SRM
INSTITUTE OF SCIENCE & TECHNOLOGY
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DEPARTMENT OF MECHATRONICS

MECHAVERSE

ASSOCIATION OF MECHATRONICS ENGINEERS

AY: 2022- 23 Issue - 1

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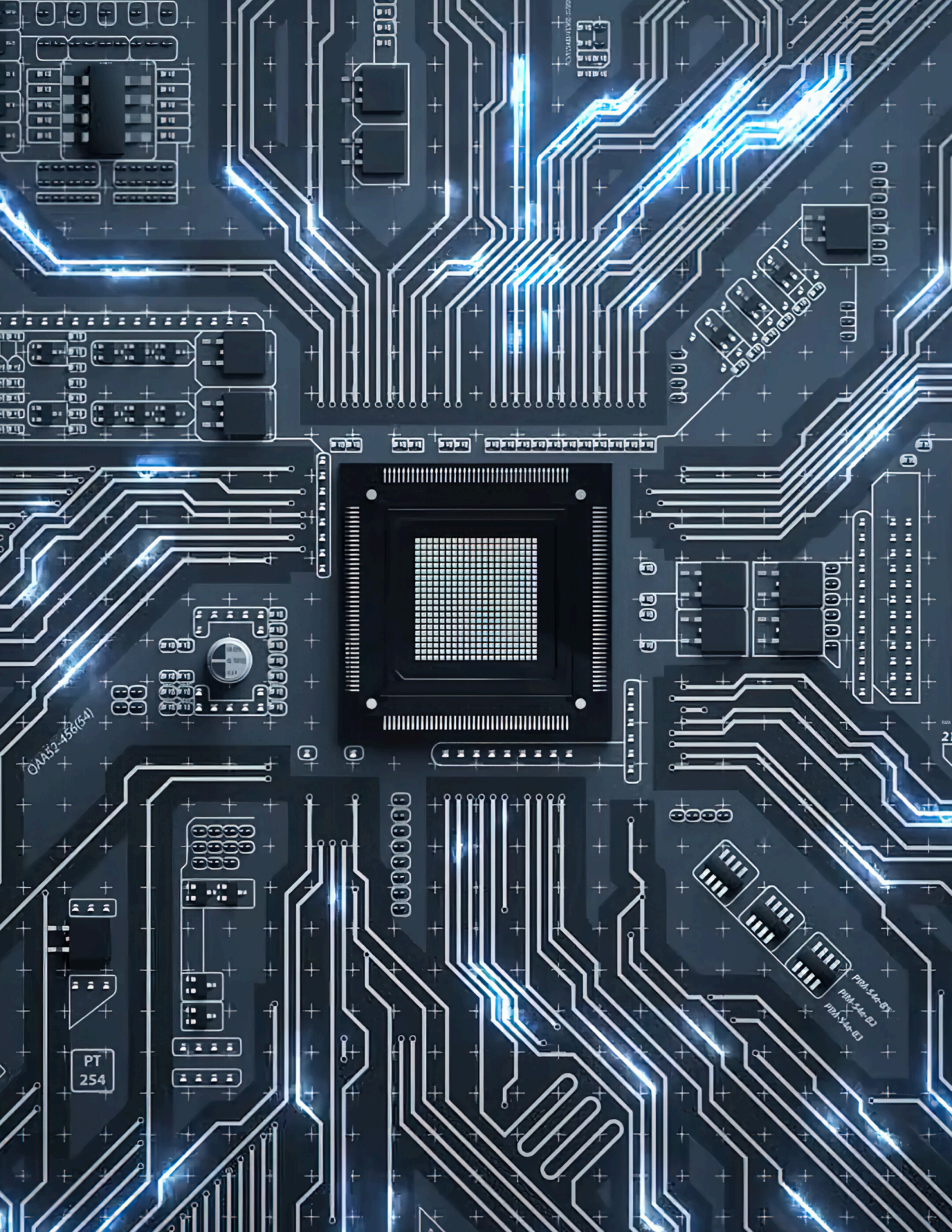
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Preface

Welcome to the first edition in the new academic year of the Department of Mechatronics. As we embark on this exciting journey, we invite you to delve into the vibrant world of mechatronics, where innovation converges with creativity, and technology blends seamlessly with craftsmanship.

On the further pages, you will witness various articles that narrates our department's activities followed by multiple events organized by our department and the Association of Mechatronics Engineers. Furthermore, you will be introduced to our department and its Association, Head of the Department, and the Convenor of the Association of Mechatronics Engineers.

Here we will also explore breakthroughs in the Robotics Community and the Research taking place in the form of "Tech Cover Stories", to inspire you for your next project!

Our magazine also sheds light on the dedicated faculties who guide, inspire, and nurture our students' aspirations. Get to know the individuals who form the bedrock of our learning environment, fostering an atmosphere of collaboration, curiosity, and growth.

I invite you to be part of this journey as you read this magazine further. Welcome to the Department of Mechatronics, SRMIST.

Sincerely,
EDITORIAL TEAM
Association of Mechatronics Engineers.

About SRM

SRM Institute of Science and Technology is one of the top ranking universities in India with over 52,000 full time students and more than 3200 faculty across all 6 campuses – offering a wide range of undergraduate, postgraduate and doctoral programs in Six Faculties - Engineering & Technology, Management, Medicine & Health sciences, Science & Humanities, Law and Agricultural Sciences.

