed through ultrasonication tests, which demonstrated less than 2% loss in material after 90 minutes of exposure. Profilometry analysis confirmed that the wash coat achieved the desired thickness, ensuring optimal catalyst surface area for the Sabatier reaction. Additionally, Gas Chromatograph (GC) analysis provided further validation. The Blank Run confirmed the absence of methane in the system, ensuring the reliability of the FID detector. The Standard Canister Run (50% CH4 and 50% N2) established the expected methane peak at 0.99 minutes. Post-reaction samples, showing methane peaks at corresponding retention times, confirmed the successful development of the 0.5 wt% Ru/γ-Al2O3 catalyst on the microchannel reactor. Despite these successes, methane yield and CO2 conversion remained lower than expected. One probable reason could be salt precipitation during the incipient

wetness impregnation process due to maintaining pH levels above 9. This may have hindered catalyst dispersion and surface exposure. Future experiments should focus on optimizing the pH conditions during catalyst preparation to minimize precipitation and improve catalytic activity.

Biography

Abhilash Chandy received his Bachelor's degree in Mechanical Engineering from National Institute of Technology (N.I.T.), Trichy, India in May 2000. He pursued his Masters in Aerospace Engineering at University of Florida in Gainesville, Florida, until August 2002. He received his Doctoral degree in Mechanical Engineering from Purdue University in West Lafayette, Indiana, in May 2007. In August of 2008, he joined the Mechanical Engineering department of University of Akron, Akron, Ohio, as a tenure-track Assistant Professor and was tenured and promoted to Associate Professor in 2014. At The University of Akron, Dr. Chandy was involved in research activities pertaining to modeling turbulence and manufacturing processes. In 2017, he moved back to India and joined the Indian Institute of Technology Bombay, as an Associate Professor and was promoted to full Professor in May 202. He continues to work on varied problems related to manufacturing process modelling and stratified and MHD turbulence.

Abhishek Bansal

Principal Consultant, New Era Consultancy Services, India

Novel Perspective of Contemplating Existing Principles of Scientific Truth

Abstract

In this session, I'm going to present my novel perspective of contemplating the existing principles which have been established or viewed as fixed eternal truth beyond which it is believed there is nothing to explore. I have revisited the concept of electrical current and circuit theory w.r.t quantum mechanics and electrodynamics, and its application in short circuit.
I also provide insight, significance of complex-domain impedance and the work and results developed in this research is also the practical implementation for the open unsolved problem in mathematics. This research aims to examine aspects of impedance in hypercomplex and higher dimension planes. My research studies questions - What is distinctive about j'' that makes it special in defining impedance? What impact the representation of impedance in hyper-complex planes will lead on critical calculations in electrical egg. especially in short-circuit, transmission lines voltage drop or voltage induced, synchronous motors? What such interpretation leads to? I also present the sinusoidal significance as needed by inverters. In electronics \& electrical engineering, being a `pure sine wave' can be understood from the power quality, power factor and designing of expensive pure sine wave inverters. In many practical applications, not pure-sine(modified) wave or quasi-sine waveform in not acceptable as performance gets degraded. In these three-part paper series, four questions are studied. What makes a sine wave, a special wave?
I also present my model/method in analysis of transformer, MPS, BLDC. (Should not be uploaded in this form as work still ongoing).

Biography

Abhishek Bansal is an amateur scholar, fully self-studied various engineering, medical & mathematical specializations, and has been working for the past 20 years in R & D(machine designing). He is also involved in non-engg. works. He is fighting himself his litigation matters in Courts. He is the founder of New Era Consultancy Services and Learn Yourself Easy Solutions. His profile can be seen at ORCiD with identification number 0000-0002-2572-9004.

