CAMME 2023

2023 INTERNATIONAL
CONFERENCE ON AEROSPACE
MECHANICAL AND MECHATRONIC
ENGINEERING

CONFERENCE PROGRAM

XI'AN · CHINA

MAY26-28, 2023

WWW.CAMME.ORG

WELCOME ››››

Dear Distinguished Participants,

Welcome to 2023 7th International Conference on Aerospace, Mechanical and Mechatronic Engineering (CAMME 2023).

After one-year painstaking preparation, we're delighted to declare that CAMME 2023 supported by Chinese Society of Aeronautics and Astronautics, Xi'an Jiaotong University, Northwestern Polytechnical University, Fuzhou University and The International Academy of Science and Engineering for Development (IASED), will be held on May 26-28, 2023, in Xi'an, China.

First of all, we'd like to express our sincere gratitude for your participation, which is a vital note to make the conference a great forum for the collision and fusion of ideas and knowledge.

Meanwhile, we'd like to say thamks to our conference chairs: Prof. Ramesh K. Agarwal, Prof. Shuming Yang, Prof. Feng Qu and Prof. Qingkui Chen who offered their kind help and great efforts in the past months.

At the same time, we'd like to express our heartful thanks to our keynote speakers: Prof. Ramesh K. Agarwal, Prof. Simon X. Yang and Prof. Subhas Mukhopadhyay who will share their newest and outstanding research achievements at this conference. We'd like to express our heartful thanks to the technical committee members represented by Prof. Chun-Lang Yeh, Prof. Linda Vee Weiland and Prof. Yu-Sheng Lu who have been devoted to the peer review of the conference and continuous support to the conference.

The 2023 7th International Conference on Aerospace, Mechanical and Mechatronic Engineering (CAMME 2023) aims to the novel discoveries, knowledge, and experience in the fields of Aerospace, Mechanical, and Mechatronic Engineering will be discussed, shared, and explored

We wish our conference will be held with a complete success. At the same time, we wish you enjoy a very splendid time during the conference days in the impressive city of Xi'an, China.

Thank you!

Organizing Committee

VENUE INFORMATION

Conference Venue:
Yuehao Totel
西安悦豪酒店

Address:
Yanta District, No. 180, West Section of South Second Ring Road, Xi'an, China
中国，陕西，西安，雁塔区，二环南路西段180号

★地铁

丰庆公园地铁站-C口
步行距离600米,约9分钟

西北工业大学地铁站-出入口
步行距离1.2公里,约18分钟

★机场

咸阳国际机场，驾车距离35.1公里,约48分钟

Committee List

International Advisory Committee

Chun-Lang Yeh——National Formosa University, Taiwan
Claudio Cuevas——Federal University of Pernambuco, Brazil
Kaveh Edalati——Kyushu University, Fukuoka, Japan
Michael I. Friswell——Swansea University, UK
MD. MUSTAFIZUR RAHMAN——Universiti Malaysia PAHANG, MALAYSIA
Nickolas S. Sapidis——University of Western Macedonia, GREECE
Dennis Y.C. Leung——The University of Hong Kong, Hong Kong

Conference Chairs

Ramesh K. Agarwal——Washinton University in St. Louis, USA
Shuming Yang——Xi'an Jiaotong University, China
Feng Qu——Northwestern Polytechnical University, China
Qingkui Chen——Shandong Jianzhu University, China

Conference Co-Chairs

Bing Li——Northwestern Polytechnical University, China
Bing Wang——Fuzhou University, China

Program Chairs

John Watkins——Wichita State University, USA
Debiao Meng——University of Electronic Science and Technology of China, China
Rong Yuan——Chengdu University, China

Program Co-Chairs

Masoud Taghavi——Technical and Vocational University, Iran
Katarina Monkova——Technical University in Kosice, Slovakia

Program Committee

Mahmoud Moradi——Malayer University, Iran
Mostafa Ranjbar——Ankara Yildirim Beyazit Univesity, Turkey
Raja Sekhar Dondapati——Lovely Professional University, India

International Scientific Committee

North America

Guanghsu Chang——Georgia Southern University, USA
Jeremy (Zheng) Li——University of Bridgeport, USA
Richard W. Longman——Columbia University, USA
Yichuan Zhao——Georgia State University, USA

Europe

Jie Zhang——Department of Mechanical Engineering, University of Bristol, Bristol, UK
P Kerfriden——Cardiff University, UK
Valentina Mihaela Pomazan——Ovidius University Constanţa, Romania
Zhangming Wu——Cardiff University, UK
Pavlo Maruschak——Ternopil Ivan Pul'uj National Technical University, Ukraine

Asia

YONGHUI PARK——Yuhan University, South Korea
A. Kannammal——Coimbatore Institute of Technology, INDIA
Alias Mohd Saman——Universiti Teknologi MARA (UiTM), Malaysia
Amin Younesi Sinaki——Petroleum Ministry, Computer and Industrial Network Department, Iran
Bhiksha. Gugulothu——Malla Reddy Engineering College, India
Bo-Wun Huang——Cheng Shiu University, Taiwan
Chul-Ho Kim——Seoul National University of Science & Technology, Seoul Korea
G. ARUNKUMAR——Sathyabama University, Chennai, India
H. Abramovich——Technion, I.I.T., Israel
K.S. Vijay Sekar——SSN College of Engineering, India
Hafiz Gulfam Ahmad——Ghazi University, Pakistan
Harijono Djojodihardjo——The Institute for the Advancement of Aerospace Science and Technology, Indonesia
Ikuo IHARA——Nagaoka University of Technology, JAPAN
Jaya Christiyan K G——M S Ramaiah Institute of Technology, India
J.A. Esfahani——Ferdowsi Univ. of Mashhad, Iran
K.N.Pandey——Motilal Nehru National Institute of Technology Allahabad, India
M. A. BAIG——CMR Technical Campus, India
Mahmoud Shamsborhan——Islamic Azad University-Mahabad Branch, Iran
MOHD FAISAL BIN HUSHIM——Universiti Tun Hussein Onn Malaysia, Malaysia
MUSA BIN MAILAH——Universiti Teknologi Malaysia, Malaysia

Md.Akhtaruzzaman——National University of Malaysia，Malaysia
P. Ranjith Kumar——M.A.M. School of Engineering, India
P. Suresh——Karpagam College of Engineering (Autonomous), India
Rabindra Narayan Mahapatr——ITER, S'O'A University, India
R. Thanigaivelan——Mahendra Engineering College, India
Shuping Xiong——Korea Advanced Institute of Science and Technology (KAIST), South Korea
Soon-Geol Lee——Kyung Hee University, Korea
SP Srinivasan——IIIE, India
Sandip S. Deshmukh——Birla Institute of Technology & Science, India
S Satapathy——KIITs University, India
Vikas Rastogi——Delhi Technological University, India
Tai-Yan Kam——National Chiao Tung University, Taiwan
Yu-Sheng Lu——National Taiwan Normal University, Taiwan
Zamri Omar——Universiti Tun Hussein Onn Malaysia, Malaysia
CHU Ky Son——Vice Director of School of BioTechnology and Food Technology, HUST, Vietnam
Do Duc Thuan——Head of Department of Applied Mathematics, School of Applied Mathematics and Informatics, HUST, Vietnam
Le Quang Thuy——Director of School of Applied Mathematics and Informatics, HUST, Vietnam
Tu Viet Phu——Department of Quality Management, School of BioTechnology and Food Technology, HUST, Vietnam
Vu Hong Son——Head of Department of Quality Management, School of BioTechnology and Food Technology, HUST, Vietnam
Vinod Kushvaha——Indian Institute of Technology Jammu, India
A. Elaya Perumal——Anna University, India
A. Khorram——University of Applied Science and Technology, Iran
Alex Ong Zhi Chao——University of Malaya, MALAYSIA
AHMAD HUSSEIN BIN ABDUL HAMID——Universiti Teknologi MARA, Malaysia
A. Murugarajan——Sri Ramakrishna Engineering College, India
Chul-Hee Lee——INHA UNIVERSITY, Korea
Debojyoti Mitra——Government Engineering College, India
Manish Bhardwaj——SRM University, India
Md. Emdadul Hoque——Saitama University, Japan
MOHD ASHRAF AHMAD——Universiti Malaysia Pahang, MALAYSIA

