The International Conference on Sustainability and Emerging Technologies for Smart Manufacturing (SETSM 2024)

HOST BY HANOI UNIVERSITY OF INDUSTRY

TABLE OF CONTENTS

CONFERENCE COMMITTEE	5
PREFACE	10
HANOI UNIVERSITY OF INDUSTRY INTRODUCTION	13
LIST OF KEYNOTE SPEAKERS AND PLENARY TALKS	15
Design of Adaptive fuzzy-PID for Adaptive Cruise Control of Electric Vehicle using DC Motor: Theory and Experiment	16
Novel Thermoelectric Generator Design For Recovering Waste Heat	16
Modulating optoelectronics characteristics of Janus SiSSe monolayer by mechanical strain	17
A Solution for Converting Gasoline Engines to Use Ammonia with A Combination Power System	18
Analyzing Frontal Car Collisions Through Imulation Utilizing Hyperworks Software	18
A novel approach of mining high utility itemsets	19
Optimizing Power Consumption And Humidity Of Sliced Avocado Using A Heat Pump Dryer	20
A Study Using Advanced Simulation Techniques and Statistical Analysis for Enhanced Precision of Cylinder Cup in Sheet Metal Deep Drawing Processes	20
Modeling And Simulation Of Automotive Dynamics With The Effect Of Lateral Forces	21
SIMULATE AIRBAG FOLDING USING ANSYS LS-DYNA SOFTWARE	21
Non-Singular Terminal Sliding Mode Control of the steering wheels of 4WD4WS mobile robot	22
Testing of Thermal Management System Intended for Automotive Traction Electric Drives by Means of X-in-the-Loop Technology Featuring VPN-Connected Remote Facility	22
Application Of CVCC Model in Researching Mixture Formation and Fuel Combustion Process	23
Free Vibration Analysis 0n Inner/Outer Ring-Stiffened Combined Shells Made By Functionally Graded Material	23
Topology Optimization for Resin 3d Printed Products to Prevent Weak Connections	24
A Numerical Study on The Thermo-Electrohydrodynamic Performance of Ecf Micro-Pumps	25
Electromechanical Properties of GaN Monolayer	25
A DNS simulation of the low-Reynold flow through an elliptical cylinder using the lattice Boltzmann method	26
Macroscopic Elastic Moduli of The Random Circle-Inclusion Model with Spring-Layer Imperfect Interfaces	26

Analysis, Simulation of The Welding System In Industrial Production Using Tecnomatix Plant Simulation Software	27
Development of The Concept Of Digital Twin Of Temperature Control System Of Electric Vehicles Category L	28
Fuel Deposits and Methods For Their Control	28
Development of a Mathematical Model of Fuel Consumption Estimation Suitable for Research of Algorithms of Energy-efficient Control on Digital Roads	29
Improve Flutter Stability for Streamlined Sections by Arranging Eccentric Masses	30
Study on aerodynamic noise characteristics of quadcopter UAV considering the influence of separation distances between rotor tips and rotational speeds	31
An Approach to The Development of A Methodology For Energy-Efficient Control of Cargo Vehicles	31
The Effect of Cutting Tool Tilt Angle On Surface Quality In Machining on A 4-Axis Turn-Mill Machine	31
Application of Finite Element Method to Analize Deformation And Stress Of The Clutch Structure	32
3d Avatar Interactive System On Hologram Fan Projector Using Motion Recognition Control By Mediapipe Holistic	33
The Study of Methods for Measuring and Controlling Oxygen Storage Capacity	33
Automotive Aerodynamics Analysis: An Implementation of Openfoam Software	34
Achieving FIT Manufacturing through the Lens of Industry 5.0: A Lean Perspective	34
Simulation of The Operating Process of A Spark Ignition Engine Powered by Carbon-Free Fuel	35
Evaluating the Impact of Cutting Speed and Feed Rate on Surface Roughness Utilizing a Four-Insert Carbide Face Milling Cutter on CNC Machines	36
Effects Of Heat Accumulation on The Part Quality And Methods For Reducing Heat Accumulation In Wire Arc Additive Manufacturing: A Short Review	36
Simulate And Optimize The Front Bumper System Of The Vehicle With Ls-Dyna Software	37
Performance iAnalysis iof iCopper iCoated iAluminum iTool iin iElectro iDischarge iMachining iof iTi-6Al-4V iAlloy	38
Simulation Of Urea Injection in A Closed-Loop Control Using Proteus Software	38
Sustainable Dry Machining of Aluminum Alloy A7075: Utilizing Coral Reefs Optimization and Heatmap Analysis for Impact Assessment and Optimization of Cutting Parameters	39

Investigation of Axis Errors of Grinding Tool in Grinding Process for Screw Rotor 40
Triboelectric Nanogenerator for The Emerging Technologies and Smart Manufacturing 40
Mechanical Properties of Dual-Phase Eutectic High-Entropy Alloys Under Nano-Cutting 41
A Review of Inverse Methods for Claw-Type Rotor Design 41
An Efficient Filter for Topology Optimization of Isotropic Elastic Materials in the Two-Dimensional Design Domain 42
Development of Finite Element Tool for the Modeling of Apparent Mechanical Properties of Composites with Random Inclusion Distribution 42
Optimizing Technological Parameters to Improve the Accuracy Of 3D LCD Printed Products 43
A Novel Hierarchical Sliding Mode Controller for Articulated Heavy Vehicles 43
Develop agents for Autonomous vehicles using Reinforcement learning 44
The Compression Behavior of Continuous Carbon Fibers Based Polylactic Acid (PLA) Resin 3D Printing Materials for Different Infill Strategy 45
The Temperature, Strain, And Strain Rate Dependent Flow Stress Of 10b33 Boron Steel Using The Modified Johnson-Cook Model 46
A systematic approach to modeling Crankshaft and Camshaft signal for the Electronic Control System of The Hyundai D4EA Engine 466
Research to Evaluate the Effectiveness of a Dehumidifier Integrated Air Conditioner in Tropical Monsoon Climate 47
Vision-Based Automatic Hand Measurement System for Ring Selection 48
Fuzzy Nonlinear Computed Torque Controller for Robot with Fault 48
Research On Compressive Force on Piles, Driven in Two-Layer Foundation, The Resistance At The Pile's Bottom Remains Constant 49
Digital Transformation Database for Material Inventory Management in Garment Industry 49
An Investigation of High Injection Pressures on Palm Biodiesel Combustion Characteristics Using A Constant Volume Combustion Chamber 50
Optimizing Turning Processes for SUS430C Steel: A Comparative Study of RSM and DFA Approaches 50
A Honey Dehydrator Working at Atmospheric Pressure Using A Heat Pump Incorporated With A Falling Film Evaporator 51
Preparation of Yttria-Stabilized Zirconia (YSZ) Nano-Scale Powder by Sol-Gel Method Apply for Preparing Electrolyte of Solid Oxide Fuel Cell 52
Towards an Open-Source Universal Controller System for Industrial Robots in Industry 4.0 52
A Design Review for Generating Involute Tooth Profile Of Non-Circular Gear Pair 53

Static Bending Behavior of Two-Directional Functionally Graded Porous Microshell 53
Static Analysis of Artificial Bone Pin Made by Using Nanocomposite 54
Unveiling the Thermal Fingerprint of Magnetorheological Brakes: A Simulation Approach 54
Sliding Mode Control Using Genetic Algorithm for Twin Rotor MIMO System 55
Multi-services Digital Twin for Modular Production System based on ISO 23247 and Web server 55
Shortest Path Planning for Rectangular Holonomic Omnidirectional Mobile Robot Using Improved PRM Algorithm 56
Formulation of Silicone Paste Extrusion-Based For 3D Printing Technology 57
Deep Learning Approach for Detecting and Evaluating 57
Which Strategies Should Vietnam’s Garment Industry Approach Leading to Sustainable Development? 58
Comparison of two methods: RAM and AROMAN 58
Experimental System Setup To Investigate The Motorcycle Performance At Various Operating Conditions 59

CONFERENCE COMMITTEE

General Chair

Kieu Xuan Thuc, Ph.D, Hanoi University of Industry

General Co-Chair

Pham Van Dong, HaUI, Vietnam

Le Hong Quan, HaUI, Vietnam

Steering Committee

Kieu Xuan Thuc, HaUI, Vietnam

Pham Van Dong, HaUI, Vietnam

Le Hong Quan, HaUI, Vietnam

Vijender Kr Solanki, CMR Institute of Tech., Hyderabad, India

Hoang Tien Dzung, HaUI, Vietnam

Nguyen Hong Son, HaUI, Vietnam

Nguyen Thi Dieu Linh, HaUI, Vietnam

Local Arrangement Chairs

Nguyen Van Thien, HaUI, Vietnam

Nguyen Anh Ngoc, HaUI, Vietnam

Nguyen Tuan Linh, HaUI, Vietnam

Nguyen Xuan Khoa, HaUI, Vietnam

Duong Van Thiet, HaUI, Vietnam

Publicity Chair

Nguyen Thi Dieu Linh, HaUI, Vietnam

Website Chair

Bui Tien Son, HaUI, Vietnam

PROGRAM COMMITTEE

Le Anh Tuan,HUST, Vietnam

Chu Van Dat,Le Quy Don Univ., Vietnam T.

Muthuramalingam,SRM Institute of S&T, India

Prashant S. Jadhav,Rajarambapu Institute of Tech., India

Tran Duc Quy,HaUI, Vietnam

Nguyen Hong Son,HaUI, Vietnam

Karpukhin Kirill,NAMI, Russia

Bambang Wahono,NRIA, Indonesia
Ooi, Sian En (James),NEC Corporation, Japan
Le Dinh Son,Univ. of Liverpool, UK
Jin-chun Kim,Ulsan Univ.
Hyoung Seop Kim,POSTECH, Korea
Ma Qian,RMIT, Australia
Marek Pagac,Technical Univ. of Ostrava
Jiri Hajnys,Technical Univ. of Ostrava
Jakub Mesicek,Technical Univ. of Ostrava
Phu Ma Quoc,Technical Univ. of Ostrava
Nguyen Duc Toan,HUST, Vietnam
Tran Van Dich,HUST, Vietnam
Hoang Van Got,NaRIME, Vietnam
Le Thu Quy,NARIME, Vietnam
Bui Ngoc Tuyen,HUST, Vietnam
Pham Thanh Long,TNUT, Vietnam
Nguyen Quoc Tuan,TNUT, Vietnam
Vu Ngoc Pi,TNUT, Vietnam
Pham Bui Khoi,HUST, Vietnam
Pham Van Hung,HUST, Vietnam
Truong Hoanh Son,HUST, Vietnam
Vu Toan Thang,HUST, Vietnam
Nguyen Minh Tuan,HUST, Vietnam
Nguyen Nhu Tung,Inter. Sch., VNU, Vietnam
Pham Duc Cuong,HaUI, Vietnam
Pham Minh Tuan,HUST, Vietnam
Nguyen Van Tuong,Nhatrang Univ., Vietnam
Pham Van Cu,JAIST, Japan
Nguyen Minh Phuong,JAIST, Japan
Nguyen Ha Thanh,NII, Japan
Chu Dieu Huong,HUST, Vietnam
Tran Kim Dung,JAIST, Japan

Le Anh Tuan,HUST, Vietnam
Khong Vu Quang,HUST, Vietnam
Nguyen Huy Truong,MIME, Vietnam
Nguyen The Luong,HUST, Vietnam
Pham Huu Tuyen,HUST, Vietnam
Tran Quang Vinh,Phenikaa Univ., Vietnam
Vu Van Tan,UTC, Vietnam
Tran Van Nhu,UTC, Vietnam
Le Van Quynh,Thai Nguyen Univ., Vietnam
Dao Trong Thang,MTA, Vietnam
Luong Dinh Thi,MTA, Vietnam
Tran Thi Thu Huong,Phenikaa Univ., Vietnam
Nguyen Tien Han,HaUI, Vietnam
Nguyen Dai An,VMU, Vietnam
Nguyen Huy Hao,VMU, Vietnam
Dang Tien Hoa,VNUA, Vietnam
Dam Hoang Phuc,HUST, Vietnam
Ho Huu Hai,HUST, Vietnam
Nguyen Trong Hoan,HUST, Vietnam
Duong Ngoc Khanh,HUST, Vietnam
Hoang Dinh Long,HUST, Vietnam
Nguyen Trong Hai,HUST, Vietnam
Tran Minh Sang,Danang Univ., Vietnam
Le Van Thao,MTA, Vietnam
Tran Ngoc Hien,UTC, Vietnam
Nguyen Nhat Tan,HaUI, Vietnam
Tran Xuan Thanh,NUTE, Vietnam
Nguyen Huu Nghia,Nhatrang Univ., Vietnam
Nguyen Huu That,Nhatrang Univ., Vietnam
Vu Ngoc Chien,Nhatrang Univ., Vietnam
Nguyen Tran Phu,HCMUTE, Vietnam
Nguyen Ba Son,HCMUTE, Vietnam

Nguyen Tien Sy,HaUI, Vietnam
Nguyen Thien Chuong,Nhatrang Univ., Vietnam
Le Nhu Chinh,Nhatrang Univ., Vietnam
Nguyen Xuan Chung,HaUI, Vietnam
Nguyen Thanh Son,Univ. S&T, USA
Nguyen Anh Tu,HaUI, Vietnam
Nguyen Van Truong,HaUI, Vietnam
Nguyen Quang Dinh,HaUI, Vietnam
Phan Dinh Hieu,HaUI, Vietnam
Nguyen Tan Viet Tuyen,Univ. of Southampton, UK
Duong Van Lac,HUST, Vietnam
Bui Tien Son,HaUI, Vietnam
Nguyen Van Duc,HaUI, Vietnam
Vu Van Duy,HaUI, Vietnam
Nguyen Ba Hung,HUST, Vietnam
Trinh Minh Hoang,HUST, Vietnam
Nguyen The Truc,HUST, Vietnam
Nguyen Thanh Tung,HUST, Vietnam
Nguyen Anh Ngoc,HUST, Vietnam
Tran Anh Trung,Phenikaa Univ., Vietnam
Khuong Thi Ha,UTC, Vietnam
Le Anh Vu,UTEHY, Vietnam
Khong Van Nguyen,UTEHY, Vietnam
Nguyen Van Tuan,UTT, Vietnam
Le Duc Hieu,HaUI, Vietnam
Nguyen Tuan Nghia,HaUI, Vietnam
Pham Minh Hieu,HaUI, Vietnam
Vu Hai Quan,HaUI, Vietnam
Nguyen Xuan Khoa,HaUI, Vietnam
Nguyen Thanh Bac,HaUI, Vietnam
Nguyen Phi Truong,HaUI, Vietnam
Du Tuan Dat,HUST, Vietnam

Hoang Thang Binh,HUST, Vietnam
Le Van Nghia,HUST, Vietnam
Nguyen Tien Dzung,HUST, Vietnam
Truong Dang Viet Thang,HUST, Vietnam
guyen Viet Thanh,HUST, Vietnam
Tran Dang Quoc,HUST, Vietnam
Nguyen Hung Manh,EPU, Vietnam
Ngo Van Thanh,EPU, Vietnam
Nguyen Duy Tien,HUST, Vietnam
Nguyen Duy Vinh,Phenikaa Univ., Vietnam
Do Trung Anh,PTIT, Vietnam
Pham Van Ha,HaUI, Vietnam
Nguyen Thi Dieu Linh,HaUI, Vietnam
Tong Van Luyen,HaUI, Vietnam
Tran Vu,ISM, Japan
Tran Duc Tan,Phenikaa Univ., Vietnam
Hoang Manh Kha,HaUI, Vietnam
Vu Trong Sinh,Banking Academy, Vietnam
Tran Minh Tuan,RMIT Vietnam, Vietnam
Bui Duy Dang,HCMUS, Vietnam
Le Thanh Tung,HCMUS, Vietnam
Nguyen Tien Huy,HCMUS, Vietnam
Pho Ngoc Dang Khoa,Trusting Social, Vietnam
Vo Duc Vinh,HCM Univ. of Banking
Nguyen Minh Thuyet,HUST, Vietnam
Do Duc Trung,HaUI, Vietnam
Nguyen Trong Mai,HaUI, Vietnam
Hoang Xuan Thinh,HaUI, Vietnam
Pham Minh Son,Imperial College London
Pham Thi Minh Hue,HaUI, Vietnam
Hoang Long,HUST, Vietnam

PREFACE

The manufacturing industry is undergoing a digital transformation, with increasing digitization of manufacturing and connected processes, and the emergence of Industry 4.0. This has led to the need for smarter and more sustainable manufacturing systems, which can enable mass personalization while maintaining efficiency and sustainability. As a result, there is a growing interest in exploring the ways in which emerging technologies can be leveraged to create such systems, as well as in the role of eco-design and innovation in creating sustainable manufacturing processes.

