SINGAPORE UNIVERSITY OF TECHNOLOGY AND DESIGN

9 July – 9 September 2022

TOPICAL REPORT

AVIATION

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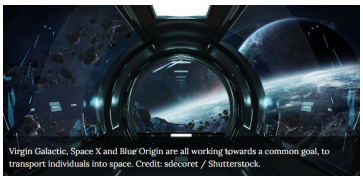
AVIATION



Space tourism could be set 'to take off' sooner than expected

"Space tourism simply refers to the act of travelling to space for recreation. Classed as science fiction for decades, it has been attracting increasing attention over the past few years. As tourists yearn for a completely unique experience, seeking undiscovered and less remote locations, space tourism has the potential to become the next big trend in the travel sector.
Many space tourism companies have fallen by the wayside, but with wealthy investors involved, major developments are underway. With tickets already being sold, it is clear that demand is there amongst affluent individuals, setting to become the next luxury travel trend."
Source: Aerospace Technology

Managing the hype around new technology - why managers should focus on the use case

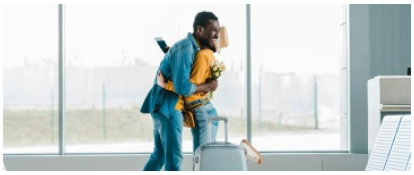
"A five-year study of industrial drone technology adoption showed the value of adopting a rigorous 'use case' approach, underpinned by simple questions like, does this technology allow the firm to be more efficient or does it make things more complex? Does it help address real

ENGINEERING

A new mandrel design with mandrel ball thickness variation for the bending process of aviation ultra-thin-walled tubes

"Due to their unique advantages of high strength, high performance, and light weight, ultra-thin-walled (UTW) tubes have attracted increasing application in the aviation and aerospace industries. However, wrinkling, cracking, cross-section distortion, and even collapse easily occur in UTW tube bending process. In this study, a new mandrel design method with variation in the mandrel ball thickness for bending UTW tubes was proposed to improve the forming quality. First, a basic mandrel design scheme with a uniform mandrel ball thickness was determined according to engineering experiences and preliminary research. Then, three different mandrel ball thicknesses were determined based on the same mandrel support angle of the basic scheme (BS), and combination schemes (CSs) of mandrel balls with different thicknesses were designed. A 3D elastic–plastic finite element (FE) model of the numerical control (NC) bending process of UTW tubes was established and verified, and the influence of different combinations of mandrel ball thickness variation on

AVIATION



2022 ICAO Safety Report

"ICAO has released its 2022 Safety Report, presenting a detailed analysis of global civil aviation safety performance for 2021 operations.
Report results reveal a 9.8% decrease in the global accident rate for last year vs. 2020, dropping from 2.14 to 1.93 per million departures.
Meanwhile 2021 fatalities fell by 66% against the number in 2020, though the number of accidents where fatalities occurred remained consistent at four.
"These outcomes are very positive and encouraging, and reconfirm that air transport is the safest mode of transport even during the current global circumstances," commented ICAO Secretary General Juan Carlos Salazar."
Source: ICAO

Effects of Novel Coronavirus (COVID-19) on Civil Aviation

"The COVID compared to impact on world scheduled passenger traffic 19 2019 levels:—Overall reduction of Overall reduction of Approx. USD 50% of seats offered by airlines 2,703 million passengers 372 billion loss of gross (60%) for year 2020 (actual results), passenger operating The COVID19 impact on world scheduled passenger traffic estimates), compared revenues of airlines for

problems or merely act as a distraction?
"Managers are caught in a potential bind – they face the hype and excitement of new technology but their conventional linear approach of 'make a business case, pilot the technology, implement and scale', may restrict a firm's ability to engage quickly with genuinely value-adding innovation" said Professor Michael Lewis of the University of Bath School of Management."
Source: University of Bath

The Airchive: The World's Most Comprehensive Online Collection Of Aviation Memorabilia