Geemoon Noh

Pusan National University, Busan, Republic of Korea

Development of a mission/path planning system for an unmanned aerial vehicle using PRM and ACO and verification through a framework

Abstract

The objective of this study is to develop and validate a framework for mission and path planning algorithms for unmanned aerial vehicles (UAVs) operating in a 3D environment. For path planning, a Probabilistic Roadmap (PRM) algorithm is used to generate a global path map. When additional obstacles are detected, the system performs path replanning to update the original map. In this stage, the obstacle checking process within the PRM is parallelized to reduce computation time. For mission planning, an Ant Colony Optimization (ACO) algorithm is used, with additional techniques applied to prevent local optima and improve convergence. Furthermore, a constraint on the maximum flight distance is introduced, allowing the system to drop some missions if the total flight distance exceeds the allowed limit. The two algorithms are then integrated to determine the mission sequence on the global path map and generate the complete flight path.

A 3D simulation framework is constructed to validate the algorithm. During the simulation, hidden obstacles are placed at specific locations, and when these obstacles affect the planned path, mission and path replanning are triggered. As a result, the proposed framework successfully performed initial mission and path planning, and dynamic replanning was verified upon obstacle detection.

Biography

Geemoon Noh is currently a Ph.D. Candidate at the Pusan National University in South Korea. His research interests are GNC for automatic operation of unmanned aerial vehicles.

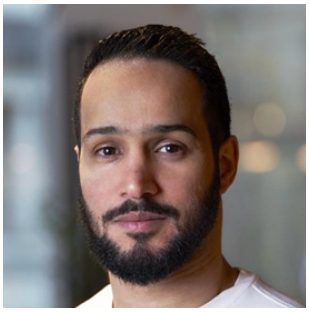
Halima Boussadia

Department of Automation, University of Science and Technology of Oran - Mohamed Boudiaf

A combined configuration (αβ filter- TRIAD algorithm) for spacecraft attitude estimation based on in-Orbit Flight Data

Abstract

The attitude estimation has been viewed as one of the key technologies in space research works. It is used to convert the sensor measurement data to an estimated attitude using different estimation methods. However, because of the difficulty of space missions and tight computational budget most estimators suffer from height consuming which render them unsuitable. In this work, the latter problem is addressed based on a new configuration for on board attitude determination and control system (ADCS) implementation based on in-Orbit Flight Data. The proposed configuration is a combination of αβ filter and Triad algorithm using the concept of sensor fusion with Magnetometer and Sun-sensor, it is applied for linearized satellite model, when the satellite has small deviations in the attitude angles (in imaging mission), and its simulation results are compared to the in-orbit attitude of Alsat-1which was estimated using small Euler angles based the Extended Kalman Filter (EKF) implemented on board Alsat-1.The primary goal of the addressed problem is to perform a low computational budget and good accuracy in the same time. It found that the proposed configuration has acceptable performances and a reduced computational budget.



Hatim Alotaibi

Institute of Earth and Space Science, King Abdulaziz City for Science and Technology, Riyadh 12354, KSA

Coupled fluid–thermal–structural numerical methods to aerospace design and manufacturing of multiscale composite structures

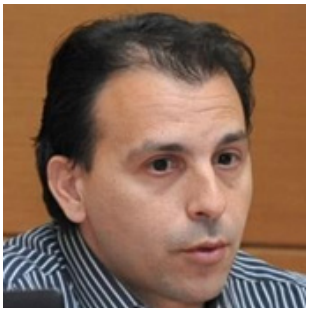
Abstract

Fibre deformation (or shearing of yarns) can develop during the liquid moulding of composites due to injection pressures or polymerisation (cross-linking) reactions (e.g., chemical shrinkage). On that premise, this may also induce potential residual stress–strain, warpage, and design defects in the composite part. In this paper, a developed numerical framework is customised to analyse deformations and the residual stress–strain of fibre (at a micro-scale) and yarns (at a meso-scale) during a liquid composite moulding (LCM) process cycle (fill and cure stages). This is achieved by linking flow simulations (coupled filling–curing simulation) to a transient structural model using ANSYS software. This work develops advanced User-Defined Functions (UDFs) and User-Defined Scalers (UDSs) to enhance the commercial CFD code with extra models for chemorheology, cure kinetics, heat generation, and permeability. Such models will be hooked within the conservation equations in the thermo-chemo-flow model and hence reflected by the structural model. In doing so, the knowledge of permeability, polymerisation, rheology, and mechanical response can be digitally obtained for more coherent and optimised manufacturing processes of advanced composites.