N. Ethiraj——Dr. M.G.R Educational and Research Institute, India
Reddappa H. N.——Bangalore Institute of Technology, India
Sachin L. Borse——Pune University, India
Varun Goel——National Institute of Technology, India
Ashraf Moh'd Hasan Hadoush——Palestine Technical University Kadoorie, Palestine
N. AZHAGESAN——Rajas Colleges, India
Ehan Sabah Shukri Askari——Middle Technical University (MTU), Iraq
Sakihara Reika——Tottori University, Japan
Prianggada Indra Tanaya——International University Liaison Indonesia, BSDCity, Indonesia
Xuping HUANG——Tokyo Metropolitan University, Japan
Dianzi Liu ——University of East Anglia, U
Chenglong Guan ——Central South University, China
Wei Liang——Fuzhou University, China
Tao Liu——Xi' an Jiaotong University, China
Zonghua Zhang——Hebei University of Technology, China
Jian Wang——Huazhong University of Science and Technology
Xiangzhao Zhang——Fudan University, China
Qiang Liu——Xi' an Jiaotong University, China

Oceania

Chi Kit Au——University of Waikato, New Zealand
Qinghua Qin——The Australian National University, Australia

Africa

Nadia Abd-Alsabour——Cairo University, Egypt
Abdelmalik serbout——Djelfa University of Science and Technology, Algeria
S. E. Oraby——Port Said University, Egypt
Mourad Mebarki——Semiconductor energy technology research center, Algeria
Toufik Zebbiche——Institute of Aeronautics and Space Studies, University of Blida 1, Algeria
Walter Nsengiyumva——Fuzhou University, China

GENERAL INFORMATION

★ Registration

The registration desk will be situated in Hotel Lobby, Yue hao Hotel, during the following time: 14:00-18:00, Friday, May 26th, 2023.

★ Remarks

Conference will provide coffee breaks, lunch and dinner during conference days, beyond the fixed menu will be on personal bills.

★ A Polite Request to All Participants:

Participants are requested to join this onsite conference in a timely fashion. Presenters are reminded that the time slots should be divided fairly and equally by the number of presentations and that they should not be overrun. The session chairs are asked to assume this timekeeping role and to summarize key issues in each presentation.

★ Dress Code:

Business Casual, formal, or national custom is recommended.

★ Certificate:

Certificates of Best Paper & Best Poster & Best Oral Presentation are setted up in our conference. Excellent papers have the opportunity to win these awards, and Best Poster Awards will be selected from the poster sessions. Certificate of Best Oral Presentation who present a great oral presentation will be awarded the Best Presentation. And the Best Paper Award will be selected from all the submissions.

★ Preparation for Oral Presentation

All the meeting rooms are equipped with a screen, an LCD projector, and a laptop computer installed with Microsoft Power Point. You will be able to insert your USB flash drive into the computer and double check your file in PowerPoint. We recommend you to bring two copies of the file in case that one fails. You may also connect your own laptop to the provided projector; however please ensure you have the requisite connector. Regular Oral Session: about 10-15 minutes of Presentation.

★ Preparation for Poster

Preparation for Poster Presentation Materials Prepared by the Conference Organizer: Adhesive tapes. Materials Prepared by the Presenters: Home-made poster (s). Material: not limited, can be posted on the canvases. Recommended poster size: Width*Height: A0 (841mm×1189mm).

1 DAY 1

MAY 26th, 2023

Technical Test Session (For online participants)	
Time	10:00-12:00
Onsite Registration:	14:00-18:00

2 DAY 2

MAY 27th, 2023

Conference Session 1	8:30-12:00
Conference Session 2	14:00-18:00
Award Ceremony:	18:00-18:30

3 DAY 3

MAY 28th, 2023

Conference Session 3	9:00-12:00
Workshop	14:00-17:30

For Online Participants

May 26th, 2023

Technical Test Link:

https://iased.my.webex.com/iased.my-sc/j.php?MTID=m1e7467b8675b1ffcde983fbb3954bc6a

Number: 2641 667 9520

Password: 2725ZBiPUXg

May 27th, 2023

Conference Link:

https://iased.my.webex.com/iased.my-sc/j.php?MTID=m3b2f866d7e701a5e42bda41b55788064

Number: 2640 263 8738

Password: mWdE4AmZK77

May 28th, 2023

Conference Link:

https://iased.my.webex.com/iased.my-sc/j.php?MTID=mb772a18bbc97d121e82c85370d82b2f4

Number: 2642 201 7954

Password: ewKUKxkH623

CONFERENCE PROGRAM AT A GLANCE GMT+8

May 27 2023	Morning Session Session Chair Feiping Du	Opening Ceremony		8:30-8:40
		A welcome address	Prof. Shuming Yang	8:40-8:50
		Keynote Speaker Ⅰ	Prof. Simon X. Yang	8:50-9:30
		Keynote Speaker Ⅱ	Prof. Ramesh K. Agarwal	9:30-10:10
		Morning Tea Break Group Photo & Free Discussion		10:10-10:30
		Keynote Speaker Ⅲ	Prof. Subhas Mukhopadhyay	10:30-11:10
		Oral Session 1		11:10-12:00
	Lunch Time			12:00-14:00
	Afternoon Session Session Chair Di Sun	Oral Session 2		14:00-16:00
		Afternoon Tea Break & Free Discussion		16:00-16:20
		Oral Session 3		16:20-17:30
		Video Session		17:30-18:00
	Chuanzhen Liu	Award Ceremony		18:00-18:15
	Chuanzhen Liu	Closing Ceremony		18:15-18:30
	Dinner Time			18:30-20:00
May 28 2023	Conference Session			9:00-11:30
	Award Ceremony			11:00-12:00
	Lunch Time			12:00-14:00
	Committee Workshop			14:00-17:30

<<<< OPENING CEREMONY 08:30-08:40
May 27,2023 (GMT+8)

KEYNOTE SESSION I

8:50-9:30 **MAY 27, 2023 (GMT+8)** **WEBEX**

PROF. Simon X. Yang

University of Guelph

SPEECH TITLE: Bio-inspired Intelligent Approaches to Real-time Navigation and Cooperation of Multiple Robotic Systems

ABSTRACT:

Research on biologically inspired intelligence has made significant progress in both understanding the biological systems and developing bionic engineering applications to various autonomous robotics systems. In this talk, I will start with a very brief introduction to biologically inspired computational neural dynamics algorithms and their applications to biological and bio-inspired systems. After that, I will focus on our recent research on bio-inspired intelligent real-time navigation and cooperation of various multiple autonomous robotic systems, such as real-time path planning, tracking, and control of autonomous mobile, aerial, water surface and underwater robotic systems; and intelligent navigation and cooperation of multi-robot systems.