As we move towards an increasingly interconnected and digital world, the manufacturing industry is undergoing a major transformation. Industry 4.0, the fourth industrial revolution, is characterized by the integration of physical and digital systems, the use of smart technologies to automate processes and increase efficiency, and the emergence of new business models based on mass customization and personalization. However, this transformation also brings new challenges, particularly with regards to sustainability. As the manufacturing industry continues to grow, there is a growing need to ensure that this growth is sustainable and does not come at the expense of the environment or society. This requires new approaches to design, innovation, and manufacturing, which take into account the environmental, social, and economic impacts of the products and processes involved.

The 1st International Conference on Sustainability and Emerging Technologies for Smart Manufacturing (SETSM 2024) is an open international platform for scientists, researchers, experts, decision makers, practitioners and students from all over the world to share latest research results, exchange innovative ideas and cutting-edge practices in fields related to Advanced mechanical engineering, Smart manufacturing, Sustainable and Intelligent mechanical systems with emerging technologies for Industry 4.0. This conference provides an opportunity for participants to expand professional connections and network, build international partnerships and promote the industrialization of academic achievement.

The conference is organized by Hanoi University of Industry, Hanoi, Vietnam. The conference will be held in hybrid mode at Hanoi University of Industry, Hanoi on 26-28 April 2024.

At the SETSM 2024, we are pleased to welcome the participation in scientific events, with the presence of several prestigious researchers, who put forth ideas on new changes and development in the field of Sustainability and Emerging Technologies for Smart Manufacturing or any other emerging trends related to the theme covered by this conference. All in all, this is an ideal forum to present your own ideas and achievements to researchers globally.

This conference has oral sessions, invited talks, and posters organized around the relevant theme. On SETSM 2024, you will have the opportunity to meet some of the world's leading researchers, to learn about some innovative research ideas and developments around the world, and to become familiar with emerging trends in Science-Technology. And, of course, SETSM 2024 will be a perfect forum and one of the platforms for presenting your own ideas and achievements in front of researchers from multiple countries.

The SETSM 2024 has attracted the attention of the research community. We are truly delighted to have received more than 200 papers. We received papers from various countries outside Vietnam such as China, Korea, Russia, USA, UK, Taiwan, Czech Republic, Bangladesh, Malaysia, India. The Organizing Committee of SETSM 2024 constituted a strong international program committee for reviewing papers. A double-blind review process has been adopted. The decision system adopted by EasyChair has been employed and accepted papers have been selected after a thorough double-blind review process. The proceedings of the conference will be published by Springer publisher.

In order to make SETSM 2024 a success, we appreciate the professional cooperation and support between Hanoi University of Industry and those involved during the preparation of the conference:

• Sincere thanks for the attention, support and close guidance of the Management Board of Swinburne Hanoi University of Industry, Dr. Kieu Xuan Thuc - Rector; Assoc.Prof. Pham Van Dong – Vice Rector; Organizing Committee and Functionality Departments of Hanoi University of Industry.

Assoc.Prof. Hoang Tien Dzung – Rector of School of Mechanical and Automotive Engineering (SAME) - HaUI

• Sincere thanks for the companionship, support and sharing of both organizational and professional experience from Prof. Dr. Vijender Kumar Solanki - CMR Institute of Technology, Hyderabad, India; - Chairs of SETSM 2024.

• Sincere thanks to the academic keynote speakers for Prof. Le Anh Tuan – Hanoi University of Science and Technology, Vietnam; Prof. Quang-Cherng Hsu - National Kaohsiung University of Science and Technology, Taiwan; Prof. T. Muthuramalingam - SRM Institute of Science and Technology, India for giving their excellent knowledge in the conference.

• Sincere thanks to reviewers for completing a big reviewing task in a short span of time and session chairs for moderating the presentation sessions and sharing their knowledge with the authors.

• Sincere thanks to the participation of all local and international scientists, who have expressed their interests and submitted articles, contributing greatly to the success of the conference.

• Sincere thanks to the feedback and discussions from researchers, business representatives, start-ups at the conference, who were extremely active and professional in their work to make the conference a great success.

With deep gratitude and excitement to more and more opportunities to share knowledge, on behalf of the organizers, we look forward to continuing to have your cooperation and companionship in the future.

HANOI UNIVERSITY OF INDUSTRY INTRODUCTION

Hanoi University of Industry (HaUI) is a public university under Ministry of Industry and Trade with a 126-year history of development (founded in 1898). HaUI is one of the leading application-oriented universities in Vietnam with multiple disciplines, modes and levels of training, also a supplier of high-quality graduates for the industrialization, modernization and global integration of Vietnam for decades.

The university currently employs over 1,500 lecturers and support staff in its 3 campuses covering the total area of nearly 50 ha and equipped with state-of-the-art facilities, enough to offer training courses to over 30,000 students. Regarding organizational structure, the university has 7 functional departments, the School of Languages and Tourism, the School of Mechanical and Automotive Engineering, 9 faculties, 8 training centers, 7 service centers, a research institute and a subsidiary company.

Becoming a university of versatile applied scientific research and training, developing according to the smart university model; achieving international standards in a number of key areas; being the first choice of learners, the community and businesses. Core values of HaUI:

- Technology-based Development: Combining the tradition of the first Engineering Technology University in Vietnam; modern engineering technology is the foundation for the formation and development.
- Consistency with Goals: Consistency in identifying and implementing activities to achieve goals.
- Connection-based Strength: Internal solidarity and partnership create the strength of the University.
- Customer Centricity: Market orientation, putting the interests and satisfaction of learners, customers and interested parties first is at the center of all activities.
- Creativity-based Distinction: Making a difference through creativity to make a breakthrough
- Educational philosophy: Comprehensive education for sustainable development and integration

- Missions: Training high-quality human resources; creating and transferring knowledge, technology to society and community to meet the requirements of the Industrial Revolution, serving society and the country.

LIST OF KEYNOTE SPEAKERS AND PLENARY TALKS

+ Prof. Le Anh Tuan- Hanoi University of Science and Technology, Vietnam: "Vietnam directions for sustainable development and green growth towards Net-Zero by 2050 in the transport sector"

+ Prof. Quang-Cherng Hsu - National Kaohsiung University of Science and Technology, Taiwan: "The trend from AOI to AI for smart manufacturing"

+ Prof. T. Muthuramalingam - SRM Institute of Science and Technology, India: "Application of Flexible Printed Sensors for Automobile Cockpit Electronics Panel"

Design of Adaptive fuzzy-PID for Adaptive Cruise Control of Electric Vehicle using DC Motor: Theory and Experiment

Van Du Phan[1], Van Quyet Phan[1], Thai Son Dang[1], Ngoc Hoang Trinh[1], Phuc Ngoc Nguyen[1], Ngoc Minh Luong[1], Ba Uy Nguyen[1], Quoc Cuong Phan[1], Ha Phan Bui[1], Phi Cuong Anh Nguyen [1], Van Nguyen Phan[1], and Dinh Thanh Dang[1]

[1] Vinh University, Vinh City, Nghe An 43100, Vietnam

dupv@vinhuni.edu.vn

Abstract. Electric vehicles (EVs) are becoming increasingly popular, however, achieving smooth and efficient speed control remains a significant challenge. This paper introduces an innovative approach by proposing an AFUPID (adaptive fuzzy-PID) technique for regulating the speed of EVs utilizing a DC motor.The paper begins by presenting the hardware architecture and modeling of the DC motor within an EV. Subsequently, it critically analyzes the limitations of conventional PID and fuzzy logic control methods. The proposed methodology is an AFUPID controller, which intelligently adjusts PID coefficients based on fuzzy inference mechanisms. Simulation results verify the effectiveness of the AFUPID controller, showcasing a smoother response and reduced errors when compared to standard PID and fuzzy controllers. Furthermore, experimental results validate the exceptional performance of the proposed method in real-world implementation. In essence, this study provides a potential solution for robust adaptive speed control in EVs through the integration of fuzzy inference and PID control, addressing the challenges of achieving optimal speed regulation in EVs.

Keywords: Electric vehicle, DC Motor, PID, Adaptive cruise control, PID-Fuzzy logic Controller.

Novel Thermoelectric Generator Design For Recovering Waste Heat

Duc Tran Duy[1] , Duc Pham Xuan[1] , Tan Nguyen Tien[2] ,Dien Vu Minh[3] , Quang Khong Vu[4] , Vinh Nguyen Duy[1]*

[1]Faculty of Vehicle and Energy Engineering, Phenikaa University, Vietnam

[2]Department of Student Affairs, Hanoi University of Industry, Vietnam

[3]Center for Automotive Technology and Driving Training, Hanoi University of Industry, Vietnam

[4]Department of Vehicle and Energy Conversion Engineering, School of Mechanical Engineering, Hanoi University of Science and Technology, Vietnam

*Corresponding author: Vinh.nguyenduy@phenikaa-uni.edu.vn

Abstract. A thermoelectric generator (TEG) is a device that converts waste heat into electricity, which can have a rapid rise in the coming years. However, the application of TEG worldwide has been limited due to its low power density and complex system layout. This study aims to improve the performance of TEG mounted in PEMFC vehicles. Hence, the cases of channel structure of TEG are modeled and simulated to compare among cases. In these cases,

the experimental bench model is set up to demonstrate precisely with numerical simulation results. Furthermore, this experimental model utilized an input heat source of 100 ^{0}C, assuming whether the waste heat of the PEM fuel cell or cooling systems of the engine. All results of simulation and experiments are compared to evaluate precisely.

Keywords: Thermal electric generator; Maximum power point tracker; Heat exchanger solvent; Heat and transfer; Boiling point; Temperature difference.

Modulating optoelectronics characteristics of Janus SiSSe monolayer by mechanical strain

Tran The Quang[1], Nguyen Hoang Linh[2], Bui Thi Hoa[1], Dinh The Hung[3], Nguyen Minh Son[2], To Toan Thang[2] and Do Van Truong[2]

[1] Faculty of Technology and Engineering, Thai Binh University, Thai Binh 410000, Vietnam

[2] Hanoi University of Science and Technology, 100000 Hanoi, Vietnam

[3] Phenikaa University, 100000 Hanoi, Vietnam

tranthequang12@gmail.com

Abstract. Utilizing the *ab–inito* calculation, we focus on exploring the mechanical behaviors and optoelectronics characteristics of the Janus SiSSe monolayer. First, a dynamic stability test was performed, and the results showed the system was completely stable. The obtained results show that the Janus SiSSe monolayer has small elastic constants and a good load-bearing capacity. Through hybrid functional calculations, the energy band structures of the Janus SiSSe have been explored and show the properties of the semiconductor material. Under mechanical strains, energy band structures and the bandgap energy have significantly changed, with a maximum increase of ~32% and a maximum decrease of ~53% compared to the natural state. Besides, we also have investigated the absorption spectrum under mechanical strains. Vertical strain leads to a maximum improvement of ~3.5 times compared to the natural state. The findings provide helpful information and are practical for the application of the Janus SiSSe in nanoelectronics and optical devices.

Keywords: Mechanical strain, energy band structure, density function theory, optoelectronics characteristics, Janus SiSSe monolayer

A Solution for Converting Gasoline Engines to Use Ammonia with A Combination Power System

Van Dung Nguyen[1,*], Andrey Y. Dunin[1], Thin Quynh Nguyen[2,*], Dinh Thi Luong[3] and Huy Truong Thai[4]

[1] Department of Heat Engineering and Automotive Engines, Moscow Automobile and Road Constuction State Technical University (MADI), Moscow, Russia

[2] Faculty of Machenical Engineering, University of Transport and Communications, Ha Noi, Viet Nam

[3] Institute of Vehicle & Energy Engineering, Military Technical Academy, Ha Noi, Viet Nam

[4] Logistic Commanding Faculty, Air Defense-Air Force Academy, Ha Noi, Viet Nam

nguyenvandung1996kchy@gmail.com, and thinquynh@utc.edu.vn

Abstract. Due to the lower volumetric energy density and the lower heating value of an ammonia–air mixture, ammonia-fueled engine to suffer from a power deficit in comparison with gasoline engines. Therefore, this study was carried out of the use of a Combination Power System (CPS) to increase the power output of Spark Ignition (SI) engines using ammonia. In this case, it's necessary to select a rational combination of the required power of the SI engine and the electrical machines. Two-cylinders 2CH 7.6/7, and four-cylinders 4CH 7.6/7 engines were tested with ammonia and gasoline fuels. During the test the mixtures of ammonia-air and gasoline-air stoichiometric ($\lambda = 1$), the compression ratio (CR = 9.9) is kept unchanged. The results show that, the use of a CPS makes it to reduce the swept volume, and the fuel consumption of the SI engine in a cycle drive during medium and high load operating conditions while the average effective engine efficiency increases. Although the fuel consumption of the SI engine in a cycle drive is reduced by 18%, and the average effective efficiency is increased by 29%, the CPS provides required power.

Keywords: Combination Power System (CPS), ammonia fuel, liquefied ammonia, spark ignition engine.

Analyzing Frontal Car Collisions Through Imulation Utilizing Hyperworks Software

Kien Nguyen Trung[1], Manh Nguyen Duc[1], Hieu Le Duc [1], Hieu Pham Minh[1] , Linh Pham Ngoc [2], Tuan Pham Minh[3]

[1] Faculty of Transportation Engineering, School Of Mechanical And Automotive Engineering, Hanoi University of Industry, No. 298 Cau Dien Street, Bac Tu Liem District, Hanoi, Vietnam

[2] Faculty of Engineering Foundation, School Of Mechanical And Automotive Engineering, Hanoi University of Industry, No. 298 Cau Dien Street, Bac Tu Liem District, Hanoi, Vietnam

[3] Department of Vehicle Engineering, National Formosa University, 64, Wen-Hua Road, HuWei Township 63208,Yun-Lin County, Taiwan, R.O.C. kiennt@haui.edu.vn

Abstract. The car body frame can be considered as the primary protective shield for passenger safety during frontal collisions. This study fo-cuses on the deformation and failure of the front car body frame when colliding with a rigid barrier. The accident scenario is simulated using explicit dynamic Finite Element software. The geometric design of the car body frame is

created using HyperWork software and imported into the Finite Element software within HyperCrash, where a rigid block is designed as an absolute rigid barrier. The car body is simulated using two materials, Elasto-Plastic modeled with the Johnson-Cook Law 2. The study evaluates a collision at a speed of 56 km/h with a rigid barrier, examining the displacement, velocity, stress, deformation, and energy of the Kia Pride. The results show that at the point of impact, the velocity decreases gradually immediately after the collision. The reaction force of the rigid barrier at the impact area reaches 1.2E+07 kN, causing defor-mation of the car's front end. The internal energy of the car increases from 0 to approximately 1.75E+08, while the kinetic energy decreases from 2.25+08 to approximately 0. The crush behavior of the car body frame, energy dissipation, and vehicle deceleration from the crash simu-lation were observed.