Biography

Hatim Alotaibi is currently a Research Assistant Professor in Aerospace Engineering (Specialised in Computational Fluid Dynamics (CFD)) at King Abdulaziz City for Science and Technology (KACST). Alotaibi received his B.A.Sc. (2016) in Industrial Systems Engineering from University of Regina (Canada), MSc (2019) in Aeronautical Engineering from The Hong Kong University of Science and Technology (Hong Kong), and PhD (2023) in Aerospace

Engineering from the University of Manchester (United Kingdom). Alotaibi's research focuses at using a combination of modelling, theory and simulation to study " advanced materials and manufacturing processes " that are complex due to multiscale nature of materials, the rheology of fluid, and multiphysics phenomena in which the interactions of various effects (thermal, chemical, electric or mechanical) lead to complex dynamics. His research is motivated by processing and manufacturing of different materials for aerospace structures and energy storage materials.



Ilias Panagiotopoulos Hellenic

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Unmanned aerial vehicles technology and its applications in modern battlefield

Abstract

As the wars in Ukraine and Israel show, unmanned aerial vehicles (UAVs) are transforming modern battlefield with novel technologies via rapid modification, swarms, and cost. While UAVs are expected to play more roles in future conflicts, they still face significant challenges compared to manned air vehicles (fighters). In this context, the aim of the present study is therefore to systematically identify and present the challenges associated with the use of UAVs in modern battlefields in terms of cost-operational efficiency, risk reduction, adaptability, endurance and range, electronic warfare resilience, situational awareness, ethical and strategic concerns. The above analysis aims to support academia, private companies, government agencies and other stakeholders to identify appropriate paths to be used, and maybe adapted, in their specific contexts and research purposes mostly on the ways that UAVs can transform and change the future warfares.

Biography

Eng. Ilias Panagiotopoulos received the bachelor's (2002) and first Ph.D. (2009) degrees in mechanical and aeronautics engineering from the Mechanical Engineering and Aeronautics Department, University of Patras, Greece, and the second Ph.D. (2020) degree in informatics science and technology from the Department of Informatics and Telematics, Harokopio University of Athens, Greece. Since 2024 he is working as an Associate Professor at Hellenic Army Academy in the field of Exterior Ballistics Engineering. His primary research interests include the scientific areas of Exterior Ballistics Engineering, Unmanned Aerial Vehicles, Aerospace Technology, Flight Mechanics, Aerodynamics and Fluid Mechanics, while other fields include Intelligent Transportation Systems and Vehicle Automation Technology. He has published in peer-reviewed scientific journals, in conference proceedings and presented his research achievements in several conferences and workshops. He is a reviewer in several scientific journals and conferences.

Jiamin Chen

Institute of Electrical Engineering, Chinese Academy of Sciences, Beijing 100190, China

Magnetic Flux Concentration Technology Based on Soft Magnets and Superconductors

Abstract

High-sensitivity magnetic sensors are fundamental components in fields such as biomedicine and non-destructive testing. Flux concentration technology enhances the sensitivity of magnetic sensors by amplifying the magnetic field to be measured, making it the most effective method to improve the magnetic field resolution of magnetic sensors. Superconductors and high-permeability soft magnetic materials exhibit completely different magnetic effects. The former possesses complete diamagnetism, while the latter has extremely high magnetic permeability. Both types of materials can be used to fabricate flux concentrators. This paper compares superconducting and soft magnetic flux concentration technologies through theoretical simulations and experiments, investigating the impact of different structural parameters on the magnetic field amplification performance of superconducting and soft magnetic concentrators. This research is significant for the development of magnetic focusing technology and its applications in weak magnetic detection and other fields.

Biography

Jiamin Chen received the B.S. degree inelectronic science and technology from the Huazhong University of Science and Technology, China, in 2012. He received the M.S. and Ph.D. degrees from University of Tsukuba, Japan, in 2014 and 2017 through the Joint Graduate Program operated by the National Institute for Materials Science (NIMS) and the University of Tsukuba, majoring in material science and engineering. Currently, he is a full professor and group leader in the State Key Laboratory of Transducer Technology, Aerospace Information Research Institute, Chinese Academy of Sciences, where he was awarded the Young Scientist Award at the Microsystem & Nanoengineering Summit 2019, and the Young Elite Scientists Sponsorship Program by CAST. His research interests include magnetic sensors, spintronic materials and devices, novel sensing materials, and MEMS-spintronic hybrid sensor.