BIOGRAPHY:

Prof. Simon X. Yang received the B.Sc. degree in engineering physics from Beijing University, China in 1987, the first of two M.Sc. degrees in biophysics from Chinese Academy of Sciences, Beijing, China in 1990, the second M.Sc. degree in electrical engineering from the University of Houston, USA in 1996, and the Ph.D. degree in electrical and computer engineering from the University of Alberta, Edmonton, Canada in 1999. Prof. Yang joined the School of Engineering at the University of Guelph, Canada in 1999. Currently he is a Professor and the Head of the Advanced Robotics & Intelligent Systems (ARIS) Laboratory at the University of Guelph in Canada. Prof. Yang has diversified research expertise. His research interests include intelligent systems, robotics, control systems, sensors and multi-sensor fusion, wireless sensor networks, intelligent communications, intelligent transportation, machine learning, and computational neuroscience. Prof. Yang he has been very active in professional activities. Prof. Yang serves as the Editor-in-Chief of International Journal of Robotics and Automation, and Intelligence & Robotics; and an Associate Editor of IEEE Transactions on Cybernetics, IEEE Transactions on Artificial Intelligence, and several other journals. He has involved in the organization of many international conferences.

KEYNOTE SESSION II

9:30-10:10 **MAY. 27 2023 (GMT+8)** **WEBEX**

PROF. Ramesh K. Agarwal

M William Palm Professor of Engineering, Fellow of AIAA, ASME, IEEE, SAE, APS, ASEE and AAAS, Washington University in St. Louis

SPEECH TITLE: Computational Studies of Active Flow Control and Aerospace Applications

ABSTRACT:

In recent years, a promising approach to the control of wall bounded as well as free shear flows, using synthetic jet (oscillatory jet with zero-net-mass-flux), pulsed jet, and sweeping jet actuators, has received a great deal of attention. A variety of impressive active flow control (AFC) results have been achieved experimentally by many researchers including the vectoring of conventional propulsive jets, modification of aerodynamic characteristics of bluff bodies, control of lift and drag of airfoils, thrust augmentation in ejectors, reduction of skin-friction in a boundary layer flow, enhanced mixing in circular jets, control of external as well as internal flow separation and of cavity oscillations. More recently, attempts have been made to numerically simulate many of these flow fields primarily by employing the Unsteady Reynolds-Averaged Navier Stokes (URANS) equations with a turbulence model and in a limited few cases by Large Eddy Simulation LES) and Direct Numerical Simulation (DNS). In this lecture, the results of simulations of several flow fields dealing with thrust-vectoring control of a propulsive jet, control of separation on a backward facing step, NASA Hump and flap of a multi-element airfoil, control of cavity oscillations, transonic drag reduction of an airfoil, and some aerospace applications such as AFC of high-speed weapon release from a bay, weapons bay acoustic loads reduction and B757 tail for side force augmentation will be described. These simulations have been performed using the URANS equations in conjunction with either a one- or a two-equation turbulence model. The simulations demonstrate the effectiveness of active flow control techniques in flow modification to achieve the desired outcome of drag reduction and separation control in many aerospace applications.

BIOGRAPHY:

Professor Ramesh K. Agarwal is the William Palm Professor of Engineering in the department of Mechanical Engineering and Materials Science at Washington University in St. Louis. From 1994 to 2001, he was the Sam Bloomfield Distinguished Professor and Executive Director of the National Institute for Aviation Research at Wichita State University in Kansas. From 1978 to 1994, he was the Program Director and McDonnell Douglas Fellow at McDonnell Douglas Research Laboratories in St. Louis. Dr. Agarwal received Ph. D in Aeronautical Sciences from Stanford University in 1975, M.S. in Aeronautical Engineering from the University of Minnesota in 1969 and B.S. in Mechanical Engineering from Indian Institute of Technology, Kharagpur, India in 1968.

Over a period of 45 years, he has worked in several disciplines within mechanical & aerospace engineering, and energy and environment which include computational fluid dynamics, computational electromagnetics and acoustics, control theory, multidisciplinary design and optimization, turbomachinery and pumps, chemical looping combustion, carbon capture and sequestration, and wind energy. He is the author and coauthor of over 600 publications. He has given many plenary, keynote and invited lectures at various national and international conferences worldwide in over sixty countries. He is a Fellow of 26 professional societies including American Institute of Aeronautics and Astronautics (AIAA), American Society of Mechanical Engineers (ASME), Institute of Electrical and Electronics Engineers (IEEE), Society of Automotive Engineers (SAE), American Association for Advancement of Science (AAAS), American Physical Society (APS) and American Society for Engineering Education (ASEE). He has received many prestigious honors and national/international awards from various professional societies and organizations for his research contributions including the AIAA Reeds Aeronautics Award, SAE Medal of Honor, ASME Honorary Membership and Honorary Fellowship from Royal Aeronautical Society.

Morning Tea Break Group Photo & Free Discussion

10:10-10:30 Saturday May 27, 2023

KEYNOTE SESSION III

10:30-11:10 **MAY, 27 2023 (GMT+8)** **WEBEX**

PROF. Subhas Mukhopadhyay

Discipline Leader, Mechatronics Engineering Degree Programme,
School of Engineering, Fellow of IEEE, IET and IETE,
Macquarie University NSW 2109 Australia

SPEECH TITLE: Recent Advances in Sensing and Machine Vision for Mechatronics

ABSTRACT:

The advancement of sensing technologies, embedded systems, wireless communication technologies, nano-materials, miniaturization, vision sensing and processing speed makes it possible to develop smart mechatronics and machine systems. This seminar will discuss recent research and developmental activities on different sensors and sensing system along with machine visions at Macquarie University as applicable to Mechatronics, robotics and drones for home, health and environmental monitoring.

BIOGRAPHY:

Subhas holds a B.E.E. (gold medallist), M.E.E., Ph.D. (India) and Doctor of Engineering (Japan). He has over 31 years of teaching, industrial and research experience.Currently he is working as a Professor of Mechanical/Electronics Engineering, Macquarie University, Australia and is the Discipline Leader of the Mechatronics Engineering Degree Programme. His fields of interest include Smart Sensors and sensing technology, instrumentation techniques, wireless sensors and network (WSN), Internet of Things (IoT), Mechatronics etc. He has supervised over 50 postgraduate students and over 150 Honours students. He has examined over 75 postgraduate theses.

He has published over 450 papers in different international journals and conference proceedings, written ten books and fifty-two book chapters and edited eighteen conference proceedings. He has also edited thirty-five books with Springer-Verlag and thirty-two journal special issues. He has organized over 20 international conferences as either General Chairs/co-chairs or Technical Programme Chair. He has delivered 420 presentations including keynote, invited, tutorial and special lectures. As per Scholargoogle, his total citation is 18077 and h-index is 68.