Keywords: HyperCrash simulation software, Collision analysis, CAE.

A novel approach of mining high utility itemsets

Nong Thi Hoa[1*]

[1]East Asia University of Technology, Ha Noi, Viet Nam

hoant1@eaut.edu.vn

Abstract. Mining High Utility Itemsets finds itemsets from transaction data-bases that are usually sold together and their profit overcomes a given thresh-old. Some popular items for everyday life appear in many transactions. There-fore, itemsets containing all popular items usually are High Utility Itemset (HUI). These HUIs is known for a long time. Therefore, algorithms of mining HUIs do not need to mine them. Previous studies still mine all HUIs. As a re-sult, they consume both CPU time and memory. In this paper, we present a novel effective algorithm of mining HUIs overcomes this disadvantage. It is called npHUIM. We use compact lists to store items and itemsets. First, our al-gorithm finds popular items, unpopular items, unpromising items, and unprom-ising 2-itemsets after scanning the database. Next, it scans the database to mine HUIs. It only generates itemsets that contain zero or one popular item and not contain unpromising items or unpromising 2-itemsets. Then, it adds/updates these itemsets to lists. Then, npHUIM presents HUIs based on testing utility of generated itemsets. We use pruning strategies based on utility of transactions to remove both unpromising items and unpromising itemsets. Experiments are conducted on benchmark datasets. Our algorithm is compared with an equiva-lent algorithm. Experimental results show that the proposed algorithm is better than the compared algorithm. Moreover, npHUIM significantly reduces number of HUIs.

Keywords: High Utility Itemset, mining HUI, knowledge discovery, business intelligence, data mining.

Optimizing Power Consumption And Humidity Of Sliced Avocado Using A Heat Pump Dryer

Thi Minh Hue Pham[1], Khac Trung Chu[1], Ngoc Thai Huynh[2], Nguyen Thi Ut Hien[2,*], Ngoc Chien Vu[3], Ho Nguyen[4], Quoc Manh Nguyen[5]
[1]Hanoi University of Industry, Hanoi city, Vietnam
[2]Ho Chi Minh City University of Industry and Trade, Ho Chi Minh city, Vietnam
[3]Nha Trang University, Nha Trang city, Vietnam
[4]Nguyen Tat Thanh University, Ho Chi Minh City, Vietnam
[5]Hung Yen University of Technology and Education Hung Yen, Vietnam
Corresponding Author email:: hienntu@huit.edu.vn

Abstract. In this work, the power consumption and ensure humidity of sliced butter were minimized by response surface method based on drying technology of heat pump. Experiments was conducted to determine the ability consume electrical energy when reaching the humidity of the sliced butter. The obtained data was also used to construct an objective function describing the influence of temperature and drying speed of the drying agent on the drying process. The results of the analysis of variance also confirmed the influence of drying conditions on the power consumption and humidity of the butter. Optimal results were obtained the power consumption and humidity of the sliced butter were 4.8 kw and 6.2 % respectively when drying with temperature and drying speed of 46.03 °C and 1.15 m/s, respectively..

Keywords: Butter drying experiment, power consumption, humidity of sliced butter, heat pump drying technology, Surface response method, analysis of variance

A Study Using Advanced Simulation Techniques and Statistical Analysis for Enhanced Precision of Cylinder Cup in Sheet Metal Deep Drawing Processes

M.Sc. Tran Dinh Van[1,2], Nguyen Anh Khoa[1],
Prof. Dr. Nguyen Duc Toan[1], M.Sc. Hoang Minh Vu[2]
[1] Hanoi University of Science and Technology, Hanoi, Vietnam
[2] East Asia University of Technology
toan.nguyenduc@hust.edu.vn

Abstract. Utilizing ABAQUS simulations and finite element analysis, this research aims to refine sheet metal deep drawing by reducing costs and improving product quality. The study incorporates the TAGUCHI method for iteration and defect prediction, while ANOVA evaluates the effect of process parameters on outcomes. Emphasis is placed on the mechanical behavior of SUS304 stainless steel in simulations to optimize tool design and process parameters. The Forming Limit Diagram and statistical analysis via Taguchi and ANOVA highlight the importance of parameters like die fillet radius in preventing defects. Ultimately, the research achieves a systematic enhancement of the deep drawing process, resulting in high-precision, low-error manufacturing.

Keywords: FEM, TAGUCHI, ANOVA, SUS304 stainless steel.

Modeling And Simulation Of Automotive Dynamics With The Effect Of Lateral Forces

Nguyen Xuan Tuan[1[*]] , Bui Van Hai[1]

[1] Faculty of Automobile Technplogy, Hanoi University of Industry, Hanoi, Vietnam

*tuannx@haui.edu.vn

Abstract. In the process of moving, cars are influenced by many factors that destabilize the trajectory of motion, including mining factors and traffic environmental conditions. When analyzing the stability of the trajectory of movement of a car should be considered Automotive is a dynamical system with input effects (such as steering angle, horizontal wind, ...) and stability of output parameters. The paper builds a horizontal dynamics model with the action of lateral forces on cars and applies Matlab/Simulink software to simulate and evaluate results. The study of the factors affecting the lateral forces on the dynamics of automobile motion helps to stabilize the trajectory of the car to design and bring automatic control systems to improve the stability and direction control of the car to meet the current trend of driving automation.

Keywords: Orbital motion, lateral automotive dynamics model, matlab/simulink, dynamics simulation model.

SIMULATE AIRBAG FOLDING USING ANSYS LS-DYNA SOFTWARE

Hieu Pham Minh[1,*,] Viet Tran Duc[1] , Tien Tang Van[1] , Huu Hoang Van[1] , Quynh Luu Ba[1] , Phuong Do Thai[1] , Hoang Chu Vuong[1] , Khanh Pham Quoc[2]

[1] Faculty of Transportation Engineering, School Of Mechanical And Automotive Engineering, Hanoi University of Industry, No. 298 Cau Dien Street, Bac Tu Liem District, Hanoi, Vietnam

[2] Department of Mechanical and Computer-Aided Engineering, National Formosa University, No. 64 Wenhua Rd, Huwei Township, Yunlin County, Taiwan 632

hieupm@haui.edu.vn

Abstract. Safety is of utmost importance when it comes to automobile manufac-turing, especially when it comes to protecting passengers in the event of a collision. To this end, the passive safety system plays a critical role in minimizing injuries. The airbag system is a key component of this system, and manufacturers are constantly striving to improve its effectiveness. This particular study exam-ines the pressure, volume, and reaction time of two airbag folding methods – thin fold and spiral fold. The results indicate that the spiral fold method offers faster volume stability, while the pressure and temperature difference is only margin-ally affected (about 0.6%). The goal of this research is to gather input and feedback to determine the most optimal folding method, with the spiral fold method being the primary focus.

Keywords: Airbag, Thin fold, Spiral fold, Ansys LS-DYNA

Non-Singular Terminal Sliding Mode Control of the steering wheels of 4WD4WS mobile robot

Kien Nam Dang[1], Vu Nguyen[2], Huy Quoc Vu[1]

[1]Control, Automation in Production and Improvement of Technology Institute (CAPITI), Academy of Military Science and Technology (AMST), Hanoi, Vietnam
dangnamkien@gmail.com,vuquochuy@capiti.info

[2]Faculty of Electrical Engineering, Hanoi University of Industry, Hanoi, Vietnam
vutudonghoa@yahoo.com.vn

Abstract. Most of the path following research for 4WD4WS mobile robots is conducted with two control loops, the kinematic loop and the dynamic loop. This article proposes a method using Non-Singular Terminal Sliding Mode Control (NSTSM) to improve the efficiency of dynamic control loop . The proposed control method is not only proved to be stable under disturbances but also has finite time convergence which was calculated explicitly and visually shown in simulation.

Keywords: mobile robot, path following, four-wheel-drive/four-wheel-steer, SMC, NTSM, dynamic control.

Testing of Thermal Management System Intended for Automotive Traction Electric Drives by Means of X-in-the-Loop Technology Featuring VPN-Connected Remote Facility

Ilya Kulikov[1], Kirill Karpukhin[1] and Denis Endachev[1]

[1]NAMI Russian State Scientific Research Center, Moscow, Russia
K.Karpukhin@nami.ru

Abstract. The paper presents the concept, design and verification of a cyber-physical facility intended for testing of the thermal management system (TMS) designed for an electric vehicle with individually driven wheels. The basic functionality of the test system is implemented using Component-in-the-Loop (CiL) technology with the TMS embodied as a physical entity that interacts with virtual models of the electric drive components by means of devices emulating thermal and hydraulic behaviors of those components. The operating environment of the TMS is physically imitated by a model-driven air fans and a climatic chamber. Expanding the system's functionality is achieved by means of X-in-the-Loop technology that enables remote test facilities, housing different components of the vehicle and its powertrain, to connect and interact in real-time through computer networks. Using that technique, the CiL system is connected to a remote laboratory that houses a setup intended to test the individual-wheel-drive controller in Software-in-the-Loop (SiL) mode employing virtual models of the electric vehicle, its powertrain, and the driving environment. Interaction between the CiL and

the SiL facilities allows testing the TMS in operating modes occurring when the vehicle runs through a driving cycle in specified ambient conditions. The test results presented in the paper prove the developed X-in-the-Loop architecture to be operational and adequately replicating behavior of the studied system.

Keywords: Electric Vehicle, Thermal Management System, Individual-Wheel Traction Electric Drive, Component-in-the-Loop, X-in-the-Loop, Cyber-Physical Testing.

Application Of CVCC Model in Researching Mixture Formation and Fuel Combustion Process

Nguyen Phi Truong[1], Nguyen Huy Chien[1], Nguyen Van Toan[1], Vu Minh Dien[1], Nguyen Van Tuan[2,*]

[1] School Of Mechanical And Automotive Engineering, HaNoi University of Industry, No. 298, Cau Dien Street, Bac Tu Liem, Hanoi 100000, Viet nam.

[2] Faculty of Mechanical Engineering, University of Transport Technology, No. 54 Trieu Khuc Street, ThanhXuan District, Hanoi 100000, Viet nam.

nguyenvantuan@utt.edu.vn

Abstract. Constant volume combustion chambers (CVCC) are prominent in fuel combustion research, especially in monitoring mixture formation and combustion processes. With the ability to maintain constant space and control the internal environment, the combustion chamber provides a precise platform for observing essential factors such as chemical reactions and pressure while the fuel is agitated. The results show that important information on fuel performance and mixture stability is collected, providing quality data for developing and validating mathematical models. This research focuses on simulating the mixture formation process inside a constant volume combustion chamber, an essential step toward conventional engine development. In this way, research can improve the performance and reduce emissions of conventional engines, promoting a deeper understanding of the fuel combustion process and assisting in technology development. Greener and sustainable for the auto industry.

Keywords: Constant volume combustion chambers, fuel, mixture formation and combustion processes.

Free Vibration Analysis 0n Inner/Outer Ring-Stiffened Combined Shells Made By Functionally Graded Material

Nguyen Manh Cuong[1], Nguyen Quoc Hung[2] and Nguyen Tuan Hai[3]

[1,2,3] Hanoi University of Science and Technology, Hanoi, Vietnam

cuong.nguyenmanh1@hust.edu.vn

Abstract. This article is dedicated to the investigation of the dynamic mechanics behavior of combined shells made by modern Functionally Graded Materials (FGM) using the Continuous Element Method (CEM) or Dynamic Stiffness Matrix (DSM). The research focused on studying examples of submarine-type combined shell configurations consists of different components including: cylindrical shells, conical shells, and inner/outer ring stiffeners made of Functionally Graded Materials (FGMs). The natural frequencies of studied structures have been examined with different mechanics properties of FG materials such as: coefficients *a*, *b*, *c* and various cases of exponent *p*… Obtained results confirmed advantages of CEM in terms of reduction of computing storage and of precision even in high frequencies.

Keywords: mechanics of materials, FGM, continuous element method, dynamic stiffness matrix, combined shell, ring stiffener, shell vibration.

Topology Optimization for Resin 3d Printed Products to Prevent Weak Connections

Trong Hieu Bui[2,3], Hoang Phi Dang[1,3] and Huu Nghi Huynh[1,3]

[1] Division of Manufacturing Engineering, Faculty of Mechanical Engineering,
Ho Chi Minh City University of Technology (HCMUT), 268 Ly Thuong Kiet Street, District 10,
Ho Chi Minh City, Vietnam

[2] Division of Machine Design, Faculty of Mechanical Engineering, Ho Chi Minh City Universty of Technology (HCMUT), 268 Ly Thuong Kiet Street, District 10, Ho Chi Minh City, Vietnam,

[3] Vietnam National University Ho Chi Minh City, Linh Trung Ward, Thu Duc City, Vietnam.
hhnghi@hcmut.edu.vn

Abstract. Currently, resin 3D printing technology is being applied in many different important industrial fields with great potential. However, the process of designing and manufacturing products using this technology still has some issues that need to be researched and perfected, such as the phenomenon of weak bonds in the product structure. This phenomenon will cause damage to the manufactured part or reduce mechanical properties due to adhesion and the ability of the material layers to bond together. The article proposes a method using the Topology optimization module of Ansys software to simulate and eliminate weak bonds through stress constraints to prevent damage during the manufacturing process. The simulation process shows that, on the MBB (Messerschmitt-Bolkow-Blohm) beam model, a mass limit of 50% will give a model with a reasonable structure. At the same time, the stress constraint at a value of 2 MPa will eliminate weak connection locations in the structure of the test model. The results of the research help improve manufacturing capabilities and improve the durability of resin 3D printed products.

Keywords: 3D Printer Resin, MBB, weak bonds.

A Numerical Study on The Thermo-Electrohydrodynamic Performance of Ecf Micro-Pumps

The Khanh Lai[1], Khanh Duong Tran[1], and Ich Long Ngo[1*]
[1] School of Mechanical Engineering, Hanoi University of Science and Technology,
No. 01, Dai Co Viet, Hai Ba Trung, Hanoi, Vietnam
long.ngoich@hust.edu.vn

Abstract. This study presents a numerical method on the dynamic behaviors of the flow in an electro-conjugate fluid (ECF) micro-pump under the effect of temperature and electric double layer (EDL). The finite element method (FEM) was used to examine the thermo-electrohydrodynamic performance of the ECF micro-pump with the applied voltage ranging from 2kV to 6kV. The numerical results indicated that the temperature increases linearly with the applied voltage but decreases with increasing fluid Reynolds number (Re_F). Additionally, characteristic curves of ECF micro-pumps are defined under the influence of temperature. The effect of EDL in the ECF micro-pump is also considered, and the increase in average velocity is approximately 14.1% with the presence of the EDL. A new correlation of temperature with Re_F and applied voltage is first proposed. These results play a critical role in understanding the dynamic behavior of the ECF flow and controlling it in mechanical engineering, biomedical engineering, and especially in microelectronics cooling.

Keywords: Electro-conjugate fluid, Finite element method, Electrothermal flow.