"What if you could access decades of aviation collectibles from the comfort of your own home? How cool would it be to experience the first flight of a particular plane or airline, to review timetables from years gone by, or leaf through the original sales brochure for aviation icons like Concorde? Well, you can, and it's all down to the hard work and dedication of one man.
The Airchive is perhaps the world's most comprehensive collection of aviation-related materials, from brochures, menus, and safety cards to an enormous collection of photographs and accounts of special flights and events. Simple Flying caught up with Chris Sloan, founder of the Airchive, to find out what inspired him to start his collection and led him to share it with the world for free."
Source: Simply Flying

How Flying Today Is Safer Than At Any Time In The Past

"The International Civil Aviation Organization (ICAO) recently released its 2022 global safety report. It showed that, last year, the aviation industry saw a 9.8% decrease in accidents compared to 2020. Fatalities resulting from aircraft accidents dropped 66%. These numbers have fallen despite an 11% increase in total scheduled flights. The ICAO attributes the improvements in safety to the safety commitments shared across the industry.
In fact, the general trend across many years of aviation is that, today, it is safer than ever to fly. According to research by Harvard University, flying in the US, Europe and Australia is actually significantly safer than driving a car. Your odds of being in an accident during a flight is one in 1.2 million, and the chances of that accident being fatal are one in 11 million. Your chances of dying in a car crash, conversely, are one in 5,000."
Source: Simply Flying

the bending quality of UTW tubes was investigated."
Source: Springer Link

Structural Health Monitoring of Electromechanical Actuators in Aviation—Challenges Ahead and Case Study

"Electrical actuation concept fits perfectly with the worldwide strategy of more electric aircraft to reduce carbon footprint. However, the integration of linear electro-mechanical actuators is promising yet challenging in safety critical systems due to the jamming of the driven load. That fault is a critical mechanical transmission failure giving rise to concern in many applications such as primary flight controls or landing gears extension and steering. This article critically reviews electric actuation solutions currently available for aerospace application, the limits for their upcoming deployment and the different solutions to achieve an on-condition maintenance to reduce any safety risk during lifetime. A particular attention is given to the jamming and possible strategies to avoid any hazard induced by this failure. The most promising approach relies on the establishment of a predictive maintenance by monitoring continuously the actuator to timely warn any structural alteration, which is prone to induce jamming."
Source: ASME

Lightweight design of an AlSi10Mg aviation control stick additively manufactured by laser powder bed fusion

"Purpose
This paper aims to explore a structural optimization method to achieve the lightweight design of an aviation control stick part manufactured by laser powder bed fusion (LPBF) additive manufacturing (AM). The utilization of LPBF for the fabrication of the part provides great freedom to its structure optimization, further reduces its weight and improves its portability.
Design/methodology/approach
The stress distribution of the model was analyzed by finite element analysis. The material distribution path of the model was optimized through topology optimization. The structure and size of the parts were designed by applying honeycomb structures for weight reduction. The lightweight designed control stick part model was printed by LPBF using AlSi10Mg."
Source: Emerald

Mechanical Properties of Hybrid Kenaf - Pineapple Leaf Fibre (PALF) Epoxy Composite For Engineering Application

year 2021 (preliminary to Overall reduction 2019 levels: of — Overall reduction of Approx. USD 324 40% of 2,201 seats offered by airlines million passengers billion loss (49%) of gross passenger operating revenues of airlines."
Source: ICAO

Report: Strong recovery underway in Singapore's aviation sector - July 2022

"Summary
Singapore's aviation sector is seeing a strong recovery. Total passenger traffic through Changi Airport is now above 40% of pre-pandemic levels, with expectations that volumes will reach 70% of pre-pandemic levels by the end of the year (up from its initial target of 50%). Nevertheless, Singapore remains acutely conscious of medium-term risks (including the potential for loss of network connectivity, unresolved labour shortages, and slowing global economic growth) along with the need to evolve the sector to achieve greater sustainability in the face of climate change."
Source: New Zealand Foreign Affairs & Trade

AVIATION FUEL

Sustainable Aviation Fuel Report

"Sustainable Aviation Fuel Market Size, Share, Growth Analysis Report By Technology (Synthetic Paraffinic Kerosene (Hefa- Spk), Fischer Tropsch Synthetic Paraffinic Kerosene (Ft-Spk), Synthetic Iso-Paraffin From Fermented Hydro Processed Sugar (Hfs-Sip), Alcohol To Jet Spk (Atj-Spk), And Catalytic Hydrothermolysis Jet (CHJ)), By Type (Biofuel, Hydrogen Fuel, and Power To Liquid Fuel), By Blending Capacity (Below 30%, 30% to 50%, and Above 50%), and By Region - Global and Regional Industry Insights, Overview, Comprehensive Analysis, Trends, Statistical Research, Market Intelligence, Historical Data and Forecast 2022 – 2028."
Source: Facts and Factors