Jiaping Xiao

School of Mechanical and Aerospace Engineering, NTU, Singapore

Learning Collaborative Search with a Visual Drone Swarm

Abstract

Equipping drones with target search capabilities is highly desirable for applications in disaster rescue and smart warehouse delivery systems. Multiple intelligent drones that can collaborate with each other and maneuver among obstacles show more effectiveness in accomplishing tasks in a shorter amount of time. However, carrying out collaborative target search (CTS) without prior target information is extremely challenging, especially with a visual drone swarm. In this talk, a novel data-efficient deep reinforcement learning approach called adaptive curriculum embedded multistage learning (ACEMSL) is proposed to address these challenges, mainly 3-D sparse reward space exploration with limited visual perception and collaborative behaviour requirements. Specifically, we decompose the CTS task into several subtasks including individual obstacle avoidance, target search, and inter-agent collaboration, and progressively train the agents with multistage learning. ACEMSL allows data-efficient training and individual-team reward allocation for the visual drone swarm. Extensive simulations and real-world flight tests validate the effectiveness of ACEMSL.

Biography

Jiaping Xiao received the Ph.D. degree in Aerospace Engineering from Nanyang Technological University (NTU), Singapore in 2024. From 2017 to 2020, he was an Engineer with the Institute of Software, Chinese Academy of Sciences, Beijing. He is currently a Research Assistant Professor with the School of Mechanical and Aerospace Engineering, NTU. He has published over 20 papers in top journals and conferences, such as IEEE TNNLS, IEEE TVT, IEEE TAI, IEEE TRO and IJCAI etc. His research interests include cyber-physical system, deep reinforcement learning, machine vision and aerial robotics.

Kimia shirini, sina samadi ghareveran

Tabriz university

A Metaheuristic Optimization Approach for Aircraft Landing Scheduling at Busy Airports

Abstract

Aircraft landing scheduling at busy airports is a critical challenge in air traffic management, directly impacting delay reduction, airport efficiency, and flight safety. This problem involves multiple complex constraints, including runway capacity, safe separation distances, time windows, and flight prioritization. In this study, an optimization model based on metaheuristic algorithms is proposed to efficiently schedule aircraft landings. The proposed approach integrates swarm intelligence and evolutionary optimization techniques to determine optimal landing times, minimizing total delays while maximizing airport operational capacity. To evaluate the effectiveness of the proposed method, simulations were conducted using real-world traffic data from a high-traffic airport. The results demonstrate that the proposed model significantly reduces total delay time, improves resource allocation, and enhances landing schedule accuracy. These findings suggest that the proposed approach can serve as an effective tool for improving air traffic management and increasing flight operation safety.

Biography

Kimia received her Ph.D. in Computer Engineering from the University of Tabriz at the age of 28. She also obtained her M.Sc. and B.Sc. degrees from the same university in 2015 and 2019, respectively. Her research focuses on optimization and metaheuristic algorithms, where she has made significant contributions. She has published numerous research papers in this field, demonstrating her expertise in developing and applying advanced optimization techniques to solve complex computational problems.

Kung-Ming Chung

Aerospace Science and Technology Research Center, National Cheng Kung University,

Tainan, Taiwan

Flow control on a compressible backward-facing step flow

Abstract

Geometric discontinuities on the exterior surface of modern high-speed aircraft induce undesired noise and fluctuating loads. A backward-facing step (BFS) is the simplest form of this type of geometry. A sudden change in contour causes the incoming boundary layer to separate at the edge of the step. A thickening, curved shear layer forms that is unsteady due to Kelvin-Helmholtz instabilities. Vorticity thickness increases at an approximately constant rate and the reattachment process induces a lower rate of change in the thickness of the vortex. This study uses micro-vortex generators (MVGs) to decrease the reattachment length and undesired surface pressure fluctuations in a compressible flow regime. An array of MVGs (counter-rotating vane-type, ramp-type and co-rotating vane-type) with a height that is 50% of the thickness of the incoming boundary layer is installed upstream of a step. Streamwise vortices due to the presence of MVGs induces stronger flow expansion near the step and early reattachment. The effect of MVGs on the shear layer and step modes depends on the freestream Mach number, the step height and the configuration of the MVGs.