Electromechanical Properties of GaN Monolayer

Dinh The Hung[1] , Tran The Quang[2] , Nguyen Hoang Linh[3] , Do Van Truong[3]
[1] Faculty of Mechanical Engineering and Mechatronics, Phenikaa University, Hanoi, Vietnam
[2] Faculty of Engineering and Technology, Thai Binh University, Thai Binh, Vietnam
[3] Hanoi University of Science and Technology, Hanoi, Vietnam
hung.dinhthe@phenikaa-uni.edu.vn

Abstract. In this research, we focus on determining the electromechanical prop-erties of the Gallium Nitride (GaN) material using density functional theory (DFT). The GaN monolayer exhibits structural stability through two tests of elas-tic constants and phonon dispersions. Obtained results show that the GaN struc-ture is quite durable with the highest mechanical fracture strain up to 24 %. In the elastic domain, the soft mechanical properties of the GaN monolayer are iso-tropic, and the polar contours of elastic parameters are perfect circles. Besides, we find out that the GaN monolayer is a semiconductor material and energy band structures have the indirect behavior. Under the impacts of mechanical strains on the lattice crystal, the GaN monolayer's bandgap energy tends to gradually de-cline compared to the equilibrium state. At the uniaxial strains of 24 % along the x-axis and 18 % along the y-axis, the bandgap energy decreases by 100 % and 90 %, respectively. Thereby, the characteristics of

the high semiconductor ability of the GaN monolayer as well as great potential in replacing Silicone semiconduc-tors in the future are shown.

Keywords: GaN monolayer, 2D material, energy band structures, indirect sem-iconductor, density functional theory (DFT)

A DNS simulation of the low-Reynold flow through an elliptical cylinder using the lattice Boltzmann method

Van Tuyen Vu[1], Quang Dung Ta[1], Viet Dung Duong[2] and Ich Long Ngo[1*]

[1] Hanoi University of Science and Technology, Hanoi, Vietnam

[2] University of Engineering and Technology, Vietnam National University, Hanoi, Vietnam

long.ngoich@hust.edu.vn

Abstract. This paper presents a numerical investigation into the dynamic behaviors of fluid flow through an elliptical cylinder. The lattice Boltzmann Method is implemented in the Direct Numerical Simulation. The aspect ratio (AR) varies from 0.25 to 1.0, and the attack angle (α) ranges from 0° to 90°. The numerical results were thoroughly validated by comparing them with both the experimental and numerical results. Consequently, the behavior of vortex formation is complex and depends on both AR and α. Moreover, the vortex formation regime changes significantly, i.e., the steady wake (pattern I) disappears, the Karman wake (pattern II) shrinks, and the Karman wake with the downstream secondary wake (pattern III) extends towards the higher AR. The results indicate the numerical method's superiority in effectively capturing the vortex structure of the incompressible fluid flow in potential uses, such as heat transfer, bridge cables, offshore structures, and pipe racks.

Keywords: Direct Numerical Simulation, Lattice Boltzmann method, Elliptical cylinder, Vortex structure.

Macroscopic Elastic Moduli of The Random Circle-Inclusion Model with Spring-Layer Imperfect Interfaces

Van-Luat Nguyen

Faculty of Engineering Foundation, Hanoi University of Industry, 298 Cau Dien Street,
Bac Tu Liem District, Hanoi, Vietnam

Email: luatnv1980@gmail.com; nguyenvanluat@haui.edu.vn

Abstract.

The article studies some solutions to calculate the macro-elastic moduli of transversely isotropic composite materials with spring-layer imperfect interfaces. Based on the polarisation approximation method (PA), this work develops a new formula to determine the elastic moduli

of the randomly circular inclusion model with spring-layer imperfect interfaces. From that, the obtained explicit algebraic expressions are simple and effective tools for estimating the elastic moduli of the random circle-inclusion model with spring-layer imperfect interfaces. The FFT algorithm is developed to determine the macro-elastic moduli of this model. Besides that, the differential approximation (DA) is also developed to construct the differential equations estimating the macroscopic elastic moduli of the random circle-inclusion model with spring-layer imperfect interfaces. The results of the FFT numerical methods will be compared with the DA and PA results with different variable material cases to show the effectiveness of the applied methods.

Keywords: *Elastic moduli; Imperfect interfaces; Spring-layer interface model; Polarization approximation; FFT simulation.*

Analysis, Simulation of The Welding System In Industrial Production Using Tecnomatix Plant Simulation Software

Thi Minh Hue Pham[1] , Son XuanPhung[1] , Thi Lan Pham[1] , Thi Thanh Mai Nguyen[1] , Dongyi Lin[2] , VietAnhNguyen[1*]

[1]School of Mechanical and Automotive Engineering, Hanoi University of Industry, Hanoi city, Vietnam

Academic address: Anxi College of Tea Science, Fujian Agriculture and Forestry University, Quanzhou 362400, China;

Corresponding Author email: anhhy1704@gmail.com

Abstract. The research team collected and analyzed data related to the welding process, workstations, material flow, required number of workers, and actual operation time at the factory. Subsequently, we designed and simulated the system using Tecnomatix Plant Simulation software to observe the productivity and output of the machines in the system. According to this data, businesses can implement lean production strategies, improve productivity, reduce waiting times and bottlenecks without wasting resources, and devise a well-thought-out plan for the design.

Keywords: Bottlenecks, lean, output, productivity, simulate the system

Development of The Concept Of Digital Twin Of Temperature Control System Of Electric Vehicles Category L

Bazavluk Sergey[1], Kurmaev Rinat [1],
Karpukhin Kirill[1], Terenchenko Alexey[1]
and Nadareishvili Givi [1]
[1] NAMI Russian State Scientific Research Center, Moscow, Russian Federation
sergey.bazavluk@nami.ru

Abstract. The introduction of computer-aided design systems into the vehicle development process makes it possible to reduce the time between creating a concept and receiving the finished product. Application of a digital twin in the creation of electric vehicles allows not only to reduce design time, but also to improve the key characteristics of the product, to study the operation of the vehicle in a wide variety of driving and operating modes due to connection with its physical twin throughout the entire life cycle. This paper proposes the concept of a digital twin of the temperature control system for an electrified vehicle of category L, and reviews the experience of creating a test bench for the temperature control system of an electric vehicle connected to a virtual environment. Use of data on the creation of a stand for the temperature control system of an electric vehicle will allow the development of a full-fledged experimental stand for assessing the accuracy of a digital twin of the temperature control system for an electrified vehicle of category L in extreme climatic conditions. The necessary mathematical models included in the digital twin were identified. This digital twin will be useful for various companies involved in the development and production of electrified vehicles, as well as for organizations engaged in research activities in the field of electrical engineering and automotive engineering.

Keywords: Electric vehicle, Digital twin, Temperature control system, Experimental stand, X-in-the-loop.

Fuel Deposits and Methods For Their Control

Zlenko Mikhail, Terenchenko Alexey[1], Nadareishvili Givi[1]
[1] NAMI Russian State Scientific Research Center, Moscow, Russia
terenchenko@nami.ru

Abstract. Deposits in a general sense are an inevitable consequence of the processes of mixture formation and combustion in the engine cylinder, complex physical and chemical processes with hydrocarbon “participants” in this process - fuel and oil. Moreover, certain qualitative characteristics of fuels, for example, group composition, presence or absence of detergent additives, can have a significant impact on the amount of deposits. Scientific and methodological support for testing fuels for their tendency to form deposits is also important. The complex of works carried out at NAMI Russian State Scientific Research Center resulted

in creation of a series of test methods for automotive fuels, which are analogues or equivalents of the generally accepted CEC and ASTM methods, but at the same time devoid of the disadvantages associated with the use of these methods. Comparative tests showed good convergence of results with the analogues. At the same time, all logistical support for testing both gasoline and diesel fuels is carried out on a domestic basis using Russian engines. In the period of general confusion in the European engine industry, uncertainty in the prospects of the automotive industry as a whole, the creation of an independent service for certification testing of fuels for the Russian market and the development of our own methods for assessing the tendency of fuels to deposits using our own engines become an important both scientific and practical task.

Keywords: Fuel, deposits, crankcase gases, crankcase ventilation system, test methods.

Development of a Mathematical Model of Fuel Consumption Estimation Suitable for Research of Algorithms of Energy-efficient Control on Digital Roads

Kudrin Aleksandr [1,2] and Shadrin Sergey [1,2]

[1] Advanced Engineering School of Electric Transport, Moscow Polytechnic University,Bolshaya Semyonovskaya Street, 38, 107023 Moscow, Russia

[2] MADI, 64, Leningradsky Prosp., Moscow, 125319, Russia

a.koudrin@outlook.com

Abstract. The purpose of this work is to develop a multifactor mathematical model in Matlab Simulink environment, taking into account fuel consumption and a digital terrain model with variable inclinations of road surface with intersections and traffic light regulation, to conduct field experiments, as well as computer simulation and verification of the developed model. The paper proposes a mathematical model for calculating the instantaneous fuel consumption of a car with an internal combustion engine. The design of a digital twin of the car is described. A full-scale experimental run on a test road section is carried out and the conditions of computer simulation are described. The results of calculation of instantaneous fuel consumption of the experimental car when driving on a test road section with elevation differences, controlled intersections and different speed ranges are compared with the results of computer simulation. The results of computer simulation matched the field experiment by 98%. Conclusions are drawn about the applicability of the proposed approach to the process of development and verification of intelligent speed control algorithms for improving the energy efficiency of road vehicles.

Keywords: Road Vehicle, Digital Twin, Simulation, Digital Terrain Model, Fuel Consumption, Mathematical Model Verification.

Improve Flutter Stability for Streamlined Sections by Arranging Eccentric Masses

Hong-Son Nguyen[1], Van-Bao Hoang[2], Van-Quyen Nguyen[2], Xuan-Thuan Nguyen[2] and Ngoc-An Tran[3(✉)]

[1] Department of Science and Technology, Hanoi University of Industry, No. 298 Cau Dien Street, Bac Tu Liem District, Hanoi

[2] Department of Mechatronics, Hanoi University of Science and Technology, No. 1 Dai Co Viet, Hai Ba Trung, Hanoi

[3] Faculty of Civil Engineering, Vietnam Maritime University, No. 484 Lach Tray, Haiphong City, Vietnam

antn.ctt@vimaru.edu.vn

Abstract. Airfoils and bridge decks usually have streamlined geometries for ef-ficient aerodynamic analysis. These shapes allow for the use of Theodorsen functions, which offer approximations specifically for thin plates. This research pre-sents a new method to improve the efficiency of streamlined sections by strate-gically arranging eccentric masses. Unlike traditional use of Tuned Mass Dampers (TMDs), this approach provides a clear benefit by decreasing the need for many springs and viscous dampers. This text elaborates on the development of equations that describe the movement of bridge deck-eccentric mass systems, laying the groundwork for future research. Using the Revised Step-by-Step technique, the research thoroughly analyzes flutter stability and concludes with numerical simulations that highlight the effectiveness of the suggested strategy. This study not only enhances the comprehension of flutter dynamics but also provides a practical approach for enhancing the stability of streamlined structures in real-world engineering applications.

Keywords: flutter stability, streamlined sections, eccentric masses, wind speed, Revised Step-by-Step.

Study on aerodynamic noise characteristics of quadcopter UAV considering the influence of separation distances between rotor tips and rotational speeds

Quang Quyen Le[1], Thanh Dong Pham[1] and Quoc Tru Vu[1]

1 Le Quy Don Technical University, Hanoi, Vietnam

le.quang-quyen@lqdtu.edu.vnVietnam

Abstract. The interactions between adjacent rotors induce intricate and unsteady airflow in their vicinity, directly influencing both the aerodynamic efficiency and acoustic emissions of the multi-rotor UAVs. This interaction is appreciably influenced by the spatial distance between adjacent rotor tips. In this study, the aerodynamic noise characteristics of APC Quadcopter rotors with the different separation dis-tances between neighboring rotor tips and with the different rotational speeds of multi-rotors in hover were investigated. We employed

the unsteady panel method and acoustic analogy, solving the FW-H equation using Formulation Najafi 1C.

Keywords: aerodynamic noise, rotor interaction, overall sound pressure level

An Approach to The Development of A Methodology For Energy-Efficient Control of Cargo Vehicles

Sergey Shadrin[1,2], Daria Makarova[1,2], Andrey Keller [1,2], Yury Furletov [1]

[1] Moscow Polytechnic University, 107023, Bolshaya Semyonovskaya street, 38, Moscow, Russia

[2] Sociocenter, 123104, Tverskoy boulevard, 13, str. 1, Moscow, Russia

Abstract. Cargo vehicles play a significant role in the road transport industry and make a major contribution to fuel consumption and air pollution. The authors of the article analyzed and structured the factors affecting fuel consumption in the process of truck cargo transportation. From the point of view of research and optimization, the factors of road parameters and driver influence were taken as priorities, on the basis of which the dependence of fuel consumption was compiled. The procedure of optimizing the speed profile over the predetermined route with respect to specific transport task was described. Tests on public roads were conducted to determine unknown coefficients of the target function and further evaluate the results of optimizing fuel consumption. The authors of the article analyzed various methods used and being developed for energy efficient vehicle management. It is established that the proposed in the article approach is suitable for analysis and rapid prototyping of intelligent energy-efficient vehicle's control systems.

Keywords: fuel consumption, energy-efficient control, cargo vehicles, digital routs, simulation.

The Effect of Cutting Tool Tilt Angle On Surface Quality In Machining on A 4-Axis Turn-Mill Machine

Chung Luong Hai[1*], Son Truong Hoanh[2], Trung Nguyen Kien[2], Huong Tran Van[2], Son Le Thai[1], Dao Nguyen Chuong[1]

[1] Mechanical Engineering Department, Vinh University of Technology Education, Vinh, Vietnam. luonghaichung@vuted.edu.vn

[2] School of Mechanical Engineering, Hanoi University of Science and Technology, Hanoi, Vietnam

Abstract. In the process of machining 3D surfaces, the cutting tool (tool) often is a end-ball tool, so the position of the contact point (cutting point) between the edge of the cutting tool and machined surface is always altered resulting in the change of the surface finish. With the machining process performed on a CNC machine with more controlled axes, the wide diversity

machining methods will be applied. The problem related to difficult-to-reach cutting positions with thin walls could be controlled. Simultaneously, it is possible to create multiple tool approaches to optimize the machining process and heat dissipation in the machining area. In this paper, the variation in surface roughness and microstructure of the machining surface is studied by changing of contact point of end-ball tool (applying different tilt angles for the tool axis). The experimental cutting process was carried out with C45 steel on a 4-axis Turn-Mill machine (EmcoTurn E65) and the CNC machining program was created on NX Cam software.

Keyword: Surface roughness, eccentricity, tilt angle, CNC milling, Mill-Turn machine, NX.

Application of Finite Element Method to Analize Deformation And Stress Of The Clutch Structure

Thi Minh Hue Pham[1] , Ho Nguyen[2] , Quoc Manh Nguyen[3] , Van Thinh Nguyen[3] , The Vinh Do[4] , Shyh-Chour Huang[5] , Ngoc Thai Huynh[6,*]

[1]Hanoi University of Industry, Hanoi city, Vietnam

[2]Nguyen Tat Thanh University, Ho Chi Minh City, Vietnam

[3]Hung Yen University of Technology and Education, Hung Yen, Vietnam

[4]Thai Nguyen University of Technology, Thai Nguyen, Vietnam

[5]National Kaohsiung University of Science and Technology, Kaohsiung, Taiwan

[6]Ho Chi Minh City University of Industry and Trade, Ho Chi Minh City, Vietnam

Corresponding Author email: thaihn@huit.edu.vn

ABSTRACT

The clutch disc transmits torque from the engine to the standard transmission. Therefore, the clutch disc is impacted by the pressure of its and the engine flywheel. Selecting the material for the clutch disc is essential to ensure the required work. In this study, the deformation and stress of the clutch disc were analyzed using the finite element method in ANSYS. SolidWorks designed the model of the clutch. The finite element model was performed by static structural analysis. The simulation results indicated that the design dimension significantly affected the deformation and stress of the friction clutch disc. The deformation and stress significantly reduced when the thickness changed from 3 mm to 3.7 mm. The deformation in 4 cases increased from 0.05 mm to 0.055 mm when the friction plate groove diameter increased from 0.25 mm to 1 mm.