Growth in AI application by 2030 might affect aviation sustainability

"The emergence of new aviation technologies are redefining the aviation discourse, given their profound impacts on air transport systems. However, the World Economic Forum (WEF) has noted that most of these innovations may fail to produce the expected value and transformations in the air mobility landscape due to insufficient regulatory frameworks to guide their deployment.

Current predictions indicate that the aviation industry will experience a 46.4% compound annual growth rate (CAGR) in AI application by 2023. The trend may replicate with other technologies, providing personalized and optimized travel experience for air travelers, supporting democratizing decision-making processes, and eliminating uncertainties in air travel."

Source: Air Cargo Week

ENGINEERING

Engineers Study Bird Flight

""Birds easily perform challenging maneuvers and they're adaptable, so what exactly about their flight is most useful to implement in future aircraft?" said Christina Harvey, assistant professor in the Department of Mechanical and Aerospace Engineering at the University of California, Davis, and lead author on the paper.

Harvey began studying gulls as a master's student in zoology at the University of British Columbia, after earning her bachelor's degree in mechanical engineering."

Source: University of California - Davis

Bioinspired whisker arrays can work as antennae to detect sources of flow disturbances under water or in the air

"A recent research study conducted by City, University of London's Professor Christoph Bruecker and his team has demonstrated that artificial whiskers, built as models of whiskers from sea lions, can work as an array of antennae to locate the source of hydrodynamic wakes, similar to the way sea lions use their whiskers. This method relies on the time differences of the signal exciting the different whiskers. The underlying principle of source detection could also explain how the sea lions use their whiskers to track the path of their prey, by leaving

"Natural fibres nowadays been famously investigated as alternative fibres due to the source depletion of petroleum. There are several natural fibres such as jute, hemp, sisal, kenaf and pineapple leaf that been actively researched in terms of their mechanical properties. This research was focusing on two of the natural fibres which are the kenaf and pineapple leaf. The kenaf and pineapple leaf fibres were proved by previous researchers to have good mechanical properties. This study aims to test the hybrid of Hybrid Kenaf and Pineapple leaf Fibre (PALF) epoxy composite for engineering application. The mechanical properties of hybrid pineapple leaves and kenaf fibre composite will be investigated. The tensile test will be performed in mechanical properties analysis. This research conducted to ensure that the fibre is being utilized rather than being left out as waste, especially by the agriculture industries and the data of the mechanical properties of pineapple leaves and kenaf fibre composite can be obtained through tests conducted."

Source: Universiti Tun Hussein Onn Malaysia

A Study of the Kinematics System in Drilling Inconel 718 for Improving of Hole Quality in the Aviation and Space Industries

"This article discusses experimental results concerning the quality of through holes drilled in Inconel 718. The tests involved hole cutting under 27 different conditions using different values of the feed per revolution and spindle speed, and different types of kinematic system. The drilling was performed on a CTX Alpha 500 universal turning center using tools with internal coolant supply. Three kinematic systems were considered for hole cutting. The first, based on the driven tool holder, had a stationary workpiece and a rotating and linearly fed tool. In the second, where drilling was based on the spindle rotations, the workpiece rotated while the tool moved along a straight line. In the third system, the workpiece and the tool rotated in opposite directions; the tool also performed a linear motion. The study aimed to assess the quality of holes on the basis of the following output parameters: the hole diameter, cylindricity and straightness errors, and the surface texture. A multifactorial statistical analysis was used to determine how the hole quality was dependent on the process parameters and the type of drilling kinematics."