Biography

Jiamin Chen received the B.S. degree inelectronic science and technology from the Huazhong University of Science and Technology, China, in 2012. He received the M.S. and Ph.D. degrees from University of Tsukuba, Japan, in 2014 and 2017 through the Joint Graduate Program operated by the National Institute for Materials Science (NIMS) and the University of Tsukuba, majoring in material science and engineering. Currently, he is a full professor and group leader in the State Key Laboratory of Transducer Technology, Aerospace Information Research Institute, Chinese Academy of Sciences, where he was awarded the Young Scientist Award at the Microsystem & Nanoengineering Summit 2019, and the Young Elite Scientists Sponsorship Program by CAST. His research interests include magnetic sensors, spintronic materials and devices, novel sensing materials, and MEMS-spintronic hybrid sensor.

Odette Laneuville

University of Ottawa, Ontario K1N 6N5, Canada

Machine learning algorithms applied to integrated HDT bed rest data: mining data from a spaceflight analogue

Abstract

During spaceflight, astronauts experience deconditioning; the simultaneous reduction of the functional capacity of multiple body systems leading to weakness and inability to perform activities. Impairments span multiple systems from cardiovascular, musculoskeletal, to immunity all contributing to deconditioning. The scarcity of astronauts' biological samples combined with technical challenges in space hampers our ability to monitor how the human body copes with space hazards. However, head-down tilt (HDT) bed rest studies represent an Earth-based analogue to microgravity and an opportunity to decipher the molecular mechanisms leading to deconditioning. Our Team secured access to European Space Agency (ESA) data collected for the monitoring of participants. We applied machine-learning algorithms to integrated ESA data and gene expression data collected from the same participants by our Team. Results revealed predictor genes and physiological responses for early detection of deconditioning and for the design of interventions to prevent the negative effects of microgravity.

Biography

Dr. Odette Laneuville is a Professor in the Department of Biology at the University of Ottawa and teaches molecular genetics courses. She is the Director of the Biomedical Science program in the Faculty of Science. She directs a research program aiming at elucidating the biological response to spaceflight at the genetic level and leading to the deconditioning of multiple systems. Her original research combines the collection and genetic analysis of rare samples from astronauts travelling to the International Space Station using high throughput sequencing technology. Her recent work has documented a reduced expression of genes controlling the immune response while in space and has attracted media attention. Her research is funded by the Canadian Space Agency. She has authored numerous publications on the effects of space on human physiology and genetics.

Sandeep Juluru

Assistant Professor, Department of Aero Engineering, SOET, SANDIP UNIVERSITY

Techniques to Control Flow Separation in Hypersonic Intakes

Abstract

Hypersonic Intake is a part of Scramjet Engine used to suck the air from atmosphere and decelerates the hypersonic speed flow to supersonic speeds. It also develops the pressure and temperature of the air required for combustion process through a series oblique shocks generated from ramps of intake. But the interaction of shock wave with boundary layers separates flow and leading unstarting phenomenon. This behavior of intake limits the operating range of scramjet engine. The unstarting phenomenon caused by the separation bubble can be reduced by various flow control techniques. Presently Micro Ramps, Bleeding, and Recirculatory systems are the passive control devices analyzed and found inefficient in control flow separation at hypersonic speeds. An active control technique i.e., injecting fluid into the boundary layer is applied to suppress separation bubble size in the hypersonic intakes.