Keywords: The clutch dics, deformation of clutch dics, stress of clutch disc, finite element analysis

3d Avatar Interactive System On Hologram Fan Projector Using Motion Recognition Control By Mediapipe Holistic

Thai Anh Huynh Ngoc[1], Hoang Pham Nguyen[1], Tho Nguyen Thi Ngoc[1] and Tri Trang Thanh[1]
[1] Can Tho University, Can Tho city, Viet Nam
{hntanh, pnhoang, ntntho, tritrang}@ctu.edu.vn,

Abstract. This paper presents a novel system for creating and displaying a 3D avatar model on a fan hologram device. The system uses a webcam to capture the gestures and movements of the user and applies an AI model to recognize the body parts and joints of the user. The system then maps the recognized joints to a 3D avatar model and renders it on a fan hologram device using a POV (Persistence of Vision) technique. The system allows the user to interact with the 3D avatar model in real time and see it from different angles. The system also provides various functions, such as changing the model, using the input as image or video, and displaying the skeleton of the user. The system is based on the mediapipe holistic solution, which combines the pose, face, and hand landmarkers to create a complete landmarker for the human body. The system is tested and evaluated in terms of basic functions, display quality, and user experience. The results show that the system performs well in most conditions and provides an immersive and engaging experience for the user. The accuracy of the recognition function varies from 55% to 100%, depending on the environment and lighting condition. The success rate of the identification function is 82.69% for all body parts and acts. The system has a high potential for further development and application in various domains, such as education, entertainment, art, and communication.

Keywords: 3D avatar model, Fan hologram, AI recognition function, Mediapipe holistic, Augmented reality

The Study of Methods for Measuring and Controlling Oxygen Storage Capacity

Terenchenko Alexey [1], Kozlov Andrey [1], Nadareishvili Givi [1] and Porsin Andrey [1]
[1] NAMI Russian State Scientific Research Center, Moscow, Russia
terenchenko@nami.ru

Abstract. Reducing the toxicity of exhaust gases from internal combustion engines remains an urgent task both now and in the future, despite the widespread development of electric vehicles. The three ways catalyst (TWC) system for reducing the toxicity of gasoline engines is well known. One of the characteristics of the catalytic unit used in aftertreatment systems is the oxygen storage tank (OSC). OSC can be measured in various ways. The technological oxygen storage capacity is a parameter measured by an electronic control unit on a car by comparing signals from oxygen sensors installed on the hot end. The engine method is an investigative method for obtaining the full oxygen content on the surface of the neutralizer in a wide range of temperatures and calculating OSC values. This article presents a comparison of the OSC

values obtained by these different methods. In order to establish a relationship between the true oxygen capacity measured during coating development and block production and the process capacity continuously measured during calibration, certification preparation and block aging, it is necessary to supplement the existing catalyst model. For the first time, the possibility of correlation using a scaling factor between OSC values was established in the practice of system development and calibration.

Keywords: Vehicle, Engine toxicity, Aftertreatment system, Oxygen storage capacity.

Automotive Aerodynamics Analysis: An Implementation of Openfoam Software

Khai H. Nguyen[1,2], Khanh Nguyen Duc[1], Tien Nguyen Duy[1], Truc Nguyen[1]

[1] Department of Vehicle and Energy Conversion Engineering, School of Mechanical Engineering, Hanoi University of Science and Technology, No.1 Dai Co Viet Street, Hanoi, 10000, Vietnam

[2] Department of Mechanical Engineering, Gyeongsang National University, Jinju, Korea

truc.nguyenthe@hust.edu.vn

Abstract. This work focuses on the computational study and simulation of aerodynamics around a passenger car using the OpenFOAM software. The problem is defined and calculated using the Tesla Model 3 prototype - an all-electric vehicle highly regarded for its performance and aerodynamic design. Throughout the work, various results were analyzed, including drag force, lift force, drag coefficient, moment coefficient, and front and rear lift coefficients. Additionally, the work pays special attention to pressure distribution results and streamlining force distribution. The results found that the electric car model being studied exhibits high aerodynamic efficiency, allowing for stable operation at both regular and highway speeds. Furthermore, the optimization in the design is shown to improve the car's grip on the road at the front and rear and optimize the side mirrors' design, reducing drag, providing good visibility, and minimizing friction noise between the vehicle and the surrounding airflow.

Keywords: Aerodynamics, Computational, OpenFOAM, k-omega-RANS model.

Achieving FIT Manufacturing through the Lens of Industry 5.0: A Lean Perspective

Ton Nguyen Trong Hien[1*], Noppadol Amdee [1],
Adisak Sangsongfa[1]

[1] Department of Industrial Technology Management, Faculty of Industrial Technology,
Muban Chom Bueng Rajabhat University, Thailand, 70150

66p951003@mcru.ac.th

Abstract. There are still gaps in the literature, as there is a lack of comprehensive evaluations regarding whether the fifth industrial revolution contributes to businesses achieving leanness,

one of the three components of FIT manufacturing, the production philosophies that aids businesses in optimizing operations, responding to market changes, staying competitive, innovative and fostering sustainable development. The effectiveness of the fourth industrial revolution in delivering clear benefits in this regard remains unproven. To avoid redundancy with previous studies, a combined approach utilizing keyword analysis through preference landscape analysis and content analysis was employed. To this end, extracting all relevant papers and deeply analyzing studies from the Scopus database, the study results reveal that Lean research within the context of the fifth industrial revolution is still in its early stages. While existing research shows promising signs compared to previous revolutions, answering this question requires further time to assess the long-term costs and benefits.

Keywords: FIT manufacturing, Industry 5.0, Lean, Sustainability.

Simulation of The Operating Process of A Spark Ignition Engine Powered by Carbon-Free Fuel

Van Dung Nguyen[1], Thin Quynh Nguyen[2,*], Andrey Y. Dunin[1] and Dinh Thi Luong[3]

[1] Department of Heat Engineering and Automotive Engines, Moscow Automobile and Road Construction State Technical University (MADI), Moscow, Russia

[2] Falculty of Mechanical Enigineering, University of Transport and Communications, Ha Noi, Viet Nam

[3] Institute of Vehicle & Energy Engineering, Military Technical Academy, Ha Noi, Viet Nam

thinquynh@utc.edu.vn

Abstract. The results of mathematical modeling of the operating process of a spark ignition engine when running on gasoline and two carbon-free fuels: hydrogen and ammonia are presented. To carry out the computational study, a software package developed at MADI was used. In this model, the factor *m* in the Wiebe formula that corresponds to each fuel type is determined. This value selection is based on the condition of coincidence of experimental and calculated data on the maximum cycle pressure and the highest rate of pressure increase. In the second stage of computational studies, the impact on the performance of a spark-ignition engine from switching to hydrogen and ammonia was assessed. The results show that, with the transition to hydrogen, the maximum value of the heat release rate increases by 17.5% compared to gasoline, while with ammonia increases by 1.6%. Engine operation on ammonia has the highest hourly fuel consumption, which is 2.6 times higher than that of gasoline and 6.2 times higher than that of hydrogen.

Keywords: spark ignition engine, carbon-free fuel, hydrogen, ammonia, operating process modeling.

Evaluating the Impact of Cutting Speed and Feed Rate on Surface Roughness Utilizing a Four-Insert Carbide Face Milling Cutter on CNC Machines

Hoanh-Son Truong, Trong-Thanh Nguyen *, and Tuan-Anh Bui ‡
School of Mechanical Engineering, Hanoi University of Science and Technology, No 1 Dai Co Viet Rd., Hanoi, Vietnam
Corresponding authors: *thanh.nguyentrong@hust.edu.vn;
‡ anh.buituan@hust.eud.vn

Abstract. A machining process with significantly higher cutting speeds than conventional machining, can enhance surface finish, machining productivity, and tool life. However, it also results in increased cutting temperatures, which can impact the surface quality of workpiece and the life of cutting tool. This study explores the effects of cutting speed (100–550 m/min), feed rate (0.01–0.2 mm/tooth), and cutting depth (0.2–0.5 mm), on the surface roughness of parts machined on a milling CNC machine. The experiment used carbon steel C45 as the workpiece material, a carbide face milling as the cutting tool, and soluble cutting oil as the coolant. The findings revealed that a rise in both the cutting speed and feed rate leads to an increment in surface roughness. However, these increases also lead to higher cutting temperatures, which can have implications on the life of the cutting tool and the quality of the surface that has been machined. This research is crucial for choosing appropriate cutting parameters to achieve the desired surface roughness and ensure efficiency in high-speed machining applications. Furthermore, the research findings contribute to broadening the understanding of machining and material processing.

Keywords: Surface Roughness, Cutting Speed, Feed Rate, Carbide Inserts, CNC Machines.

Effects Of Heat Accumulation on The Part Quality And Methods For Reducing Heat Accumulation In Wire Arc Additive Manufacturing: A Short Review

Quang Huy Hoang[1], Thuy Duong Nguyen[2], Van Thao Le[3,*], Van Canh Nguyen[4], Tat Khoa Doan[5],
[1] Weapon Institute, Hanoi, Vietnam
[2] School of Mechanical Engineering, Hanoi University of Science and Technology, Hanoi, Vietnam
[3] Advanced Technology Center, Le Quy Don Technical University, Hanoi, Vietnam
[4] School of mechanical and Automotive Engineering, Hanoi University of Industry, Hanoi, Vietnam
[5] Faculty of Mechanical Engineering, Le Quy Don Technical University, Hanoi, Vietnam
*Corresponding author. Email: vtle@lqdtu.edu.vn

Abstract. Metal 3D printing technology using an arc energy source - widely known as wire arc additive manufacturing (WAAM) has a great promising for manufacturing large-sized and medium-complex parts. However, with its very large heat input characteristics, the complex thermal cycle and heat accumulation cause major challenges in WAAM. This paper presents a short review on the influence of heat accumulation on the process stability, geometric accuracy,

and material properties. In addition, methods for reducing the heat accumulation phenomenon to improve the product quality are also exported. The findings reveal that the heat buildup is one of the most important causes that leads to low surface quality, high thermal distortion, and high residual stress. The heat accumulation also causes anisotropy in microstructures and materials properties. The paper provides an insight into the WAAM process, especially on the heat buildup phenomenon and several methods to reduce such a phenomenon and improve the quality of WAAMed parts.

Keywords: Wire arc additive manufacturing, heat accumulation, part quality, material properties.

Simulate And Optimize The Front Bumper System Of The Vehicle With Ls-Dyna Software

Hieu Pham Minh[1], Tien Tang Van[1,*], Huu Hoang Van[1] , Quynh Luu Ba[1] , Phuong Do Thai[1] , Hoang Chu Vuong[1] , Khanh Pham Quoc[2]

[1]Faculty of Transportation Engineering, School of Mechanical And Automotive Engineering, Hanoi University of Industry, No. 298 Cau Dien Street, Bac Tu Liem District, Hanoi, Vietnam

[2]Department of Mechanical and Computer-Aided Engineering, National Formosa University, No.64 Wenhua Rd, Huwei Township, Yunlin County, Taiwan 632

tangtienthoha@gmail.com

Abstract. Ensuring the safety of passengers is a top priority in the automobile industry. To achieve this, engineers have designed new vehicles with advanced safety systems. These systems can be classified into two categories: active and passive safety. This article will examine the passive safety system, namely the front bumper. The front bumper is an essential part of the vehicle that protects passengers from injuries during a frontal collision. It works by absorbing part of the vehicle's energy during the collision. This study aims to optimize the front bumper's structure by calculating and analyzing its ability to withstand collisions and absorb energy. The finite element method is used, with LSDYNA software being the primary research tool. The collision results are evaluated based on NCAP standards, with a speed of 64 km/h. The study focuses on the front bumper's ability to absorb collision energy and its deformation. By increasing the front bumper's thickness from 3mm to 5mm, the results show that a thickness of 5mm is optimal, with a deformation parameter of more than 0.84%.

Keywords: Bumper simulation, LS-DYNA, Optimizing bumper.

Performance iAnalysis iof iCopper iCoated iAluminum iTool iin iElectro iDischarge iMachining iof iTi-6Al-4V iAlloy

Dua Tran Van[1], Shailesh S. Shirguppikar[2], L.Selvarajan[3], Bong Pham Van[1], Anh Nguyen Mai[1]

[1] Hanoi University of Industry, No. 298, Cau Dien Street, Bac Tu Liem District, Hanoi, Vietnam

[2] Department of Mechanical Engineering Department, RIT, Rajaramnagar affiliated to SUK, Maharashtra, India

[3]Department of Mechanical Engineering, Mahendra Institute of Technology (Autonomous), Namakkal District, 637503, Tamilnadu, India

duatv@haui.edu.vn

Abstract. Electric Discharge Machining (EDM) is one of the most popular nontraditional machining processes applied for machining very hard conductive materials with desired shape, size and dimensional accuracy. In this paper, copper-coated aluminium alloy is applied as EDM electrode instead of copper electrode. Electrodeposition, simple and economical process, was used for preparation of copper coating on aluminium alloy. The method of anodization was applied in order to get a strong adhesive copper coating on aluminium alloy substrate. Taguchi based design of experiment technique were used to form relationship of process parameters and response variables. The copper-coated surface was characterized with XRD report. Lower tool wear rate (TWR), surface roughness (SR) and higher material removal rate (MRR) were found for copper-coated aluminium alloy EDM electrode compare to uncoated aluminium alloy electrode.

Keywords: EDM, coated electrode, MRR, TWR

Simulation Of Urea Injection in A Closed-Loop Control Using Proteus Software

Huu Tuyen Pham[1], Huy Chien Nguyen[1,2*], Xuan Thanh Dinh[2], Manh Tuan Nguyen[3], Thi Huong Tran[4]

[1] School of Mechanical Engineering, Hanoi University of Science and Technology,
No.1 Dai Co Viet, Hai Ba Trung, Hanoi, Vietnam

[2] School of Mechanical Automotive Engineering, HaNoi University of Industry,
No.298 Cau Dien Street, Bac Tu Liem District, Hanoi, Vietnam.

[3] FPT Polytechnic
No.13 Trinh Van Bo Street, Nam Tu Liem District, Ha Noi, Vietnam.

[4] University of Economics - Technology for Industries
No.456 Minh Khai Street, Hai Ba Trung District, Ha Noi, Vietnam.

* Corresponding Author Email: chiennh@haui.edu.vn

Abstract. Urea solution plays a crucial role in reducing nitrogen oxide (NO_x) emissions within diesel engine exhausts through selective catalytic reduction (SCR) systems. Control over the injection of urea solution is essential to ensure a complete reaction with the NO_x concentration before the SCR catalyst and that the NO_x concentration does not exceed the allowable

threshold. In this study, a closed-loop proportional integral derivative (PID) control method was used using Proteus software. Input data entered into Proteus software includes NO_x concentration after and before the SCR catalyst, exhaust temperature, and exhaust flowrate taken from sensors. Output parameters, including urea injection flowrate and NO_x conversion efficiency, are calculated and displayed on the LED screen. The study has determined the urea injection map when changing NO_x concentration before the SCR catalyst, exhaust flowrate, and exhaust temperature.

Keywords: Urea injection control, Closed loop control.