He is a Fellow of IEEE (USA), a Fellow of IET (UK), a Fellow of IETE (India). He is a Topical Editor of IEEE Sensors journal. He is also an associate editor of IEEE Transactions on Instrumentation and Measurements and IEEE Reviews in Biomedical Engineering (RBME). He is a Distinguished Lecturer of the IEEE Sensors Council from 2017 to 2022. He chairs the IEEE Sensors Council NSW chapter.

Oral Session 11:10-12:00

Paper ID: M005

Affiliation: Beijing Institute of Precision Mechatronics and Controls

Paper Title: Research on Sensorless Control of Permanent Magnet Synchronous Motor Based on Adaptive Sliding Mode Observer

Presenter: Shuping Meng

ABSTRACT:

Permanent magnet synchronous motor (PMSM) sensorless control system is widely used in some special environments, such as water immersion, oil immersion, high temperature and so on. A novel improved adaptive gate filter and the saturation function of variable boundary layer thickness is proposed to solve the problems of discontinuous jitter at the switch interface and the amplitude attenuation and phase delay of estimated back EMF caused by the low-pass filter when the classical sliding mode observer (SMO)control algorithm is applied to PMSM sensorless control. The experimental results show that compared with the classical SMO, the amplitude attenuation of the observed back EMF signal is reduced from about 34% to about 4%, and the high-frequency buffeting signal caused by the sliding mode structure is effectively filtered. The estimated rotor position error is reduced from -52 ° ~ -35 ° to -2 ° ~ 2 °. When applied to the closed-loop sensorless speed control of PMSM, the speed fluctuation is -30r/min~+30r/min and the motor runs smoothly.

Paper ID: M031

Affiliation: Silesian University of Technology; Poland

Paper Title: Comparison of Propulsion Systems for Small UAVs

Presenter: Sujkowski Michał

ABSTRACT:

In this paper, the authors show their research analysis about the different types of engines possible to use in Unmanned Aerial Vehicles (UAV). The whole investigation is mainly focused on determining and comparing the most important parameters of selected engines. This studies aims to show which type of the engine is the most proper for particular drone purpose. The chosen engines are: electric motor, micro jet engine and gasoline piston engine, with similar maximum thrust parameters (maximum common thrust force for the selected engines is about 120N). The obtained results prove the electric motor's highest effectiveness and the least of the micro jet engine. For every type of engine, there is also calculated impact of the propulsion system (engine + fuel/batteries) for UAV maximum take-off weight (MTOW), necessary to obtain 120N of thrust in defined duration. The tests have also shown that in the case of an electric motor, there is a loss of energy/thrust force with working time. On the other hand, the

piston engine and a jet engine have an even better impact on flight parameters with working time. As a final result, the authors illustrate the use of each engine type depending on the UAV's purpose. Their intended use is considerably different, and it is strictly connected with the UAV purpose.

Paper ID: M032

Affiliation: Silesian University of Technology; Poland

Paper Title: The use of modern technologies - UAVs – to combat the problem of bird strikes at the airport

Presenter: Adam Stanisław Banaś

ABSTRACT:

As an introduction to the issue, the authors provide a short historical overview and statistics of air incidents involving birds. This demonstrates that the problem of bird incidents in aviation is serious (it is more appropriate to consider the collision rate per 10,000 operations). Research aimed at bird strikes prevention is conducted all over the world, but in the described study, the innovative approach was taken – using UAV fitted with a dedicated megaphone and camera. The most important part of the project was the field research carried out at the Gliwice - Trynek airport. It is located in a high-risk zone due to the proximity of an open landfill. Practical tests were carried out using the DJI M210 drone with an attached megaphone from which sound signals were emitted in the vicinity of birds posing a threat to airplanes. The results obtained by the research so far demonstrate the high effectiveness of the reactive method of deterring birds. It should be emphasized that the effectiveness of this method depends on the adherence to strictly defined procedures with particular emphasis on those that determine the place and time of using sound signals on a specific frequency. In summary, the results of the conducted research confirmed that the use of UAVs equipped with dedicated devices has positive effects in deterring the wild birds from the airport. These systems are an effective tool supporting the maintenance of an acceptable level of safety for the performance of operational tasks at the airport.

Paper ID: M049

Affiliation: Fuzhou University, Fuzhou, 350108, P.R. China

Paper Title: A prestrained bistable composite gridded structure

Presenter: Bing Wang

ABSTRACT:

Bistable composite structures have attracted growing interest in morphing applications to aerospace industry. Here, we device a novel prestrained bistable composite gridded structure, consisting pairs of prestrained composite strips on both sides and oriented in 90°. This is achieved by employing the elastic fibre prestressing (EFP) technique, where four plain-weave carbon prepreg strips were stretched in two directions at a constant strain level, and the tensile strain was maintained throughout the curing process to produce a prestrained composite gridded structure. Upon load removal, recovery from the prestrained carbon fibres generates compressive stresses and interacts with thermal residual stresses, which in turn changing the in-plane stress level within a composite strip, and induce out-of-plane deflections. Therefore, the

bistability is generated from the pairs of the oriented prestrained composite strips, their deflections give converged circular configurations to the mid-plane. Considering the fibre damages upon straining, it is found that there is an optimal prestrain level in order to maximise the bistability. Here, we presented further details on the biaxial fibre straining rig; samples were produced with different prestrain levels, in order to reveal the underlying mechanisms from the fibre prestraining. These results provide valuable insights for the design of aerospace deployable structures.

Lunch Time

12:00-14:00 Saturday May 27, 2023

Oral Session 14:00-16:00

Paper ID: M1003

Affiliation: Chinese Flight Test Establishment

Paper Title: Multidisciplinary multi-point optimization design of transport aircraft wing

Presenter: Yuchao Li

ABSTRACT:

In traditional aircraft design, the interaction between aerodynamic and structural discipline is not fully considered in the preliminary design stage, so it is difficult to obtain the optimal design. In this context, this paper takes the transport aircraft wing as the research object to develop an aerodynamic/structural multidisciplinary multi-point optimization design method for transport aircraft wing in the preliminary design stage. In this study, the optimization method of Kriging surrogate model is used to carry out multi-point optimization design of transport aircraft wing under various typical speed. During optimization design, using the full-velocity potential equation for aerodynamic calculation, and Ansys for structural finite element analysis to optimize the design with the lift-to-drag ratio and structural weight as the goals. The effectiveness of the method was preliminarily verified.

Paper ID: M033

Affiliation: Xi'an Jiaotong University

Paper Title: The mechanism of formability improvement in multi-pass incremental flanging

Presenter: Chong Tian

ABSTRACT:

As a flexible and low-cost forming process, incremental flanging has been widely used in the aerospace field. The multi-pass flanging strategy has been proven to be an effective means to further improve formability, but the mechanism of formability improvement is not clear. In this paper, a FE (Finite Element) model of the incremental flanging was established by introducing the FFL (Fracture Forming Limit), and the multi-pass incremental flanging with two different strategies was simulated. Based on forming defects, minimum thickness, and neck height of different strategies, it was found that the formability from low to high is single-pass flanging, multi-pass flanging with increasing flanging angle, and multi-pass flanging with increasing flanging diameter. Then, by analyzing the strain paths, it is found that the reason for the single-pass incremental flanging failure is that the strain value reaches FFL in the bidirectional tensile strain state, and the multi-pass incremental flanging forming with a gradually increasing flanging angle can reduce the strain value in the bidirectional tensile state, thus improving the formability. The multi-pass incremental flanging with increasing flanging diameter can avoid deformation in the bidirectional stretching state and further improve formability.