Comparing all the control techniques the size of separation bubble is able to minimize. Micro ramps reduce flow separation bubble size by generating streamwise vortices that energize the boundary layer, but leaves small, localized bubbles due to the uneven flow. Coming to bleed systems, it effectively minimizes bubble size by removing low-energy air, leading to a more stable flow and smaller separation bubbles. The re-circulatory devices redistribute energy across the boundary layer, significantly reducing the size of separation bubbles by maintaining a smoother flow attachment. While the injection technique is highly effective at shrinking or even eliminating separation bubbles by injecting high-energy air, this can sometimes create secondary, smaller bubbles if not well-controlled. Out of all the analysis, three injectors demonstrated the effective control of flow separation with viable improvement in total-pressure recovery.

Biography

Sandeep Juluru has completed B.Tech Aeronautical Engineering and M.Tech Aerospace Engineering. He also submitted Doctoral Thesis on Computational Investigation around Hypersonic Intake to enhance the operationg range of Scramjet Engine at JNTU Hyderabad. He has Published in excess of 15 papers in Scopus and reputed Journals. He completed Lab Migration project on Aerospace Computational Analysis under FOSSEE IIT Bombay. He laso Published 2 book chaptes related to Aerodynamics.

SeongHo Lee

School of Aerospace Engineering, Pusan National University, Pusan

Scaled Experiment of Relative Navigation Using Model-Based-Tracking in a simulated Space Environment

Abstract

In recent Year, technologies such as satellite life extension and active debris removal have garnered significant attention as part of the global effort to ensure the sustainability of the space environment. These operations collectively referred to as On-Orbit-Servicing(OOS) encompass a range of sevices including Health moniroting, attitude maintance, repair, debris removal, and component replacement of space assets. A critical requirement of enabling OOS is the accurate estimation of relative navigation between space objects. In space environments, relative navigation is commonly derived from sensor raw data such as images or Pointclouds obtained from cameras and LIDAR. Among various image-based approaches, Model-Based-Tracking(MBT) is capable of estimating the pose and tracking motion of a target object by exploiting its prominent structural features. In this work, a rendezvous simulation with the International Space Station(ISS) was conducted in the ROS-GAZEBO environment using an MBT-based relative navigation algorithm, modeled sensor with cameras and LIDAR.
Expanding upon this simulation, this work aims to validate the preformance of MBT-based relative navigation in realistic lighting and environmental conditions. To this end, a scaled testbed emulating a space environment has been developed, incorporating a two robotic arm for Chaser and target object, and linear rail system.

Seongho Lee received his B.S. degree from Pusan National University at the age of 25. He is currently pursuing his M.S. degree in the Department of Aerospace Engineering at Pusan National University, where he is conducting research in the Flight Dynamics Laboratory.

Biography

SEONG-HO LEE received the B.S. degree in Computer Science and Engineering from Incheon National University in 2019 and received the M.S. degree with the Department of Electronic Computer Engineering at Inha University, Korea. He is currently a full-time Researcher at Inha University. His current research interest is multi-object tracking, object detection, generative adversarial networks, multi-scale representation, and self-supervised learning.

Serhii S. Shevchenko

G.E. Pukhov Institute for Modelling in Energy Engineering of National Academy of Sciences of Ukraine (IPME)

Sealing systems and their influence on rotor dynamics

Abstract

In liquid rocket engines, the fuel supply system is implemented by turbopump units, which include pumps and a pump drive - a gas turbine. Turbopump units supply highly aggressive and toxic fuel components to the combustion chamber, which can enter into a chemical reaction when interacting. The physical properties of the working fluids supplied by the pumps and the working fluid in the gas turbine tract differ significantly.

Therefore, it is very important to ensure the sealing of the unit cavities with different pressures, as well as to prevent the leakage of aggressive liquids to the outside.

Design measures aimed at increasing the hydraulic resistance of seals, as a rule, increase their hydrostatic rigidity and damping, and thereby improve their dynamic qualities. Thus, non-contact seals, in addition to sealing, perform an equally important function - they improve the vibration state of the centrifugal machine. Dynamic characteristics are especially important for seals in high- speed rotary machines.

The studies have shown that all sealing units with throttling gaps or sealing paths filled with a high- pressure sealed medium should be considered as dynamic systems. The sealed medium affects the dynamic state of the rotor, acting on the walls of the sealing paths.