Sustainable Dry Machining of Aluminum Alloy A7075: Utilizing Coral Reefs Optimization and Heatmap Analysis for Impact Assessment and Optimization of Cutting Parameters

Van-Canh Nguyen[1], Duong Van Duc[1] and Nhu-Trang Le[2*]

[1]Hanoi University of Industry, No. 298, Cau Dien Street, Bac Tu Liem District, Hanoi, Vietnam

[2] University of Economics – Technology for Industry, 456 Minh Khai Str., Hanoi, Vietnam

nguyenvancanh@haui.edu.vn

Abstract. In this comprehensive study, the multi-objective optimization of the milling process for Aluminum Alloy A7075 is addressed using the Coral Reefs Optimization (CRO) algorithm. Aimed at minimizing the cutting force (Fc) and surface roughness (Ra), the research fine-tunes process parameters such as cutting speed (Vc), feed rate (F), and depth of cut (ap) under stringent machine and tooling constraints. The CRO algorithm, renowned for its effectiveness in complex problem-solving, has been meticulously applied to navigate the trade-offs between these objectives. A set of Pareto-optimal solutions was obtained, with a standout combination featuring a Vc of 1200 m/min, an F of 1.3455 mm/min, and an ap of 335.7291 mm. This resulted in an Fc of 162.93 N and an Ra of 0.313 µm, signifying an optimal balance between efficiency and quality. These results underscore the potential of bio-inspired algorithms like CRO in optimizing industrial machining processes, offering valuable insights for the advancement of precision manufacturing within the constraints of practical applications. The findings pave the way for improved operational performance in the milling of high-strength aluminum alloys.

Keywords: Cutting Force, Dry Milling, Flood Milling, Aluminum Alloy, Milling Parameter

Investigation of Axis Errors of Grinding Tool in Grinding Process for Screw Rotor

Van-Quyet Tran[a,*]

[a] Department of Mechanical Engineering, Hung Yen University of Technology and Education, 39A Rd., Hung Yen City, Viet Nam

[*]Corresponding author (Email: tranquyetbk86@gmail.com)

Abstract. In the screw compressor, the screw rotors are the vital component. The machining accuracy for rotors is mainly affected to the screw compressor performance. However, the axis errors of the grinding wheel are often existed in the grinding process. To enhance the accuracy for rotor manufacturing, the effecting evaluation of the grinding wheel axis errors to the rotor profile of screw compressor is necessary. Therefore, this paper proposes a numerical method to evaluate the grinding wheel axis errors to the rotor profile of screw compressor. It is built to a software by using C# programming language. The validity and advantages of the proposed method are demonstrated via numerical examples.

Keywords: rotor profile, screw compressor, grinding wheel.

Triboelectric Nanogenerator for The Emerging Technologies and Smart Manufacturing

V. L. Trinh[1*], C. K. Chung[2*], X. C. Nguyen[3] , T. S. Nguyen[1] , N. T. Tran[1] , H. H. Nguyen[4] , V. N. Hoang[3]

[1] School of Mechanical and Automotive Engineering, Hanoi University of Industry, 298 Caudien Street, Hanoi 10000, Vietnam

[2] Department of Mechanical Engineering, National Cheng Kung University, Tainan 701, Taiwan

[3] Vietnam-Japan Center, Hanoi University of Industry, 298 Caudien Street, Hanoi 10000, Vietnam

[4] Faculty of Natural Sciences, Hungvuong University, Nongtrang area, Viettri, Phutho Province, Vietnam

Correspondence: ckchung@mail.ncku.edu.tw (C.K. Chung); longtv@haui.edu.vn (V. L. Trinh)

Abstract. Triboelectric nanogenerator (TENG) is recently emerging as a sustainable energy source for applications of the emerging technologies and smart manufacturing. TENG is an energy converter that can harvest wasted mechanical energy into electrical energy for many practical applications. The TENG has many precious characteristics for the emerging technologies and smart manufacturing (ETSM) such as green energy, renewable energy, cost effectiveness, light weight, and self-powered energy. This paper reviews recently TENG technology and its applications for the emerging technology and smart manufacturing. The paper hopes that the TENG energy will be spread for more practical applications of ETSM in the near future.

Keywords: Triboelectric nanogenerator, emerging technologies, renewable energy, sustainable energy

Mechanical Properties of Dual-Phase Eutectic High-Entropy Alloys Under Nano-Cutting

Duy-Khanh Nguyen[1,2] , Te-Hua Fang[1,*], Ching-Chien Huang[1]

[1] [1]Department of Mechanical Engineering, National Kaohsiung University of Science and Technology, Kaohsiung, Taiwan.

[2] School of Mechanical and Automotive Engineering, Hanoi University of Industry, Hanoi, Vietnam.

* Corresponding author. Email: fang.tehua@msa.hinet.net (T.H. Fang)

Abstract. This study explores the mechanical characteristics of dual-phase herringbone high entropy alloys through Molecular Dynamics simulations during the cutting process. Lamellar and herringbone pattern dual-phase workpieces are subjected to multi-directional cutting at varying depths; the behavior is observed in the distribution of shear strain, von Mises stress, temperature, and microstructure evolution with the plastic flow. The findings indicate that structural interfaces influence the uniform directional propagation of shear strain in FCC atoms, with the atomic force being less pronounced on the BCC layer surface but exhibiting high stability. Moreover, atom migration under force occurs concurrently within the FCC layer before gradually redirecting or dispersing in the BCC volume, contingent on the orientation of the structural interface. This results in diverse deformation behaviors in distinct structures and cutting directions.

Keywords: Herringbone, dual-phase, eutectic high-entropy alloy, nano-cutting, Molecular Dynamics simulation.

A Review of Inverse Methods for Claw-Type Rotor Design

Ngoc-Tuan Phan, Van-The Tran, Minh-Thuan Hoang *

Department of Mechanical Engineering, Hung Yen University of Technology and Education, 39A Rd., Hung Yen City, Viet Nam

* Email: Hoangthuan.hut@gmail.com

Abstract.

Due to its efficiency and versatility, claw-type rotors have received significant attention in various engineering applications. The design process of these wheels often involves complex geometry and complex configurations, which makes optimizing performance difficult. In recent years, reverse methods have emerged as promising approaches to dealing with the complexity of design associated with claw rotors. This paper comprehensively reviews the reverse method used to design claw-type rotors. We discuss the use, benefits and limitations of various reverse design techniques. In addition, we highlight recent advances and future research directions in this field. This study examines the current state of the art of inverse methods for rotor design for claw-type rotors to provide valuable insights for researchers and engineers involved in rotor design and optimization.

Keywords: Inverse Method, Sealing Line, Normal Rack, Claw-type Rotor.

An Efficient Filter for Topology Optimization of Isotropic Elastic Materials in the Two-Dimensional Design Domain

Quy-Tho Nhu, Ngoc-Tien Tran* , Thi-Thao Tran, Van-Long Trinh
School of Mechanical and Automotive Engineering, Hanoi University of Industry, No. 298 Cau Dien Street, Bac Tu Liem District, Hanoi, Vietnam
*Email: tientn@haui.edu.vn

Abstract. This study introduces an improved density filter that effectively manages the intricacy of the topology optimization structure. The proposed filter is implemented within a homogeneous isotropic elastic material domain. The findings demonstrate that the utilization of this novel filter effectively mitigates the challenging checkerboard phenomenon commonly encountered in topology optimization problems. The topology optimization approach employed in this study aims to minimize the material based on the minimum compliance objective, while accommodating multiple initial structural constraints. The findings explore the most effective arrangement in terms of the number of iterations and the value of the objective function, supported by various numerical illustrations.

Keywords: Topology Optimization, Filter, Checkerboard Phenomenon, Design Domain.

Development of Finite Element Tool for the Modeling of Apparent Mechanical Properties of Composites with Random Inclusion Distribution

Tien-Thinh Le[1,2,*] , Huan Thanh Duong[3] , Lu Minh Le[3] , Hieu Chi Phan[4] , Quan Tran Quoc[5] , and Van Hai Nguyen[1,2]
[1] Faculty of Mechanical Engineering and Mechatronics, PHENIKAA University, Yen Nghia, Ha Dong, Hanoi 12116, Vietnam
[2] PHENIKAA Research and Technology Institute (PRATI), A&A Green Phoenix Group JSC, No.167 Hoang Ngan, Trung Hoa, Cau Giay, Hanoi 11313, Vietnam
[3] Faculty of Engineering, Vietnam National University of Agriculture, Trau Quy, Gia Lam, Hanoi, 100000, Viet Nam
[4] Department of Civil Engineering, Faculty of Engineering and Applied Science, Memorial University of Newfoundland, St. John's, NL A1B 3X5, Canada
[5] Faculty of Civil Engineering – VNU Hanoi, University of Engineering and Technology, 144 – Xuan Thuy, Cau Giay, Hanoi, Vietnam
thinh.letien@phenikaa-uni.edu.vn

Abstract. The general goal of this research is to develop a numerical Finite Element model in order to calibrate the apparent elasticity tensor of composites with random distribution of inclusions. The statistical fluctuations related to the microstructure is captured through geometrical parameters. The probability density function of the apparent elasticity tensor depends on two factors, the mean value and the fluctuation parameter, both of which are determined by statistical estimate and Monte Carlo realizations. The technique presented in

this study can be used to determine the general characteristics of a random elastic microstructure.

Keywords: Apparent elasticity tensor · Finite Element analysis · Random distribution · Homogenization.

Optimizing Technological Parameters to Improve the Accuracy Of 3D LCD Printed Products

Huu Nghi Huynh[1,2], Bao Khang Quach[1,2], Trong Hieu Bui[1,2]
[1] Ho Chi Minh City University of Technology (HCMUT), Viet Nam
[2] Vietnam National University Ho Chi Minh City, Viet Nam
hieubt@hcmut.edu.vn

Abstract. Using resin 3D printing technology to manufacture technical products is a new trend that brings many benefits, especially when using open source or desktop devices due to cost advantages. In order to do this, it is necessary to determine the optimal technological parameter sets according to the intended use, equipment and materials. In this study, the authors focused on understanding the influence of five technological parameters in the 3D Resin printing process as well as the influence of their interaction on dimensional accuracy in each dimension and all three dimensions LWH, optimize technological parameters to improve the dimensional accuracy of test samples according to ASTM D5418/ASTM D7028 standards fabricated on desktop LCD devices using Standard Resin material. The experiment was designed according to the FCCCD method with 32 test samples. Analysis and optimization results on Minitab software and validation results show that the dimensional accuracy of the sample manufactured according to the optimal set of parameters found is close to the predicted value on the software. This demonstrates the process of selecting input technological parameters. The initial values of those parameters are appropriate and the desktop LCD resin 3D printing device can be used to manufacture technical products for the production process.

Keywords: 3D Resin, LCD, Dimensional Accuracy.

A Novel Hierarchical Sliding Mode Controller for Articulated Heavy Vehicles

Huu Viet Nguyen[1], Tuan Kiet Cao[1], Ngoc Duy Le [1,2], Van Chung Nguyen [1], Huu Hai Ho[1], Tung Lam Nguyen[1]
[1] Hanoi University of Science and Technology, Vietnam
[2] Hanoi University of Industry, Vietnam
Corresponding author: Tung Lam Nguyen (lam.nguyentung@hust.edu.vn)

Abstract. Path following and lateral stability remain a major challenge for AHVs with little progress in improving traditional tractor steering. In this paper, a hierarchical sliding mode controller (HSMC) for tractor steering is proposed to achieve path tracking and stability control simultaneously for a tractor-semitrailer. Based on a single-point preview driver reference, an aggregated sliding surface is constructed from three sliding surfaces including yaw rate, slip angle, and articulated angle error, and the control signal is designed to satisfy all sliding surfaces' asymptotic stability. The controller is tested under double lane change conditions at high speed in TruckSim and shows considerable improvement in stability versus the default TruckSim controller.

Keywords: Tractor-semitrailers, preview driver, hierarchical sliding mode, lane changing.

Develop agents for Autonomous vehicles using Reinforcement learning

Duc-Quang Nguyen[1], Viet-Anh Nguyen[1], Trong-Phuoc Nguyen[1], Phuc-Nam Nguyen-The[1], Thanh-Tung Nguyen[1]

[1] School of Mechanical Engineering, Hanoi University of Science and Technology, Vietnam

tung.nguyenthanh@hust.edu.vn

Abstract. Machine learning and artificial intelligence have been used in various fields, including academic and industries, to make driving safer, more reliable, and improve performance. The objective of this research was to create an agent framework capable of driving a vehicle autonomously in a simulated world. The simulation environment was designed to receive control actions from both agents and humans while providing real-time updates on the state of the vehicle through in-vehicle sensors. The agent framework was developed to learn from past experiences and improve its driving skills. The results showed that the agent can drive the vehicle smoothly and safely. The data collected from the simulation verified the outcomes, exhibiting stable driving behavior and moving speed. This research has potential to accelerate the development of the automotive industry by increasing driving safety without compromising on performance.

Keywords: Autonomous vehicle, Machine learning, Reinforcement learning, Driving behavior, Simulation.

The Compression Behavior of Continuous Carbon Fibers Based Polylactic Acid (PLA) Resin 3D Printing Materials for Different Infill Strategy

Hoang Tien Dung[1] , Nguyen Ba Thuan[2] , Van Huan-Dau[3] , Nguyen Van Canh[1] , Ngo Quang Tu[1] , Nguyen Dang Viet[4] , Tran Quoc Hung[1] and Tien-Dat Hoang[1,✉]

[1] School of Mechanical and Automotive Engineering (SMAE), Ha Noi University of Industry, Vietnam.

[2] Faculty of Mechanical Engineering, Vinh University of Technology Education, Vietnam

[3] Facaulty of Engineering, Dong Nai Technology University, Bien Hoa City, Vietnam

[4] Facaulty of International Training, Thai Nguyen University of Technology, Vietnam

✉hoangdat@haui.edu.vn

Abstract. 3D Printing, which employs a method of layer-by-layer material deposition, offers several benefits for part manufacturing and include a reduced number of process steps, increased flexibility for prototyping, particularly for intricate components, and minimal waste of materials. However, the mechanical characteristics of 3D-printed components have a big concern owing to the inherent limitations of inter-layer adhesion and surface roughness. The utilization of continuous fiber-reinforced polymer composites in 3D printing involves the incorporation of continuous fiber reinforcements within the polymer matrix, enhancing the mechanical integrity of the printed parts. Compression testing is the primary means of evaluation as this study to explore the mechanical characteristics of continuous carbon fiber (CCF)-based Polylactic Acid (PLA) in connection to various infill patterns. For demonstration, three models with the same infill pattern but different material layouts are investigated to show the power of CCF based PLA resin. It can be seen that the results of the case of PLA-CCF achieve excellent mechanical properties that can withstand the peak load of 7KN with only 31g of weight. The finite element models are used to predict the stress and strain of the tests which are close to the results of experiments. Furthermore, since 3D printing materials are becoming more and more important in a range of industries, our discovery opens the door for additional research. Finding the ideal features for various applications will require more research into the mechanical properties and behavior of 3D printed materials.

Keywords: Composite 3D printing, Printed lattice, Continuous carbon fiber printing.

The Temperature, Strain, And Strain Rate Dependent Flow Stress Of 10b33 Boron Steel Using The Modified Johnson-Cook Model

Thanh-Cong Nguyen[1,2], Quang-Cherng Hsu[1,*,]
Jing-Yuan Gao[1], Nhu-Tung Nguyen[3]
[1] Department of Mechanical Engineering, National Kaohsiung University of Science and Technology, 415 Chien-Kung Road, Kaohsiung City 80778, Taiwan
[2] School of Mechanical and Automotive Engineering, Hanoi University of Industry, No. 298, Cau Dien Street, Bac Tu Liem District, Hanoi 11950, Vietnam
[3] International School, Vietnam National University, Hanoi, Vietnam, 144 Xuan Thuy Street, Cau Giay District, Hanoi
hsuqc@nkust.edu.tw

Abstract. The Gleeble-3500 thermomechanical simulator was utilized to perform isothermal compression tests on 10B33 boron steel. These tests obtained reliable stress-strain data at various temperatures (including room temperature, 100°C and 200°C), as well as strain rates (0.1 s^{-1}, 1 s^{-1} and 5 s^{-1}). This data served as the foundation for establishing constitutive equations based on the modified Johnson-Cook and power-law models, aiming to estimate the flow stress behavior. The evaluation employed the correlation coefficient (R) as a metric to compare the accuracy of predicted deformation behavior against experimental observations. While the flow stress obtained from the modified Johnson-Cook model demonstrated an excellent correlation with the experimental results across the investigated temperature range except for room temperature, it generally exhibited superior tracking of the deformation behavior compared to the power-law model. This study highlights the enhanced capability of the modified Johnson-Cook model in capturing the stress behavior dependence on strain rate and temperature for 10B33 boron steel under various deformation conditions.