Source: MDPI

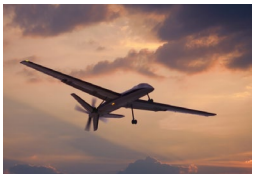
hydrodynamic disturbances in their wake while swimming."
Source: City University London

ARTIFICIAL INTELLIGENCE

AI pilot can navigate crowded airspace

"Researchers have developed an AI pilot that enables autonomous aircraft to navigate a crowded airspace. The artificial intelligence can safely avoid collisions, predict the intent of other aircraft, track aircraft and coordinate with their actions, and communicate over the radio with pilots and air traffic controllers. The researchers aim to develop the AI so the behaviors of their system will be indistinguishable from those of a human pilot."
Source: Carnegie Mellon University

MATERIALS



New wind sensor uses smart materials to improve drone performance

"Engineers have designed and successfully tested a more efficient wind sensor for use on drones, balloons and other autonomous aircraft.
These wind sensors – called anemometers – are used to monitor wind speed and direction. As demand for autonomous aircraft increases, better wind sensors are needed to make it easier for these vehicles to both sense weather changes and perform safer take-offs and landings, according to researchers."
Source: Ohio State University

Faster friction -- less wear

"Typically, the faster the two surfaces slide past each other, the greater the wear. But at extremely high speeds, comparable to the muzzle velocity of a firearm, this can be reversed: Above a certain speed, the wear decreases again. This surprising and seemingly contradictory result has now been explained using computer simulations by the Research Unit Tribology at TU Wien and the Austrian Excellence Center for Tribology (AC2T research GmbH) in Wiener Neustadt in cooperation with Imperial College in London."
Source: Vienna University of Technology

Assessment of aviation operators' efficacy in highly automated systems

"Purpose
Technological advances and the adaption of higher levels of automation serve as a potential cause of aviation incidents and accidents. This study aims to investigate the effect of automated systems on the operator's performance total load (work, task, information, communication and mental) in highly advanced systems.
Design/methodology/approach
A questionnaire was designed for aviation operators (Pilots, ATCOs) to understand the intensity to which automation has affected their working environment and personal behavior. In total, 115 responses were received from 44 countries worldwide. Approximately, 66% of respondents were pilots, 27% Air traffic controllers and 7% were both pilots and ATCOs with various experience levels."
Source: Emerald

Influence of Inlet Pressure Distortion on the Engine Performance of a Supersonic Passenger Aircraft

"The influence of inlet distortion of the total pressure field on the engine characteristics of a supersonic passenger aircraft is investigated, by means of a one-dimensional mathematical model of a mixed turbofan engine. The model, employing the parallel compressor method, permits assessment of how inlet distortion of the air parameters affects the engine's performance and also the gas-dynamic stability of the fan and the high-pressure compressor."
Source: Springer Link

RISK ASSESSMENTS

Study on Quantitative Evaluation Method of Aviation Equipment Error-Prevention

"The proportion of flight accidents and accident symptoms caused by human error is increasing year by year. Error prevention design, as the most fundamental way to overcome human error is very important for aviation equipment. At present, the error prevention level evaluation method during flight test is mostly qualitative, for single equipment, lacking of systematicness and quantitation. So, based on the theory

AIR TRAVEL

Changi Airport Terminal 5 redesigned to be resilient and pandemic-ready

"Changi Airport's Terminal 5 has been redesigned to be resilient and pandemic-ready, prime minister Lee Hsien Loong said in his National Day Rally speech.

Lee said that because of the pandemic, the government had to postpone the tender to build T5. The plan was postponed for two years which Lee said created enough time for them to reassess the long-term prospects for air travel and improve the terminal design.

Lee explained that even before breaking ground for Terminal 4 and Jewel, they are already mulling the concepts for T5. T5 was made to be bigger than T1 to T4 put together."

Source: Singapore Business Review

SUSTAINABLE AVIATION

These 5 Airlines Are Using the Latest Technology to Make Their Planes Greener

"Taking a cue from the automobile industry, airlines are betting big on next-generation aircraft technologies that will trade conventional carbon-emitting jet fuel for other kinds of power, including electric, hybrid, and hydrogen—and new planes that utilize them. Sooner still, companies are adopting cleaner, low-carbon sustainable aviation fuel (SAF), a range of biofuels derived from renewable biomass and waste products. Both initiatives will help the industry meet the pledge many of its most important members made last fall to meet the high-stakes deadline laid out by United Nations scientists: Reach net-zero carbon emissions by 2050 or risk losing a "livable climate."