The greater the hydraulic resistance we create in the sealing gaps (for example, due to taper), the more energy is spent on overcoming these channels by the sealed medium, the more the sealing units dynamically reinforce the rotor, improving its vibration characteristics.

It is shown that a targeted selection of seal design parameters allows improving the vibration state of the rotor. An initially dynamically "flexible" rotor in combination with correctly designed seals can become dynamically "rigid".

Based on the study of the hydromechanical model of a gap seal and models of rotors in gap seals, analytical dependencies were obtained that describe the radial-angular oscillations of the rotor.

Methods for calculating and designing sealing systems are proposed that take into account oscillatory processes caused by the hydrodynamic characteristics of the seals.

Biography

Graduated from the Kharkiv Polytechnic Institute (KhPI) in 1984 (specialty: "Hydraulic machines and means of automation").
In 1990, he defended his Ph. D thesis on the topic "Development and research of new designs of stuffing-box seals for NPP pumping equipment."
Worked at the research laboratory of machines' vibration reliability at the theoretical mechanic's department of the Sumy branch of KhPI (later Sumy State University): as a senior research associate from 1984 to 1994, participated in the development for the Airspace technology and NPP. Since July 2020, has been a senior researcher at the G.E. Pukhov Institute for Modelling in Energy Engineering NAS of Ukraine. In June 2023, defended his doctoral (Doctor of Engineering) thesis on the topic "Mathematical models of processes in the sealing systems of centrifugal machines".
The area of research related to the methods development of sealing theory and vibration reliability of centrifugal machines.

Srinivasa Rao Pundru

Mahatma Gandhi Institute of Technology, India

Research Fronts - Active Fields - Leading Countries

Abstract

The World Research Leading Countries Ranks are based on Research Leadership Index (RLI) Score, which is analysed based on Record of Research Publication RLI Score of the articles of the Countries. The RLI Score of Countries are analysed based on published last 5 years recognized (Cross Reference Appendix/ Scopus Appendix / Web of Science Appendix) Research articles, Conferences and Patents. The World latest Research data is based on Research Fronts and Active Fields. The Researchers are recognized based on record of research publications and RLI Score of the Published articles. The Research Fronts are 110 hot fronts and 18 emerging fronts are recognized by Research Leadership Index and the Active Fields of 11broad research areas to assess the research activity of the world's major countries in the year 2023. Based on 11 broad research areas, 110 hot and 18 emerging fronts the most active countries in the world are USA (RLI 207), China (RLI 131), UK (RLI 89), Germany (81), France (RLI 56), Italy (RLI 49), Canada (RLI 48), Spain (RLI 47), Australia (RLI 46) and Japan (RLI 38) which is analyzed based on RLI Score of the Countries. The First Rank of Country in research area wise of the 11 broad research areas are Agricultural, plant and animal sciences (China RLI 13), Ecology and environmental science (China RLI 15), Geosciences (USA RLI 23), Clinical medicine (USA RLI 33), Biological sciences (USA RLI 25), Chemistry and materials science (China RLI 22), Physics (USA RLI 17), Astronomy and astrophysics (USA RLI 21), Mathematics (USA RLI 23), Information science (China RLI 12) & Economics, psychology and other social sciences (USA RLI 11). The one of the broad research area is Geosciences. The research activities in Geosciences of the Leading Countries are USA RLI 23, UK RLI 10, France RLI 8, Germany RLI 8 and China RLI 7. The Academic Experts are selected based on Record of Research Publications and RLI Score of article. The economy and growth of the Countries are based on 13 Factors-Constraints–Parameters. The Research is one of the categories of Factors-Constraints–Parameters. In general the Research weightage is in between 20 to 67.5 percentile. In the year 2022 the Research weightage is considered as 62.5 percentile due to