Keywords: Constitutive equation, compression test, flow stress, 10B33, boron steel, modified Johnson-Cook model.

A systematic approach to modeling Crankshaft and Camshaft signal for the Electronic Control System of The Hyundai D4EA Engine

Tinh Van Tran[1,2], Tien Thanh Tran[1,2], Thinh Nguyen Cuong[1,2], Tri Dinh Quoc[1,2], Lam Quang Tran[1,2] and Quang T.D. Pham[1,2]
[1] Faculty of Transportation Engineering, Ho Chi Minh City University of Technology (HCMUT), Ho Chi Minh City, Vietnam.
[2] Vietnam National University Ho Chi Minh City (VNU-HCM), Ho Chi Minh City, Vietnam.
quangtdpham@hcmut.edu.vn

Abstract. Electronic Engine Control Technology stands as a pivotal advancement in modern engine development. The Engine Control Unit (ECU) retrieves operational data from the engine to precisely regulate ignition timing, fuel injection, air-fuel ratio, exhaust emissions,

and more, based on signals from various sensors, particularly the crankshaft and camshaft position sensors. This research introduces a methodology for developing a simulation model to analyze the signal of crankshaft and camshaft position sensor in the Diesel D4EA engine using Matlab/Simulink. The waveform model is divided into several segments, each with distinctive parameters represented through sinusoidal, arcsine, and square wave functions to match the characteristic signals of the crankshaft and camshaft within one engine cycle. Both signals display synchronization within one engine cycle, when the crankshaft complete two revolutions, the camshaft completes one revolution during the experimental process. The model is validated through a comparison between simulated and real signals at various engine speeds, demonstrating high precision and reliability. The model is developed with the intention of replacing actual sensors to perform measurements and test the engine ECU in an offline condition, serving educational and research purposes.

Keywords: signal simulation; ECU; crankshaft and camshaft signal, missing teeth.

Research to Evaluate the Effectiveness of a Dehumidifier Integrated Air Conditioner in Tropical Monsoon Climate

Ta Van Chuong[1]

[1] School of Heat Engineering and Refrigeration, Hanoi University of Science and Technology, Hanoi, Vietnam

Chuong.tavan@hust.edu.vn

Abstract. A model of a dehumidifier integrated air conditioner (DHIAC) with the ability to control air temperature and humidity precisely at the same time has been developed by our research team. In this research, the operation of DHIAC in hot and humid climate conditions for one year was simulated to evaluate the device's performance. The Gray box simulation method, combining theory and experiment, gives high accuracy, and a convincing argument is selected for the application. The simulation program is built on Matlab software based on a system of equations to simulate the change of temperature and humidity parameters of the air-conditioned space and regional weather data for a long time. It allows the evaluation of the equipment's operating efficiency in a one-year cycle. Simulation results show that DHIAC can control air temperature and humidity parameters according to national standards with high accuracy. The maximum error of air temperature and humidity compared to the set value is 2.7%. The average EEF energy efficiency factor for the whole year is 2.2. Maximum process time is 1095 seconds in summer and 607 seconds in winter. This DHIAC can provide a comfortable environment for people with low energy consumption.

Keywords: Air Conditioning, Dehumidification, Gray box simulation method, Weather data, COP

Vision-Based Automatic Hand Measurement System for Ring Selection

Minh-Dung Nguyen[1], Tieu-Thanh Le[1] , Thi Ngoc Anh La [1] and Thai-Viet Dang[1*]
[1]Hanoi University of Science and Technology, Vietnam
viet.dangthai@hust.edu.vn

Abstract. Image processing has been significantly transformed in recent years by technological advances that provide solutions that are exceptionally efficient and demand few resources. By utilizing 2D images exclusively, this eliminates the necessity for expensive and occasionally unattainable scanning technologies such as 3D or 2D scanners, thereby facilitating the development of rapid measurement systems. Using cameras and image processing technology, this article describes an automated technique for determining the size of fingers. After generating a binary image and extracting finger contours via OpenCV image processing and camera calibration, the procedure proceeds to calculate actual sizes via a sampling technique. Comparing hand data from several subjects to manual measurements taken with a ruler, the OpenCV library-implemented Python system was evaluated. The findings highlight the effectiveness of the system, which completes ring size measurements in the jewelry and customer service sectors in a mere 0.5 seconds, as opposed to the manual method's mean of 11 seconds.

Keywords: Camera calibration, Computer vision, Finger measure, Semantic segmentation, 3D scanner.

Fuzzy Nonlinear Computed Torque Controller for Robot with Fault

Van-Truong Nguyen[1] , Hai-Binh Giap[1] , Dinh-Tan Nguyen[2,*] , Ngoc-Binh Nguyen[1] , and Van-Tuan Nguyen[1]
[1]School of Mechanical and Automotive Engineering, Hanoi University of Industry, Hanoi, Vietnam
[2]Faculty of Mechanical Engineering, East Asia University of Technology, Hanoi, Vietnam
*Tannd@eaut.edu.vn

Abstract. In our study, we provide a fuzzy nonlinear computed torque controller (FNCTC) for robot. The nonlinear computed torque controller (NCTC) is formed by altering the linear proportional-derivative algorithm in the conventional computed torque controller with the nonlinear proportional-derivative (PD) method. Fuzzy logic control (FLC) is used to approximate uncertainties inside the system. By using the Lyapunov stability theorem, it is demonstrated that the system is stable when configured with the FNCTC. The efficacy of the FNCTC is validated by simulations conducted using the pendubot and by making comparisons with the NCTC.

Keywords: Nonlinear Computed Torque, Fuzzy Logic Control, Robot.

Research On Compressive Force on Piles, Driven in Two-Layer Foundation, The Resistance At The Pile's Bottom Remains Constant

Cong T.C[1], Tai N.V[2]
[1,2] School of Mechanical and Automotive Engineering, Hanoi University of Industry
Email: truongchicong@haui.edu.vn

Abstract. This paper considers the collision of hammer to pile driven into two layers foundation base. The pile side friction in each layer is different, pile bottom be subjected to constant resistance. In this paper, use the D'alembert wave propagation method and longitudinal collision theory of elastic bars to determine the compressive force of the buffering on the pile, thus, it will be easy to drive piles safely and effectively.

Keywords*: *pile; hammer; two layers; buffering; compression force.

Digital Transformation Database for Material Inventory Management in Garment Industry

Tieu-Thanh Le [1], Thi-Hanh Nguyen[1], and Thi Ngoc Anh La[1*]
[1]Hanoi University of Science and Technology, Vietnam
anh.lathingoc@hust.edu.vn

Abstract. Inventory management is an important part of the manufacturing operations in the garment industry. This study presents an initial proposal for a database system for managing material inventory in the garment industry. It allows for control over the receiving process through managing information related to production plans, suppliers, orders, and order details, as well as addressing the problem of managing the quality of input materials through specified criteria for material inspections. Additionally, it provides a basis for identifying materials with a unique code, establishing a link between the material of the location and the shelf position to optimize storage volume or determine routing for transportation, arrangement, and retrieval of materials. This data system serves the purpose of designing automated management software for inventory warehouses in garment manufacturing businesses. Furthermore, empirical results suggest that there is a near future potential for cost reductions to be realized in the domains of quality control, energy utilization, productivity, and operations and administration. Given the Vietnamese textile industry's endeavor to achieve international competitiveness, this research offers practical implications for policymakers, scholars, and industry experts.

Keywords: Database System, Inventory Material, MS Access, Smart Garment factory.

An Investigation of High Injection Pressures on Palm Biodiesel Combustion Characteristics Using A Constant Volume Combustion Chamber

Chau Tan Vo[1]*, Tai The Mai[2,3], Au Hai Ho[2,3], Long Dang Tran[2,3]

[1] Industrial University of Ho Chi Minh City (IUH), Ho Chi Minh City, Vietnam

[2] Ho Chi Minh City University of Technology (HCMUT), 268 Ly Thuong Kiet Street, District 10, Ho Chi Minh City, Vietnam

[3] Vietnam National University Ho Chi Minh City, Linh Trung Ward, Thu Duc City, Ho Chi Minh City, Vietnam

*votanchau@iuh.edu.vn

Abstract. This study examines the effects of varying fuel injection pressures on the combustion characteristics of diesel (B0) and palm biodiesel (B100) using combustion pressure and heat release rate analysis. Experiments were conducted in a constant volume combustion chamber system under simulating precombustion conditions of a CI engine before fuel injection with precision in maintaining a 21% oxygen concentration and an ambient pressure of 43 bar. Findings demonstrated a 21% decrease in ignition delay for B0, while B100 displayed a noteworthy 33% reduction, matching the surge injection pressure from 400 bar to 1200 bar. Meanwhile, the peak combustion pressure speed rose from 1.69 to 4.02 bar/ms for B0 and from 1.53 to 3.52 bar/ms for B100, followed by a large integral heat release augmentation of 793 J for B0 and 779 J for B100. At injection pressures exceeding 800 bar, palm biodiesel showcased a shorter ignition delay than diesel, whereas an inverse pattern emerged at pressures of 400 and 600 bar. Moreover, the integral heat release and maximum combustion pressure of palm biodiesel were lower than those of diesel across all injection pressures.

Keywords: Palm biodiesel, diesel fuel, high injection pressure, constant volume combustion chamber, combustion characteristics.

Optimizing Turning Processes for SUS430C Steel: A Comparative Study of RSM and DFA Approaches

Nhat-Tan Nguyen [1] Anh-Thang Nguyen[1] , Ruan Meng Yue[2] , Van-Thanh Pham[3] , Van-Long Trinh[3] , and Van-Canh Nguyen [3*]

[1]Vietnam-Japan Center, Hanoi University of Industry, 298 Cau Dien Str., Bac Tu Liem Dist., Hanoi, Vietnam

[2]9F-2, No.1 Taishun Street, Lingya District, Kaohsiung, Taiwan

[3]School of Mechanical and Automotive Engineering, Hanoi University of Industry, 298 Cau Dien Str., Bac Tu Liem Dist., Hanoi, Vietnam

canhnv@haui.edu.vn

Abstract. This study addresses the challenge of optimizing the turning process for SUS430C alloy, focusing on minimizing surface roughness (Ra) while maximizing material removal rate (MRR), crucial for enhancing machining efficiency and surface quality. Employing the Desirability Function Approach (DFA) and Response Surface Methodology (RSM), we investigated the effects of cutting speed (Vc), feed rate (F), and depth of cut (ap) on Ra and

MRR. Our optimization process revealed that a cutting speed of 200 m/min, feed rate of 0.119 mm/min, and depth of cut of 0.200 mm predict optimal values of Ra and MRR with a high desirability index, indicating a significant improvement over the traditional method. This study not only demonstrates the efficacy of combining RSM and DFA for multi-objective optimization in machining processes but also provides a validated set of parameters that align with industrial application requirements, marking a significant contribution to the field of machining optimization.

Keywords: SUS430C; Response Surface Methodology; Desirability Function Approach; Multiple Objective Optimization

A Honey Dehydrator Working at Atmospheric Pressure Using A Heat Pump Incorporated With A Falling Film Evaporator

Son Thai Pham[1,2] and Tho Tran Dang[1,2*]

[1] School of Mechanical Engineering, Hanoi University of Science and Technology, Dai Co Viet Rd. 01st, Hanoi, Vietnam

[2] Institute of Heat Engineering and Refrigeration, Hanoi University of Science and Technology, Dai Co Viet Rd. 01st, Hanoi, Vietnam

*tho.dangtran@hust.edu.vn

Abstract. This study aims to evaluate the performance of a honey dehydrator system that combines a heat pump with a falling film evaporator, with the specific objectives of achieving enhanced energy efficiency and reducing the moisture content of honey to meet export standards. Various temperature modes of drying air, ranging from 40 to 55oC with a 5-degree interval, were systematically examined, and the optimal values were determined based on considerations of the moisture extraction capacity with respect to energy consumption. The optimized temperature mode of 50oC was subsequently employed for the dehydration process of a batch of honey. The moisture content of honey has been reduced from initial value of 22.0% to 15.5% in batch and the last drops of honey have a moisture content of 12.0%, thereby satisfying the desired specifications required for exportation.

Keywords: Honey dehydrator, Atmospheric pressure, Heat pump, Honey moisture content, Energy efficiency.

Preparation of Yttria-Stabilized Zirconia (YSZ) Nano-Scale Powder by Sol-Gel Method Apply for Preparing Electrolyte of Solid Oxide Fuel Cell

Vu Manh Quang[1,2], Le Duc Dung[2], Ba-Canh, Bui[2], Cao Hong Ha[2]
[1] Petro Vietnam, No. 18 Lang Ha, Dong Da, Ha Noi, Viet Nam
[2]Hanoi University of Science and Technology, No. 1 Dai Co Viet, Hai Ba Trung, Hanoi, Viet Nam
ha.caohong@hust.edu.vn

Abstract

In this study, a method for synthesizing nano-sized 8 mol% Yttria-Stabilized Zirconia (YSZ-8) materials via the sol-gel approach using polyamino-carboxylic acid as a gel-forming aid is developed. Specifically, ethylenediaminetetraacetate disodium salt (EDTA-Na_2) and diethylenetriaminepentaacetic acid (DTPA) are utilized to form the sol-gel in the synthesis process of YSZ-8 materials. DTPA is demonstrated to be more effective than EDTA-Na_2 in the gel formation process due to its strong chelating ability with zirconium and yttrium ions. Consequently, the synthesis yields good results with YSZ-8 particle sizes reaching about 20 nm at low calcinated temperatures of 800 – 900 ^oC. These results are validated through analytical techniques such as TGA-DSC, SEM-EDS, and XRD. The successful synthesis of YSZ-8 serves as a crucial foundation in the fabrication of solid electrolytes used in solid oxide fuel cells.

Keyworks: 8 mol% YSZ, Solid electrolyte, Solid oxide fuel cells, Sol-gel method.

Towards an Open-Source Universal Controller System for Industrial Robots in Industry 4.0

Bui Tien Son[1,*] and Duong Van Lac[2,*]
[1] Hanoi University of Industry (HaUI), Hanoi, Vietnam
sonbt@haui.edu.vn
[2] Hanoi University of Science and Technology (HUST), Hanoi, Vietnam
lac.duongvan@hust.edu.vn
[*]All authors contributed equally to this work and designated as co-first authors

Abstract. This article presents the development of a control system for a 3-degree-of-freedom industrial robot, incorporating a user-friendly programming language. The system utilizes the Mitsubishi Q02HCPU PLC controller and the QD75MH4 positioning module. The software offers fundamental functions and enables users to compose programming code for robot control. Experimental results demonstrate the accurate, effective, and stable functioning of the robot controller. The findings suggest that the developed system can be extended to more complex robot configurations with additional degrees of freedom by integrating motion control modules such as the QD77MS16. We open-source the project at https://github.com/lacduong/RobotController

Keywords: Industrial robot, control system design, programmable logic controller (PLC).