"Aviation needs to make radical changes," says Jane Ashton, director of sustainability for the European low-cost carrier easyJet, which has one of the largest fleets in Europe. "We believe SAF will be an interim solution, bringing emissions down before short-haul aviation can transition to zero-carbon-emission flying.""

Source: CN Traveller

of the man-machine ring and maintenance event, we established the evaluation indicator system. Then, from the perspective of security, combined with the incorrect consequences, aviation equipment error prevention quantitative evaluation method is established. The method has been applied to the maintainability evaluation of some aviation equipment, and scientific and reasonable evaluation results have been obtained."

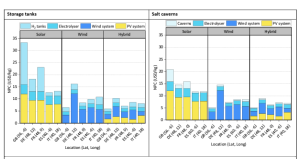
Source: Springer Link

Safety Analysis Methods for Complex Systems in Aviation

"Each new concept of operation and equipment generation in aviation becomes more automated, integrated and interconnected. In the case of Unmanned Aircraft Systems (UAS), this evolution allows drastically decreasing aircraft weight and operational cost, but these benefits are also realized in highly automated manned aircraft and ground Air Traffic Control (ATC) systems. The downside of these advances is overwhelmingly more complex software and hardware, making it harder to identify potential failure paths. Although there are mandatory certification processes based on broadly accepted standards, such as ARP4754 and its family, ESARR 4 and others, these standards do not allow proof or disproof of safety of disruptive technology changes, such as GBAS Precision Approaches, Autonomous UAS, aircraft self-separation and others. In order to leverage the introduction of such concepts, it is necessary to develop solid knowledge on the foundations of safety in complex systems and use this knowledge to elaborate sound demonstrations of either safety or unsafety of new system designs. These demonstrations at early design stages will help reducing costs both on development of new technology as well as reducing the risk of such technology causing accidents when in use. This paper presents some safety analysis methods which are not in the industry standards but which we identify as having benefits for analyzing safety of advanced technological concepts in aviation."

Source: Harvard

AVIATION FUEL



Evaluation of the potential use of e-fuels in the European aviation sector: A

What Boeing's new research center means for sustainable aviation

"The future is green, and Boeing is hopping on board. In this article, we'll explore Boeing's new research initiative and how the company plans to address sustainability in the aviation sector

The transportation industry accounts for **27% of annual greenhouse gas emissions**, making it the biggest contributor to carbon dioxide (CO2) emissions worldwide.

The impacts of CO2 are detrimental and far-reaching. From increasing global temperatures to more acidic oceans, carbon dioxide endangers the livelihood of plants, animals, and humans around the world. As the planet heats up, natural disasters such as flooding, famine, drought, and hurricanes increase in intensity and frequency."

Source: Open Access Government

All-in-one solar-powered tower makes carbon-neutral jet fuel

"Researchers have designed a fuel production system that uses water, carbon dioxide (CO2), and sunlight to produce aviation fuel. They have implemented the system in the field, and the design, publishing July 20 in the journal Joule, could help the aviation industry become carbon neutral."

Source: Cell Press

comprehensive economic and environmental assessment including externalities

"The decarbonisation of the transportation sector is key to meeting climate goals. Whilst the electrification of road passenger transportation is proving to be a viable low-carbon solution in many contexts, a viable pathway towards a decarbonised aviation sector remains opaque. In this context, so-called e-fuels produced via the combination of H2O, CO2 and renewable energy may have promise owing to their compatibility with existing infrastructure. Most studies on e-fuels focus only on the economic dimension, neglecting their environmental performance and associated costs. In this contribution, we present a techno-economic evaluation and cradle-to-grave life cycle assessment of e-jet fuels produced via different sources of CO2 and green H2 to comprehensively assess the potential of Fischer-Tropsch (FT) e-fuels in aviation, explicitly accounting for externalities. Our results show that FT e-jet fuel is much more expensive than its fossil analogue, even when externalities are included. Moreover, using current technology, FT e-jet fuel appears to exacerbate damages to human health and ecosystems despite showing lower carbon footprint and resource scarcity impacts than the fossil counterpart. In this regard, the CO2 and H2 provenance dictates the cost and environmental impact, which can vary substantially depending on the plant location."