Paper ID: M020

Affiliation: Xi'an Jiaotong University

Paper Title: Numerical Simulation of Oxygen Jet Condensation in Cryogenic Liquid Rocket

Presenter: Chengfeng Zhu

ABSTRACT:

Low frequency pressure fluctuation is an important topic on the stable and safe working of the system. As the excitation source of the pressure fluctuation, oxygen injection condensation is the indispensable process in the pipeline system of liquid fuel aircraft. Due to the intense mass transfer and flow instability, it is difficult to capture the accurate pressure characteristic of oxygen jet condensation, especially in the first main frequency of pressure oscillation. Aiming at the mechanism and excitation process of pressure oscillation, a numerical simulation is carried out using a modified mass transfer model. The height function method is implemented to calculate the curvature of gas-liquid interface. It can update the mass transfer rate in real-time, which is the core technology to evaluate the pressure fluctuation. The modified model is verified by a water steam jet condensation simulation and the numerical result agrees well with the experimental data. The low-frequency pressure fluctuation characteristic is obtained successfully. The first main frequency is 9.5 Hz with the apparent amplitude of approximately 80 kPa. The research shows that the periodic mass transfer rate and the swing of the continuous oxygen gas plume are the key factor causing the low frequency pressure oscillation. There is an oxygen suck-back flow phenomenon in the oxygen chamber of condenser pipe. In addition, it is

also found that decreasing the injection area can restrain the pressure oscillation effectively. These conclusions provide a theoretical guidance for overcoming the low-frequency pressure oscillation eventually.

Paper ID: MO29

Affiliation: Northwestern Polytechnical University

Paper Title: High-altitude airship propeller fluid-structure interaction solver

Presenter: Dongchen Wang

ABSTRACT:

This paper presents a study on fluid-structure interaction (FSI) solver for propellers of composite materials, which are commonly used on high-altitude airships and require FSI consideration for better propulsion optimal design. The FSI solver consists of an aerodynamic solver and a structural solver. The aerodynamic solver is a RANS (Reynolds Average Navier-Stokes) solver based on an in-house code named ROTNS. The structural solver is based on the secondary development of a commercial finite element software using Patran Command Language (PCL). The general framework of the FSI solver is built using C++ language and a weak coupling approach. To validate the accuracy of the solver for propulsion optimal design, wind tunnel test, ground static thrust test and structural deformation test were conducted. The numerical results show good agreement with the experimental results.

Paper ID: MO35

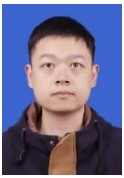
Affiliation: Aerospace System Engineering Shanghai

Paper Title: Analysis of Interference Factors on Paralleling Multi-Satellite Separation

Presenter: Yuqin Zeng

ABSTRACT:

At present, the majority of launches for multiple main satellites utilize a serial layout, which is associated with several issues such as high costs, reduced carrying capacity, and decreased separation reliability. To address these challenges, a parallel layout scheme is proposed for launching multiple main satellites. This scheme involves three main satellites separating simultaneously, with the separation device designed to maintain a certain speed difference between the satellites to ensure safe separation and short-term orbital safety. The proposed layout scheme is implemented in a specific type of multi-satellite launch mission and is subjected to extreme simulation analysis to calculate the worst-case scenarios that may arise during the separation process. The simulation results demonstrate that this separation scheme is capable of ensuring the safe separation of the satellite and rocket.



Paper ID: M036

Affiliation: Xi'an Jiaotong University

Paper Title: Experimental Investigation on Frost Density and Thermal Conductivity under Cryogenic Condition

Presenter: Shi Shangguan

ABSTRACT:

Cryogenic frosting is a common phenomenon in the field of aerospace industry. However, for the case that the cryogenic surface is cooled from room temperature, such as a cryogenic propellant fueling to an uninsulated cryogenic tank, the frost formation process could be unique. In this paper, the density and thermal conductivity of frost deposited on the cold surface cooled from room temperature to cryogenic temperature were experimentally investigated under forced condition. Weighting method was adopted to measure the final frost density at the end of each experiment, and frost thermal conductivity distribution inside the frost layer was obtained by analyzing the temperature profile measured at different heights. The results show that the final frost density increases with air velocity and air absolute humidity and varies from 54.7 kg/m3 to 556.7 kg/m3 in this study. The cooling rate in the initial cooling process exerts a certain effect on the frost structure, which could be observed by the variations of frost density. The frost thermal conductivity is layered along the thickness direction of the frost layer, but the thermal conductivity value, which has been formed at a certain height, does not change significantly with time. Moreover, correlations of frost density and frost thermal conductivity are established with ambient temperature, ambient humidity, and incoming air velocity as variables. The predicted frost density and frost thermal conductivity show good agreement with experimental data, and the deviations are both within 10%. The present study could deepen the understanding on frost features in cryogenic conditions, and the established correlations provide reliable tools of estimating frost properties, which are beneficial to the design of cryogenic propellant fueling process.

Paper ID: M037

Affiliation: Xi'an Jiaotong University

Paper Title: Research on Laser On-line Monitoring for Counter-roller Spinning of Thin-walled Cylindrical Parts

Presenter: Fan Li

ABSTRACT:

In order to achieve intelligent control of counter-roller spinning equipment and improve the accuracy of the counter-roller spinning forming of thin-walled cylindrical parts used in the aerospace field, a set of roller position monitoring and workpiece size online measurement system for full-electric servo vertical three counter-roller driving power spinning equipment is designed according to the laser displacement sensor ranging principle. Different installation positions were determined according to the measurement objects of each laser displacement sensor, and the analog voltage signals of multiple groups of laser displacement sensors were obtained through the data acquisition card, and the relationship between the voltage signals of each sensor and the actual displacement was calculated, thereby monitoring the real-time position of each moving component online. In order to test the reliability of the on-line

monitoring system, a 500mm diameter, 10mm wall thickness 2219 Al alloy cylindrical billet was formed to 3.5mm thickness on the equipment. The radius deviation, roundness error and wall thickness difference of the formed cylindrical part were 0.2977mm, 0.2402mm and 0.05mm respectively.