A Design Review for Generating Involute Tooth Profile Of Non-Circular Gear Pair

Hong-Phong Nguyen[1], Van-Quyet Tran[1], Minh-Thuan Hoang[1], Banh Tien-Long[1], Van-The Tran[1,*]
[1] Department of Mechanical Engineering, Hung Yen University of Technology and Education,
39A Rd.,Hung Yen City, Viet Nam
* Email: vanct4.hut@gmail.com

Abstract. Non-circular gear transmissions are increasingly used in equipment serving daily life and industrial production that the traditional cylindrical gears with constant transmission ratios cannot meet. Significantly, the machine parts, machines that require a change in speed according to a defined rule. The research and applications of non-circular gears have attracted the attention of many researchers and designers. In this paper, a design review for generating the involute tooth profile of the non-circular gears is presented. A numerical analysis is performed to verify the merit of non-circular gears.

Keywords: Involute profile, non-circular gears, gear design

Static Bending Behavior of Two-Directional Functionally Graded Porous Microshell

Khuat Duc Duong[1,*] ,Nguyen Tuan Linh[1], Tran Thi Thu Thuy[1] and Dao Nhu Mai[2]
[1] School of Mechanical and Automotive Engineering, Hanoi University of Industry, Hanoi, Vietnam
[2] VNU University of Engineering and Technology – VNU-UET, Hanoi, Vietnam
*Corresponding email: Duongkd@haui.edu.vn

Abstract. This work investigates the static bending of a bi-directional functionally graded porous (BFGP) microshell using Kirchhoff-Love's shell hypothesis, the modified couple stress hypothesis, and the isogeometric analysis technique (IGA). An exponential rule governs the mechanical characteristics of the entire shell, which is supported by a elastic medium. There are two forms of porosity: even and un-even. This approach is unique in that it takes into account the change length-scale parameter as the mechanical characteristics of the material. The validity and effectiveness of the established model are shown by contrasting the numerical results produced by the present formulations with data that have been published in a number of particular circumstances. Furthermore, the influence of properties like porosity, length-scale factor, elastic medium stiffness, and other parameters on the microshell static bending is studied numerically.

Keywords: IGA method, static bending, bi-directional functionally graded porous.

Static Analysis of Artificial Bone Pin Made by Using Nanocomposite

[5]Dong Pham Van, [1]Mahesh Thorat, [2]Santosh Patil, [3]Rajanikant Kurane,
[4]Shailesh Shirguppikar, [5]Thinh Hoang Xuan, [5]Thanh Pham Viet
[1]Department of Automobile Engineering , Rajarambapu Institute of Technology, Shivaji University, Sakharale. MS -414415, India
[2]Department of Mechanical Engineering, Rajarambapu Institute of Technology, Shivaji University, Sakharale. MS -414415, India
[3]Department of Science and Humanities, Rajarambapu Institute of Technology, Shivaji University, Sakharale. MS -414415, India
[4]Department of Mechatronics Engineering, Rajarambapu Institute of Technology, Shivaji University, Sakharale. MS -414415, India
[5]Hanoi University of Industry, No. 298, CauDien Street, Bac TuLiem District, Hanoi, Vietnam
Corresponding author: hoangxuanthinh@haui.edu.vn

Abstract:
This paper investigates the fabrication and analysis of artificial bone pins using various nanocomposite materials. The study explores the mechanical properties and biocompatibility of these artificial bone pins through Finite Element Method (FEM) analysis, comparing them with natural bone. Three distinct samples of artificial bone pins were synthesized, each with a unique chemical composition. The analysis includes directional deformation and equivalent stress measurements for each sample, revealing their performance relative to natural bone. Results indicate that Sample 1 and Sample 2 nanocomposite materials closely resemble the properties of natural bone, suggesting their potential for bone pin implants. However, Sample 3 exhibits inferior performance compared to the other samples and natural bone. Overall, this study contributes to the development of more effective artificial bone structures and materials, offering insights into potential implant materials with properties akin to natural bone.

Keywords:
Artificial bone, nanocomposite materials, Finite Element Method (FEM) analysis, directional deformation, equivalent stress, biocompatibility

Unveiling the Thermal Fingerprint of Magnetorheological Brakes: A Simulation Approach

Hoang Quang Tuan[1,2], Trinh Minh Hoang[2] , Nguyen Anh Ngoc[1*], Ock Taeck Lim[3]
[1] Hanoi University of Industry, Ha Noi, Viet Nam
[2] Hanoi University of Science and Technology, Hanoi, Vietnam
[3] School of Mechanical Engineering, University of Ulsan, 93 Daehak-ro, Nam-gu, Ulsan 44610, South Korea
* Corresponding Author Email: ngocnguyencnoto@haui.edu.vn

Abstract. Magneto-rheological brake (MRB) is a promising new braking technology with several potential advantages over conventional hydraulic brakes. However, MRB has not yet

been widely commercialized due to a number of challenges, including high operating temperatures. This paper presents a thermal analysis method for the structure of a trapezoidal tooth-shaped disk MR brake. The temperature of the MRF and the main components of the MRB is simulated using Altair Flux software. The simulation results for a period of 60s show that the temperature of the MRF, rotor and stator of the trapezoidal brake device is still within the allowable operating range of the material (50-100°C). The trapezoidal MRB is capable of meeting thermal requirements. The results of this study provide a basis for further research on energy, cooling and optimization of the trapezoidal MRB structure.

Keywords: Magnetorheological Brakes (MRB), Thermal Analysis, trapezoidal tooth-shaped disk, Magnetorheological Fluids, Altair Flux.

Sliding Mode Control Using Genetic Algorithm for Twin Rotor MIMO System

Dinh – Hieu Phan[1] , Duy – Minh Nguyen[1] , Van-Truong Nguyen[1] , and Van-Anh Nguyen[2]
[1] Faculty of Mechatronics Engineering, Hanoi University of Industry, Hanoi, Vietnam
[2]School of Aerospace, Transport and Manufacturing, Cranfield University, UK
phandinhhieu@haui.edu.vn

Abstract. In this paper, the purpose of using genetic algorithms (GA) is to enhance the efficiency of sliding mode control (SMC) for a twin-rotor system (TRMS). The proposed control strategy, named SMC-GA, combines the traditional sliding controller with GA. Initially, the SMC controller was designed using Lyaponov theory. Then, GA is employed to optimize the parameters of the SMC, ensuring that the TRMS achieves excellent performance. The simulation results demonstrate that the SMC-GA has ability to effectively track different reference trajectories of TRMS.

Keywords: Sliding mode control (SMC), genetic algorithm (GA), pitch angle, yaw angle, control parameter.

Multi-services Digital Twin for Modular Production System based on ISO 23247 and Web server

Giang-Nam Le[1], Tra-Giang Nguyen Thi, Viet-Dzung Tran, Ngoc-Truong Nguyen, Xuan-Hoang Tang, Thien-Hue Hoang
[1] Hanoi University of Science and Technology, Hanoi, Vietnam
nam.legiang@hust.edu.vn

Abstract. In the context of Industry 4.0, Digital Twin is representative of real-world system in the digital world, which relies on physical system data for optimization, manipulation, discovery and interaction with actual system. This paper presents the process of developing

and implementing the Digital Twin architecture applied on a modular production system (MPS). The proposed architecture is based on the current Digital Twin framework for manufacturing normalized by ISO 23247. The Digital Twin architecture shows an approach between web services, databases and key observable production elements to create a bidirectional connection and multi-services Digital Twin system. This approach has been validated on real systems and can be applied to other machines and manufacturing processes.
Keywords: Digital Twin, Behavior Monitoring, ISO 23247, MPS.

Shortest Path Planning for Rectangular Holonomic Omnidirectional Mobile Robot Using Improved PRM Algorithm

Li Jie Yew [1], Muhammad Juhairi Aziz Safar[1,2], Khairul Salleh Basaruddin[3], Mohd Hanafi Mat Som[4], Muhammad Khairul Ali Hassan[1]

[1] Faculty of Electrical Engineering & Technology, Universiti Malaysia Perlis, Malaysia

[2] Centre of Excellence for Intelligent Robotics and Autonomous Systems (CIRAS), Universiti Malaysia Perlis, Malaysia

[3] Faculty of Mechanical Engineering & Technology, Universiti Malaysia Perlis, Malaysia

[4] Faculty of Electronic Engineering & Technology, Universiti Malaysia Perlis, Malaysia

juhairi@unimap.edu.my

Abstract. An improved and modified Probabilistic Roadmap (PRM) algorithm for non-circular holonomic mobile robot is proposed based on the consideration the shape and its kinematic constraint of non-circular holonomic mobile robot while moving from the initial point to the target point, especially to pass through the narrow passage. The path planning algorithm is also being modified to generate a shorter path distance in the shortest duration of time with the least number of turning points. The comparison of the conventional path planning algorithm will be carried out to determine the most optimal algorithm for modification to achieve the objectives. Then, the chosen path planning algorithm is PRM are improved by obstacle expansion and automatic selection for region of interest (AutoROI). Software simulation and analysis are performed on three different environment maps by a single holonomic mobile robot. The analysis of simulation revealed the performance of the modified path planning algorithm able to reduce elapsed time of PRM and increase the percentage of success path planning.
Keywords: Path Planning, Probabilistic Roadmap (PRM), Region of Interest

Formulation of Silicone Paste Extrusion-Based For 3D Printing Technology

Khairul Salleh Basaruddin[1], Liyana Tajul[1,] Nor Shafiqah Ahmat[1,] Shah Fenner Khan Mohamad Khan[1], Muhammad Juhairi Aziz Safar[2] and Tien- Dat Hoang[3]
[1]Faculty of Mechanical Engineering & Technology, Universiti Malaysia Perlis, 02600 Arau, Malaysia
[2]Faculty of Mechanical Engineering & Technology, Universiti Malaysia Perlis, 02600 Arau, Malaysia
[3]School of Mechanical and Automotive Engineering (SMAE), Ha Noi University of Industry, Vietnam
khsalleh@unimap.edu.my

Abstract. The growth of 3D printer inks is in line with the growth of 3D printing technology. Finding a suitable formulation of 3D printer ink is crucial for fulfilling the demands of construction fields, bio-printing, and consumer products. Soft materials, such as silicone paste, have become one of the requested inks owing to their natural characteristics, cost effectiveness, and substantial environmental friendliness. However, because of the thixotropic behavior of silicone, the development of silicone paste as a 3D printer ink is challenging. This study aimed to develop a new soft material formulation ink made from silicone for extrusion-based 3D printing. A common silicone polymer was added with 0.2%wt of Thi-Vex and sericite mica ranging from 2% to-10%wt. The extrudability and viscosity of the silicone ink were tested by extrusion line printing. A uniaxial tensile test was conducted to evaluate the tensile strength and elongation percentage. The feasible formulation was found to be 3:1:0.2%wt:2%wt (Silicone part A, part B, Thi-Vex, sericite mica) with the tensile strength of 1.37 MPa and 148.71% of the percentage of elongation before the break.

Keywords: 3D printing, silicone ink, paste extrusion.

Deep Learning Approach for Detecting and Evaluating

Than Van Hong Son[1], Luong Thien[1], Tran Dinh Minh Khoa[1], Le Duc Tho[1], Le Viet Hung[1]
[1]The University of Da Nang - University of Science and Technology, Danang, Vietnam
hungle.dut@gmail.com

Abstract. In this study, we developed a mobile application that uses Artificial Intelligence to identify and evaluate the quality of oranges in real time. To get those results, we collected, labeled, processed a large data set of oranges and used Nanodet and YOLOv8 to train the system to identify and classify fruit quality. The results show that our system has high accuracy in identification and classification. We evaluated the quality of oranges through analyzing the peel characteristics and shape of the object such as color, shape, etc. The application of Artificial Intelligence technology helps orange farms and consumers evaluate the quality of products quickly and accurately. Our code is available at http://bit.ly/42ZMtxr.

Keywords: Object Detection, Deep Learning, Yolov8, Orange Identification, Mobile Application

Which Strategies Should Vietnam's Garment Industry Approach Leading to Sustainable Development?

Quang-Tri Tran [1], Nguyen Thi Le [2], and Tho Alang [3]
[1] Ho Chi Minh City University of Technology and Education, Ho Chi Minh City, Vietnam
tritq@hcmute.edu.vn
[2] Hanoi University of Industry, Hanoi, Vietnam.
le.nguyenthi@haui.edu.vn
[3] International University - Vietnam National University Ho Chi Minh City, Vietnam
alangtho@hcmiu.edu.vn

Abstract:
Vietnam's garment industry ranks among the foremost industries globally, emphasizing exportation. It sits alongside China and Bangladesh as one of the top three producers and exporters of ready-made garments. Despite this status, Vietnam's garment industry is primarily recognized for its proficiency in CutMake-Trim (CMT) manufacturing. CMT, which constitutes around 73% of total exports, is deemed ideal for harnessing Vietnam's extensive workforce. This study seeks to identify strategies for elevating Vietnam's garment industry to higher value-added segments, thereby fostering sustainable development. The research employs a sequential mixed-method approach, comprising qualitative interviews and quantitative surveys conducted in two phases. Through this methodology, two overarching conclusions were drawn and validated. This research aims to shed light on current and future challenges within Vietnam's garment industry, facilitating the development of effective strategies while averting potential pitfalls.
Keywords: Vietnam, garment industry, production mode, sustainable development.

Comparison of two methods: RAM and AROMAN

Tran Van Dua[1], Do Duc Trung[1,*], Nguyen Thi Phuong Giang[2], Duong Van Duc[1]
[1]Hanoi University of Industry, Vietnam
[2]Hanoi University of Science and Technology, Vietnam
**doductrung@haui.edu.vn*

Abstract. The purpose of making a decision with multiple criteria is to determine the best option among several alternatives. However, the best option determined may change if different methods are used to rank the alternatives. This study is conducted to compare two methods: RAM and AROMAN. These are two new Multi-Criteria Decision Making (MCDM) methods, both of which were recently discovered in 2023. Three different examples were conducted to compare these two methods, including the selection of a mushroom cultivation mixture, the choice of a metal recycling option, and the selection of an electric bike. The results

show that in each example, the best option found when using the RAM method is consistent with the results of other MCDM methods. However, the best option found when using the AROMAN method differs from other methods. This means that AROMAN is deemed unsuitable for use in determining the best option in the three cases examined.

Keywords: MCDM, RAM method, AROMAN method

Experimental System Setup To Investigate The Motorcycle Performance At Various Operating Conditions

Trinh Dac Phong[1*]; Nguyen Quang Truong[1]; Doan Cong Thanh[1]; Le Van Anh[1]; Nguyen Tien Han[1]; Trinh Duy Hung[1]; Bui Van Chinh[1], Nguyen Xuan Khoa[1] and OckTaeck Lim[2]

[1]School of Mechanical and Automotive Engineering, Ha Noi University of Industry, Viet Nam

[2]School of Mechanical Engineering, University of Ulsan, 93 Daehak-ro, Nam-gu, Ulsan 44610, South Korea

phongtd@haui.edu.vn

Abstract. The paper presents research results and design experimental system for electric motorbike. With purpose of this article is to study the input parameters that affect electric motorbikes, to better understand the important factors related to the operation and performance of electric motorbikes. To achieve this goal, an electric motorbike simulation model has been built based on MATLAB SIMULINK software. In addition, the research also focuses on designing and installing an experimental system to measure the speed, power and power consumption of motorbikes. The simulation model is used to study the influence of input factors and working conditions on the performance and power consumption of electric motorbikes. Through simulation research, the article shows that thanks to the integration of important structural parameters, such as wheel diameter and transmission ratio, this model can simulate the vehicle's operation process effectively. authentic and accurate.

Keywords: electric motorbike, simulation model, Matlab Simulink.