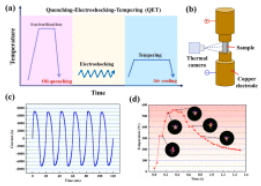
Source: Royal Society of Chemistry

Renewable Aviation Fuel: Review of Bio-jet Fuel for Aviation Industry

"The search for environmentally sound, socially responsible, and economically viable renewable fuel generation methods is a major global concern. A type of aviation fuel called jet fuel or often spelled avtur is intended for use in aeroplanes with turbine (gas) engines. Jet fuel appears colourless. The fuels Jet A and Jet A-1 are the most frequently used ones in commercial aviation sector. Other than Jet B, which is utilised for its enhanced cold-weather operation, there are no other jet fuels that are frequently used in gas-turbine-engine in the aviation industry. Renewable aviation fuel or known as bio-jet fuels represent a sizable sector for the consumption of fossil fuels. The production of bioethanol and biodiesel for piston engine vehicles in internal combustion engines has already shown that biofuel can play a

significant role in the development of sustainable renewable aviation jet fuel. Here, we also provide a book review on the potential bio-jet fuel as a renewable aviation jet fuel."
Source: Engineering Science Letter

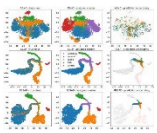
MATERIAL SCIENCE



A novel quenching-electroshocking-tempering process for toughness improvement by microstructure refining and austenite stability tailoring in aviation bearing steel

"In this work, the microstructural evolution and mechanical properties of aviation M50 steel under a novel quenching-electroshocking-tempering (Q-E-T) process were investigated. Microstructural observations indicate that the carbon concentration and volume fraction of retained austenite (RA) in Q-E-T specimens are higher than those in conventional quenching-tempering (Q-T) specimens due to the significant carbon partition induced by the introduced electroshocking treatment (EST). Meanwhile, the diameter of packets in the Q-E-T specimens is refined from 1.71 μm to 1.34 μm, which is attributed to the segmentation of blocky as-quenched RA by bainite transformation during EST. The mechanical analysis shows that an excellent combination of ultimate tensile strength and impact toughness is achieved for M50 steel subjected to the Q-E-T process. Compared with the conventional Q-T process, the impact absorbing energy of M50 steel is increased by 24.1% without any loss of tensile strength."
Source: Elsevier

ARTIFICIAL INTELLIGENCE



Robust and Explainable Semi-Supervised Deep Learning Model for Anomaly Detection in Aviation

"Identifying safety anomalies and vulnerabilities in the aviation domain is a very expensive and time-consuming task. Currently, it is accomplished via manual forensic reviews by subject matter experts (SMEs). However, with the increase in

the amount of data produced in airspace operations, relying on such manual reviews is impractical. Automated approaches, such as exceedance detection, have been deployed to flag safety events which surpass a pre-defined safety threshold. These approaches, however, completely rely on domain knowledge and outcome of the SMEs' reviews and can only identify purely threshold crossings safety vulnerabilities. Unsupervised and supervised machine learning approaches have been developed in the past to automate the process of anomaly detection and vulnerability discovery in the aviation data, with availability of the labeled data being their differentiator. Purely unsupervised approaches can be prone to high false alarm rates, while a completely supervised approach might not reach optimal performance and generalize well when the size of labeled data is small. This is one of the fundamental challenges in the aviation domain, where the process of obtaining safety labels for the data requires significant time and effort from SMEs and cannot be crowd-sourced to citizen scientists. As a result, the size of properly labeled and reviewed data is often very small in aviation safety and supervised approaches fall short of the optimum performance with such data. In this paper, we develop a Robust and Explainable Semi-supervised deep learning model for Anomaly Detection (RESAD) in aviation data."
Source: MDPI

A Comparative Analysis of Exhaust Gas Temperature Based on Machine Learning Models for Aviation Application

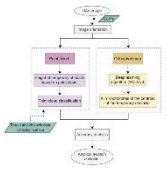
"The main objective of this study is to investigate elaborately the relationship between exhaust gas temperature (EGT) and various operational parameters specific to aero-engine for the cruise phase. EGT prediction is performed based on different models, including deep learning (DL) and support vector machine (SVM), using a set of historical flight data, more than 1300. In order to achieve this goal, the EGT is taken as the output parameter while the most key variables for the EGT prediction are taken as the input parameters to the models. Several statistical goodness tests, namely root-mean-square error (RMSE), mean absolute error (MAE), and coefficient of determination (R2), are conducted to make a fair comparison between the efficiency and performance of each model that is developed based on Matrix Laboratory (matlab) and R code."