pandemic. It indicates the sum of other 12 Factors-Constraints–Parameters (Import system, Export system, Textile system, Security system on earth-above earth-below earth, Financial-Interest-Banking-Budget security system, Transport system on earth-above earth-below earth, Countries Won Flag flying system, Industry and pollution control system, Environmental and eco friendly system, Sustainability system, Tourism system, Pollution control and greenery system) weightage is 37.5 percentile. It indicates each system weightage runs in between 2 to 6 percentile. That represents the system is in danger zone if 2 percentile weightage and is completely safe if system weightage is 6 percentile. But in Research orientation point of view the Human beings are safe if Research weightage is 20 percentile and Human beings are in Danger Zone if Research weightage is 67.5 percentile. In year 2023 the Research weightage is considered as 30 percentile that means the sum of other 12 Factors-Constraints–Parameters weightage is 70 percentile. The conclusion of this article represents which Country leading in Research that Country is treated as Leading Country in the World, because Research weightage runs from 20 percentile to 67.5 percentile. The Country USA is leading in Research (RLI Score of USA is 207) so Dollar is the reference to one and all. Suppose, in year 2023 the RLI Score of the Country is 26 percentile, then that corresponding Country will lose economy of 2.1 of that currency. The country economy and growth both are based on RLI (Research Leadership Index) Score. So, publish research articles, in a proper way. Published articles must belong to the category of Cross referenced article, the published article must be programmable by cross reference itself. The procedures in Scopus and Web of Science are also similar. Then there is a scope for the RLI to recognize. The Country growth is based on the RLI score of article of Country. So, publish articles in a better way to increase the economic growth of the Country.

Biography

Srinivasa Rao Pundru from India affiliated to Mahatma Gandhi Institute of Technology [INDIA]. He was awarded the Doctor of Philosophy in Mechanical Engineering (Robotics) at Jawaharlal Nehru Technological University Kakinada [INDIA]. He completed Master of Engineering in Machine Design at Andhra University [INDIA]. He is an Academic Expert of QS World University Rankings and have been selected as a Recognized Researcher in Times Higher Education “World University Rankings”, based on his record of research publications. He submitted the highly confidential reports to Academic Reputation of Times Higher Education "World University Rankings” in respective Years 2025, 2024, 2023 & 2022. All his published research articles are Cross referred and Scopus. All his Springer articles are promoted to Cross reference appendix, Scopus appendix, and also all his published Springer articles are promoted externally to NASA and incorporated by NASA Astrophysics Data System. His Springer published articles are promoted to Harvard University and Researcher App. He was selected as an Academic Expert in "Times Higher Education- World University rankings" based on his Record of Research Publications.

Tarek Hamel

University Cote d Azur France, France

Unified Control Approach Design for Aerial Vehicles

Abstract

Airplanes, helicopters, and other Vertical Take-Off and Landing (VTOL) vehicles, blimps, rockets, hydroplanes, marine ships, and submarines are generally under-actuated. They are essentially composed of a rigid body immersed in a fluid medium (air or water). They are commonly controlled via a propulsive thrust force directed along a body-fixed privileged axis and a torque vector with one (in the case of a marine ship) and either two or three (in the case of airships and submarines) independent components in charge of modifying the body's orientation on a 2D-plane or in 3D-space. These vehicles are under-actuated because, apart from the direction associated with the thrust force, the other direction(s) of displacement is (are) not directly actuated. Yet, until some recent works, the structural similarity between all these vehicles has never been exploited to develop a general control framework. In this talk, I will give some insights to take a good step in this direction by proposing a unified control strategy that considers aerodynamic (resp. hydrodynamic) forces in the control design of a large class of aerial (resp. underwater) vehicles, including VTOL vehicles, rockets, airplanes, and convertible vehicles.

Biography

Tarek HAMEL has been a Professor at the University Côte d'Azur since 2003. He received his Ph.D. in Robotics from the University of Technology of Compiègne (UTC), France 1996. After two years as a research assistant at UTC, he joined the Centre d'Études de Mécanique d'Île-de-France in 1997 as an Associate Professor. His research interests encompass nonlinear control theory, estimation, and vision-based control, with a particular focus on applications to unmanned robotic systems. Prof. HAMEL is an IEEE Fellow and a senior Institut Universitaire de France member. He has served as an Associate Editor for IEEE Transactions on Robotics, IEEE Transactions on Control Systems Technology, and Control Engineering Practice.