Paper ID: M039

Affiliation: Xi'an Jiaotong University

Paper Title: Numerical Simulation of Mechanical Bulging Process of a Large Three-Layer Rectangular Bellow

Presenter: Hong Jiang

ABSTRACT:

A novel mechanical bulging process is proposed in this work to overcome the disadvantages of the existing forming process for large rectangular bellows with deep waves. Numerical simulation was conducted on the mechanical bulging process of the three-layer 304 stainless steel rectangular bellow. Simulation results reveal that each layer steel has similar deformation and equivalent strain distribution. The maximum equivalent strain at the round corner of the rectangular bellow is 0.406. The general dimensions of the rectangular bellow are well consistent with the designed values. The wall thickness thinning rate at the round corner is greater than that in the straight edges, which has a maximum value of 20.48%

Afternoon Tea Break & Free Discussion

16:00-16:20 Saturday May 27, 2023

Oral Session 16:20-17:30

Paper ID: M038

Affiliation: Xi'an Jiaotong University

Paper Title: Study on Effect of Single-tooth Radial Forging Process Parameters on Spline Shaft Forming

Presenter: Kun Li

ABSTRACT:

Higher requirement of the performance of spline shaft has been put forward with the development of aerospace technology. As a precision advanced manufacturing technology, radial forging technology is suitable for the manufacturing of high-performance spline shaft. Aiming at the influence of process parameters on plastic forming in single-tooth radial forging (STRF) process of spline shaft, the effects of process parameters such as initial forging temperature of the blank, forging speed of the dies, and friction condition on the forming load, and distribution of equivalent stress and equivalent strain of the workpiece were investigated. Firstly, the introduction to STRF process of spline shaft was given. And then a finite element model was established based on the FORGE software, and the range of each process parameter was determined. Through the finite element analysis, the influence laws of various parameters of STRF process on spline shaft forming were obtained. The simulation results show that the forming load and equivalent stress decrease with the increasing of the initial forging temperature of the blank, and increase with the increasing of the forging speed. Within the friction coefficient range, the effect of friction conditions on die load and equivalent stress is not significant. The equivalent strain and the cumulative plastic deformation degree of the material are almost unchanged under different parameter condition. The obtained results in this paper can provide reference for the application and development of advanced manufacturing process of high-performance gear parts used in aerospace.

Paper ID: M041

Affiliation: Xi'an Jiaotong University

Paper Title: Influence of friction on deformation characteristics in incremental sheet forming process

Presenter: Guangcan Yang

ABSTRACT:

Incremental sheet forming (ISF) process is a flexible forming technology that utilizes a simple tool to act on the sheet metal point by point and form the target part through plastic accumulation. It has the potential to provide strong technical support for rapid response prototype manufacturing at low-cost. The friction between the tool and sheet is an important parameter affecting the formability and surface quality of the process, and understanding its

influence on the deformation characteristics of the sheet is an essential basis for reasonably optimizing the friction parameters and exploring forming mechanisms. Therefore, this work establishes a numerical analysis model for ISF under different friction conditions, extracts the equivalent strain and stress data during the whole forming process of arbitrary element in the contact area and shear stress of the element, and compares and analyses the average equivalent strain and stress values with the calculation results of the analytical model. It is found that the friction condition hardly affects the equivalent strain and stress values of the sheet in the contact deformation area during ISF process, but it has a significant impact on the shear stress.

Paper ID: M044

Affiliation: Science and Technology on Space Physics Laboratory

Paper Title: High Precision Measurement of High Frequency Dynamic Strain of Aerospace Structures with FBG strain sensors

Presenter: Hongyang Li

ABSTRACT:

Fiber Bragg grating (FBG) strain sensors are widely used in strain measurement of aerospace structures. FBG strain sensors have received widespread attention as an important strain testing method. With the continuous development of the aerospace manufacturing industry, the dynamic properties of new spacecraft materials have been rapidly improved, and dynamic strain testing has extremely high requirements for FBG strain sensors. The measurement characteristics of FBG sensors often change with the frequency of the measured strain signal. Therefore, current dynamic strain measurements cannot accurately obtain the strain magnitude of aerospace structures. In this paper, a high-precision measurement and error analysis method with FBG sensors is proposed to obtain high-frequency dynamic strains of aerospace structures. The measurement errors under different amplitude and frequency of dynamic strain are obtained. Experiment results show that the maximum error is only 36 με. Accurate and reliable measurement of high-frequency dynamic strain of aerospace structures using FBG strain sensors is realized.

Paper ID: M045

Affiliation: Chinese Flight Test Establishment

Paper Title: ADRC flight control system design for flying wing UAV with high aspect ratio

Presenter: Jiayu Shi

ABSTRACT:

The flying wing unmanned aerial vehicle (UAV) with high aspect ratio is taken as the research object in this study. Based on the theory of auto-disturbance-rejection control (ADRC)and combined with the characteristics of multi-rudder configuration of flying wing layout, the attitude controller of flying wing UAV is designed. The results show that the flight controller has good control performance, which can meet the performance requirements, and can effectively deal with the coupling effects between lateral, directional and longitudinal of the flying wing UAV. Compared with the conventional flight control methods, the controller designed in this paper has fewer parameters to be set, and a set of control parameters can be used in the whole flight envelope. The process is relatively simple. It provides a reference for

further engineering applications.

Paper ID: M050

Affiliation: Fuzhou University, Fuzhou, 350108, P.R. China

Paper Title: Towards a unified theory on the superposition principles

Presenter: Bing Wang

ABSTRACT:

Polymers and their composites have been widely applied in many industries. There are growing demands for understanding their natural viscoelastic performance especially in aerospace applications, where precise dimensional control and prediction of the residual strength and modulus are vital for the success of an aerospace vehicle. The existing superposition principles mainly focus on the well-known WLF-based horizontal shift in order predict the long-term behaviour through short-term experimental tests in terms of creep or stress relaxation. Whilst the intrinsic microstructural changes or damages within a polymeric material due to viscoelastic deformation are not considered, which may lead to large differences for long-term predictions. Here, we look into the very fundamentals of the existing superposition principles, aiming to develop towards a unified theory to better predict the long-term relaxation modulus or creep of a polymeric solid. This is achieved by considering both the free volume theory-based horizontal shift factors and activation energy-based shift factors; microstructural changes or damages induced vertical shift factors are then coupled to improve the prediction accuracy of the superposition methods. These will facilitate long-term predictions and accelerated aging for viscoelastic solids.

Video Session 17:30-18:00

Paper ID: M008

Affiliation: COMAC Flight Test Centre

Paper Title: Study on the Influence of AC Power Supply Frequency on Electric Load

Author: YingLiu

ABSTRACT:

The AC variable frequency power supply system of civil aircraft was briefly described. The influence of AC power supply frequency on electrical load was analyzed, especially the influence of variable frequency AC power supply on three-phase AC fuel pump. Combined with the test results of flight test fuel pump and its power supply frequency, the correctness of the theoretical analysis was verified. The higher the power supply frequency, the greater the outlet

pressure when the fuel flow is the same. The design proposal of the fuel pump for the variable frequency power supply system was given. The advantages and disadvantages of each scheme shall be weighed and selected according to the actual working needs of the fuel pump.

Paper ID: M010

Affiliation: Shenyang Institute of Automation,Chinese Academy of Sciences

Paper Title: Research on the Jet Milling Process of Oxidizer for Solid Propellant

Authors: Han Lu, Xinlin Bai, Zhigang Xu, Gengshun Hou, Zhang Zhang

ABSTRACT:

The particle size of the oxidizer used by the solid rocket propellant has a great impact on the combustion performance of the grain. In order to study the influence law of the oxidizer used for the jet milling, the jet milling process test system is constructed. The influence of the main process parameters on the average particle size was studied by single-factor test.The orthogonal test was designed, and the prediction model of the relationship between particle size and milling pressure, milling chamber material mass and classification wheel speed was established using multiple linear regression method, and the significance analysis and the prediction test were conducted.The results show that the particle size prediction model is significant, and the classification wheel speed affects the average particle size the most, followed by milling pressure and milling chamber material mass.The conclusion is that the deviation of the milling average particle size under the prediction model acquisition process parameters is between 1.79%~5.88%, and the prediction model acquisition process parameters can be obtained to mill the AP with the average particle size requirements of different specifications.