Source: ASME

Natural Language Processing of Aviation Safety Reports to Identify Inefficient Operational Patterns

"With the growth in commercial aviation traffic and the need for improved environmental performance, strategies to lower emissions that can be implemented in the near term are necessary. Since novel technology takes time to enter the market, operational improvements that employ existing aircraft and require no new infrastructure are fit for this goal. While quantified data collected throughout aviation, such as arrival/departure statistics and flight data, have been well-utilized, text data collected through safety reports have not been leveraged to their full extent. In this paper, a methodology is presented that can use aviation text data to identify high-level causes of flight delays and cancellations, using delays as a metric of operational inefficiency. The dataset is extracted from the Aviation Safety Reporting System (ASRS), which includes voluntary safety incident reports in text narrative and metadata formats. The methodology uses natural language processing tools, K Means clustering, and dimensionality reduction by t-Distributed Stochastic Neighbor Embedding (t-SNE) to categorize and visualize narratives."
Source: MDPI

UAV



Automated Detection of Atypical Aviation Obstacles from UAV Images Using a YOLO Algorithm

"Unmanned Aerial Vehicles (UAVs) are able to guarantee very high spatial and temporal resolution and up-to-date information in order to ensure safety in the direct vicinity of the airport. The current dynamic growth of investment areas in large agglomerations, especially in the neighbourhood of airports, leads to the emergence of objects that may constitute a threat for air traffic. In order to ensure that the obtained spatial data are accurate, it is necessary to understand the detection of atypical aviation obstacles by means of their identification and classification. Quite often, a common feature of atypical

aviation obstacles is their elongated shape and irregular cross-section. These factors pose a challenge for modern object detection techniques when the processes used to determine their height are automated. This paper analyses the possibilities for the automated detection of atypical aviation obstacles based on the YOLO algorithm and presents an analysis of the accuracy of the determination of their height based on data obtained from UAV."
Source: MDPI

Trustworthy UAV Relationships: Applying the Schema Action World Taxonomy to UAVs and UAV Swarm Operations

"Human Factors play a significant role in the development and integration of avionic systems to ensure that they are trusted and can be used effectively. As Unoccupied Aerial Vehicle (UAV) technology becomes increasingly important to the aviation domain this holds true. This study aims to gain an understanding of UAV operators' trust requirements when piloting UAVs by utilising a popular aviation interview methodology (Schema World Action Research Method), in combination with key questions on trust identified from the literature. Interviews were conducted with six UAV operators, with a range of experience. This identified the importance of past experience to trust and the expectations that operators hold. Recommendations are made that target training to inform experience, in addition to the equipment, procedures and organisational standards that can aid in developing trustworthy systems."
Source: Taylor & Francis Online

A small fixed-wing UAV system identification using metaheuristics

"A novel method for system identification of small-scale fixed-wing Unmanned Aerial Vehicles (UAVs) using a metaheuristics (MHs) approach is proposed. This investigation splits the complex aerodynamic model of UAV into longitudinal and lateral dynamics sub-systems. The system identification optimisation problem is proposed to find the UAV aerodynamic and stability derivatives by minimizing the R-squared error between the measurement data and the flight dynamic model. Thirteen popular optimisation algorithms are applied for solving the proposed UAV system identification optimisation problem while each algorithm is tested for 10 independent optimisation runs. By performing the Freidman's rank test, statistical analysis of the experiment

work was carried out while, based on the fitness value, each algorithm is ranked. The outcomes demonstrate the dominance of the L-SHADE algorithm, with mean R-square errors of 0.5465 and 0.0487 for longitudinal and lateral dynamics, respectively. It is considered superior to the other algorithms for this system identification problem."
Source: Taylor & Francis Online