Paper ID: M012

Affiliation: Nanjing University of Aeronautics and Astronautics

Paper Title: Collaborative Multi-Drones Air Combat Threat Assessment and Credibility Study

Authors: Ruimin Pu, Meng Yu, Huiting Wang

ABSTRACT:

With the rapid development of artificial intelligence technology, air combat is now developing in the direction of fully autonomous and collaborative operation. In a collaborative mode, drones need to assess the current situation of the environment when operating, and every drone will interact with each other for better information gathering and situational awareness. To this end, this study develops a novel index system for threat assessment based on seven factors that have impacts on the threat assessment. A hierarchical analysis means is introduced to quantify the drone threat assessment results. The consistency of threat assessment results among different drones is compared by combining the Jaccard coefficients and the sequence similarity values,

which leads to an efficient credibility evaluation of information interaction between drones. Finally, exemplary simulations are carried out, results from which demonstrates the effectiveness of the proposed method when implementing in a drone collaborative exploration mission.

Paper ID: M013

Affiliation: Nanjing University of Aeronautics and Astronautic

Paper Title: A Novel Navigation Beneficial Path Planning Algorithm for Application in Lunar Surface Exploration

Authors: Huiting Wang, Meng Yu, Ruimin Pu

ABSTRACT:

The lunar south pole surface environment is characterized by sparse and homogeneous topographic features, poor optical texture and unstructured landforms, which brings great challenges to the lunar rover autonomous navigation. For high-precision autonomous navigation during lunar surface exploration, this paper proposes a novel path planning algorithm, the main purpose is to plan a travelable path that might be beneficial to improve the navigation accuracy. Firstly, the proposed method integrates the global auxiliary lines generated based on the A* algorithm into the Dynamic Window Approach (DWA). Then, a new cost function that takes into account the specialty of the lunar south pole environment and the accuracy impact factors of navigation is established. Finally, a numerical simulation is conducted to verify the feasibility of the optimized path planning algorithm, where the navigation accuracy serves as an evaluation index to evaluate the performance of path planning.

Paper ID: M025

Affiliation: Unit 91851 of the PLA

Paper Title: Research on the Concept of Missile Cooperative Combat

Authors: Wei Pan, Chi Zhang, Tianhui Wang, Ming Liang, Gang Wang

ABSTRACT:

At present, guided by the concept of system of operations, missile cooperative operation has become a new direction and new competitive point of missile weapon system development. Taking the US military as the main research object, this paper mainly introduces the origin and concept of missile cooperative operation and the research status of missile weapon system applicable to distributed cooperative operation system in the United States. On this basis, it analyzes the key technologies, operational elements and basic functions of distributed cooperative operation system, and finally puts forward some opinions and suggestions for the development of missile cooperative operation in China.

Paper ID: M026

Affiliation: Unit 91851 of the PLA

Paper Title: Application of GPS technology in missile measurement and control

Authors: Wei Pan, Chi Zhang, Tianhui Wang, Ming Liang, Gang Wang

ABSTRACT:

GPS (Global Positioning System) is a new generation of precision satellite positioning system established with the rapid development of modern science and technology. It uses navigation satellites to measure time and distance, and has the ability of real-time three-dimensional navigation and positioning in all directions at sea, land and air. Global Positioning System (GPS) plays a vital role in the field of missile measurement and control. This paper summarizes the application status of GPS technology in the field of missile measurement and control, and looks forward to the application and development trend of GPS technology in missile measurement and control.

Paper ID: M046

Affiliation: School of Mechanical Engineering, Nanjing University of Science and Technology

Paper Title: Adaptive sliding mode control of magazine based on fuzzy theory

Authors: Pengyao Bai, Longmiao Chen, Quan Zou

ABSTRACT:

As a very important part of the automatic loading technology of artillery, the automatic chain magazine can be accurately placed to affect the smooth progress of subsequent firing missions. Aiming at the problem of precise position control of automatic chain magazine, a control method combining fuzzy intelligent control and sliding mode adaptive control algorithm is proposed. The fuzzy theory is used to replace the discontinuous switching control item in the sliding mode control algorithm, and the boundary layer method is used to replace the switching function, making full use of the robustness of sliding mode control and the advantages of fuzzy theory to select the appropriate switching gain, and then using the adaptive algorithm to estimate the system change parameters according to the characteristics of the system parameter uncertainty problem and reduce the influence of parameter change on the system. The simulation results show that the control method has good control accuracy and strong robustness.

Paper ID: M043

Affiliation: Commercial Aircraft Corporation of China, Ltd. (COMAC)/ Flight Test Center

Paper Title: Research on Quasi-real-time Flight Test Data Identification Method and Software Development

Author: Jiang Wu

ABSTRACT:

To improve the efficiency of flight test engineers in analyzing flight test data and obtain high-quality flight test data without outliers, smoothing, and consistent with kinematic characteristics, this paper studied key technologies in flight test data secondary processing, such as outlier processing, filtering, and kinematic consistency analysis, and developed a quasi-real-time flight test data identification software based on flight test of a certain type of aircraft. Through testing and use, the feasibility of the software design method was verified, and it was applied and promoted in the processing and analysis of flight test data for multiple types of civilian aircraft.

Paper ID: M047

Affiliation: Commercial Aircraft Corporation of China, Ltd. (COMAC)/ Flight Test Center

Paper Title: Research of Climb Performance Calculation Method and Program Implementation for Civil Aircraft Flight Test

Author: Jiang Wu

ABSTRACT:

Climb test flight is one of the important flight test subjects in performance test flight. Through the analysis of climb theory, this paper gives the calculation method and process of the test aircraft climb performance parameters after only the flight test data and the polar curve data corrected by the flight test data are obtained. Through flight testing proves that the calculation method of parameters such as climb rate and climb gradient weight limit in this paper is feasible, and can provide a reference for the calculation requirements of parameters related to climb performance during flight tests of new aircraft.

Poster Session

Paper ID: M015

Affiliation: Wuhan University of Technology

Paper Title: High-sensitivity and low-noise interrogation for spindle fault monitoring

Authors: Jie Wang, YuegangTan, Yi Liu

ABSTRACT:

To reduce the error, the stiffness of the high-precision machine tool spindle is often remarkably high, and the strain, when subjected to force, is extremely small. It is difficult for traditional strain monitoring methods to monitor the failure of the spindle. In this paper, enhanced sensitivity of the fiber Bragg grating(FBG) interrogation system is proposed, which can increase the sensitivity of traditional FBG strain sensors at high bandwidth (0-4KHz). The system measurement sensitivity reached 96.9 mV/με, and the minimum strain reached 0.1 με. High-stiffness spindle misalignment faults and bearing outer ring faults can be identified.

Paper ID: M016

Affiliation: The First Aircraft Institute, Aviation Industry Corporation of China

Paper Title: Research on Air Autonomous Route Re-planning Technology of Combat Aircraft

Authors: Chunxia Yin, Tao Chu

ABSTRACT:

In the complex combat environment, it is difficult to predict pop-up threats and temporary orders after take-off, so it is necessary to quickly complete the new route decision that meets the viability of the aircraft and the task completion in a very short time. However, in the tense flight, decisions cannot be made quickly by manual force alone, and the research on air autonomous route re-planning technology came into being. This paper expounds the current research status, and focuses on the air autonomous route re-planning system design, including function composition and working logic. The difficult problems are sorted out to consolidate the theoretical foundation for the further engineering realization.

Paper ID: M018

Affiliation: China Agricultural University

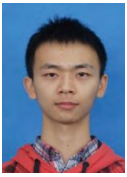
Paper Title: Stability of a tractor with implement by employing fluid-based inerters into front axle suspension

Authors: Huachun Li, Xiaofu Liu

ABSTRACT:

Vibration caused instability of the tractor with implements has always been severe during agricultural work. In this paper, the potential of applying fluid-based inerter into the front axle suspension of tractor to reduce the vibration was studied, where two inerter-based strut layouts were proposed and compared with the conventional layout towards the stability of ploughing

depth was studied in pitch plane model, the performance benefits of each layout were optimised and analysed. Meanwhile, the optimum design parameters were identified, respectively. According to the optimization results, over a wide range of static suspension stiffness, the ploughing depth stability of both potential layouts has improved compared to the conventional layout, with a maximum performance improvement of 27.8% and 38.2% respectively.



Paper ID: M019

Affiliation: Huazhong University of Science and Technology

Paper Title: Measurement of freestream density fluctuation in hypersonic wind tunnel

Authors: Youde Xiong, Jie Wu

ABSTRACT:

The freestream disturbance type and magnitude of hypersonic wind tunnels have a significant impact on experiments such as boundary-layer transition and shock wave/boundary-layer interaction. The present understanding of the background perturbation in hypersonic wind tunnels is quite rare, and it limits the research on relevant issues. In view of this situation, the measurement on freestream density fluctuation using focused laser differential interferometry, which is a nonintrusive method was conducted in the Mach 6 hypersonic wind tunnel of Huazhong University of Science and Technology. Assuming that the density perturbation in the free flow is all contributed to the eddy Mach wave formed by the turbulent boundary layer on the nozzle wall, the transfer function of the optical system responding to the sound wave radiating from axisymmetric nozzle wall was calculated. Then the spectrum of density disturbance was obtained. The experimental results show with the increase of Reynolds number, the absolute value of density perturbation raises, while the normalized values decrease. The root mean square value of the fluctuation is between 1% and 1.4%.

Paper ID: M009

Affiliation: Harbin Institute of Technology

Paper Title: Trajectory optimization for spacecraft close proximity based on dual quaternions

Authors: Qian Wang, Hongmin Zhai, Shunli Li

ABSTRACT:

The problem of trajectory optimization for spacecraft close proximity is addressed in this paper. The proposed algorithm aims to find a fuel-optimal trajectory while subject to line-of-sight constraint, glide slope constraint and control magnitude constraint, etc. Because line-of-sight constraint and glide slope constraint are coupled with the position and attitude motions of the spacecraft, and the dual quaternion can uniformly represent the relative position and attitude between coordinate systems. Therefore, dual quaternions were used to describe the motion of the spacecraft. Secondly, the sequential convex optimization is used to solve the fuel-optimal trajectory established by dual quaternions. Finally, the calculation time and energy consumption of the proposed method are given by numerical simulations.

Paper ID: M014

Affiliation: Wuhuan University of Technology

Paper Title: Design of Axial Force Sensor based on Equal Strength Beam

Authors: Zhikang Li, Yuegang Tan, Yi Li

ABSTRACT:

Axial force is an important indicator affecting the gas turbine's reliability. This work proposes a novelty annular force sensor based on an equal-strength beam for the axial force of bearing. The finite element method verifies that the sensor elastomer has a considerable strain-flat length and validates the sensor's measurement range. The static performance of the sensor is also studied, and the sensor has excellent linearity in the range of 0-3.5t.

Paper ID: M030

Affiliation: Flight Test Center,COMAC

Paper Title: Research on Flight Test Technologies of FMS Vertical Profile for Civil Aircraft

Author: Xin Li

ABSTRACT:

In civil aircraft Flight Management System (FMS), vertical flight profile can provide all predicable information and performance parameters of flight plan in real time from takeoff to landing flight phase, such as speed, altitude and engine data. The function of vertical profile prediction and its accuracy are very important for flight path and flight performance. Its flight test is thus essential for civil aircraft airworthiness certification flight test. This paper studies deeply technical research and detailed functional characteristics on four FMS functional units and its data flow. And based on Advisory Circular(AC) documents, this paper put forward to airworthiness requirements on performance management function, performance prediction reasonableness, interface of other systems, and vertical navigation error. Four flight test procedures are then proposed and can be carried out in combination. The data results of one type aircraft are presented to demonstrate the feasibility of data analysis method. As a result, this paper can provide guidance and help for subsequent civil aircraft flight test.

Paper ID: M022

Affiliation: North China University of Technology

Paper Title: Design of Control System for Precision Parts Cleaning Equipment Based on PLC

Authors: Yehui Ding, Yanzhi Guan, Ziliang Pang

ABSTRACT:

The traditional cleaning process of precision parts is completed by manual operation and ultrasonic machine. In order to solve problems such as high labor intensity, low efficiency,

inaccurate solvent injection and organic solvents are harmful to human health, etc. A precision parts cleaning equipment with ultrasonic cleaning technology as the core was designed. The automatic control system for equipment takes Siemens PLC as the core, uses mechanical arm to cooperate to grasp parts, uses weighing method to inject cleaning solvent, and uses Siemens HMI to realize human-machine interaction function. A simple and effective filtering algorithm is designed to ensure more accurate cleaning solvent injection. The field test shows that the equipment can adapt to the field cleaning environment, the control system has reasonable functions and can clean according to the corresponding process, which greatly reduces manual participation and improves the cleaning efficiency.

The video will be played according to the actual situation on the day of the conference.

Listener

ID: L001

Affiliation: Xi'an University of Technology

Presenter: Qi Wan

Thanks to the above participants for participating in this conference as a listener and for their support for the conference, and welcome to communicate and discuss in this research field at the conference.

Closing Ceremony & Awards Ceremony & Photo Session

18:00-18:30 Saturday May 27, 2023

Upcomimg Conference

2023 International Conference on Advanced Unmanned Aerial Systems (ICAUAS 2023)

July 14-16, 2023 Harbin, China
July13-15, 2023 Toronto, Canada

2023 International Conference on Industrial Automation, Robotics and Control Engineering (IARCE 2023)

October 27-30, 2023 Chengdu, China

2023 3rd International Joint Conference on Energy, Electrical and Power Engineering (CoEEPE 2023)

November 22-24, 2023 Melbourne, Australia

Note

Contact: Ms. Dora

Consult: 181 0815 9229

Note

Contact: Ms. Dora

Consult: 181 0815 9229

CAMME 2023

2023年航空航天、机械工程与机电一体化国际会议

2023 International Conference on Aerospace, Mechanical and Mechatronic Engineering

支持单位：

中国航空学会
Chinese Society of Aeronautics and Astronautics

Complex Engineering Systems www.comengsys.com

IR Intelligence & Robotics

西北工業大學 NORTHWESTERN POLYTECHNICAL UNIVERSITY

中国航空学会 Chinese Society of Aeronautics and Astronautics

IASED www.iased.org

WWW. CAMME.ORG