About the Department

The Department of Mechatronics Engineering at SRM Institute of Science and Technology, established in 2005 as the first private university program in India, focuses on delivering multidisciplinary skills in response to the growing demand for Mechatronics Engineers driven by advancements in robotics, automation, and Industry 4.0.

The department offers various programs emphasizing experiential leaning and is recognized for its state-of-the-art facilities and diverse faculty. Equipped with modern laboratories featuring collaborative Robots, Autonomous Mobile Robots, and Advanced Control Systems.

The department supports design, analysis, and simulation of Mechatronic systems. The diverse expertise of its faculty and a strong alumni network working globally in reputable organizations further contribute to the department's success.

About AME

The Association of Mechatronics Engineers is a group of Mechatronics Engineers from SRM University's Department of mechatronics. We are like- minded individuals who came together to create various opportunities for students by organizing numerous events and providing research and project assistances to the students of the department.

Our Association is divided into various sub-domains:

Core and Public Relations: Here various event organizing activities like crowd management, venue confirmation and promotional activities take place.

Corporate connect: Events which involves industrial assistance, communications with industrial experts and corporate connections are handled by them.

Editorial: Paper works for both official and unofficial purpose are done by this domain which includes designing this magazine too.

Alumni Connect: They concentrate on maintaining connections with the Alumni students of our department.

Social Service: This domain focuses on providing social services like donation drives, awareness camps and other events for betterment of the society.

Technical: They are responsible for handling project works, researches and fund management for the students and with the students.

Message from HOD

Dear Readers,

It is my pleasure to welcome you to the first Issue of Mechaverse in this new academic year, a platform that highlights the impressive accomplishments of our Department of Mechatronics. As Head of Department, I am proud to oversee a community that is advancing engineering innovation through interdisciplinary collaboration.

In this issue, discover how our students and faculty are redefining the field through pioneering work across a wide range of mechatronics applications.

Furthermore you can explore the technical articles which throw light on some new and emerging fields in Mechatronics and Robotics, a sure inspiration for your future endeavors.

Regards,

Dr. Murali G
HOD
Department of Mechatronics Engineering

Message from convenor

Dear Readers,

It’s my pleasure to introduce the first Issue of Mechaverse in this new academic year. As the convenor of the Association of Mechatronics Engineers, I am proud to represent our community, which is advancing interdisciplinary innovation and excellence. This edition delves into the field of mechatronics, highlighting our department's accomplishments, activities, and a special focus on the concept of “Swarm Robotics” — a powerful example of integrated mechatronics with sensors, control systems, decision-making algorithms, and modeling based on social networks.

My gratitude goes to the editorial team and contributors for bringing this issue to life. Enjoy exploring the remarkable work within our department!

Regards,

Dr. K Sivanathan
Assistant Professor, SrG
Department of Mechatronics Engineering

DEPARTMENT HIGHLIGHTS

Exploring the Fundamentals of Science and Robotics: A Dynamic Two-Day Bootcamp by AME

The Bootcamp started with a warm welcome ceremony where the chief guest and other resource persons were welcomed by the Principal of Parampara academy, followed by an introduction session given by the hon'ble chief guest Dr. Shivanathan, shedding light upon the agenda of the Bootcamp. The afternoon session started with a basic introduction to the components followed by hands-on practice where students worked on the projects “LED Blinker Program” and “IR reading” under the guidance of the mentors.

Tech Snippet #01- Robotics in Journalism & Writing

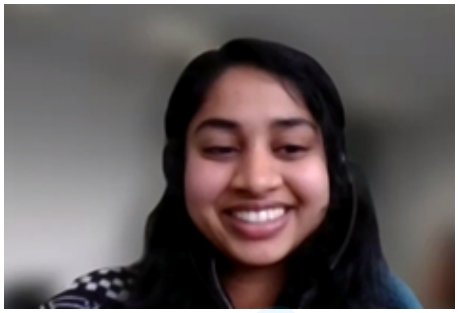
Heliograf (The Washington Post) – An AI-powered journalism bot that writes short news reports, financial updates, and sports summaries with high efficiency.

OpenAI’s GPT Writing Assistants – AI-powered text generators assist journalists, authors, and bloggers in writing creative and technical content.

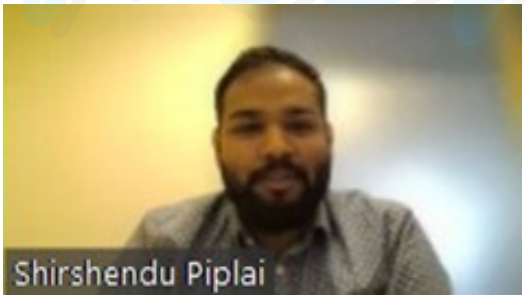
Exploring Global Horizons in Education - Inspiring Talks by AME Alumni

In a captivating showcase of diverse educational journeys and exciting prospects, AME recently hosted an enlightening event featuring accomplished alumni who have ventured abroad for their higher studies.

Guest Speakers:-
1. Amrutha Pattath Saseendran, Research Assistant at Cologne University
2. Shirshendu Piplai, Demand Planner at Henkel
3. Sibangi Bhowmick, Data Scientist at Siemens

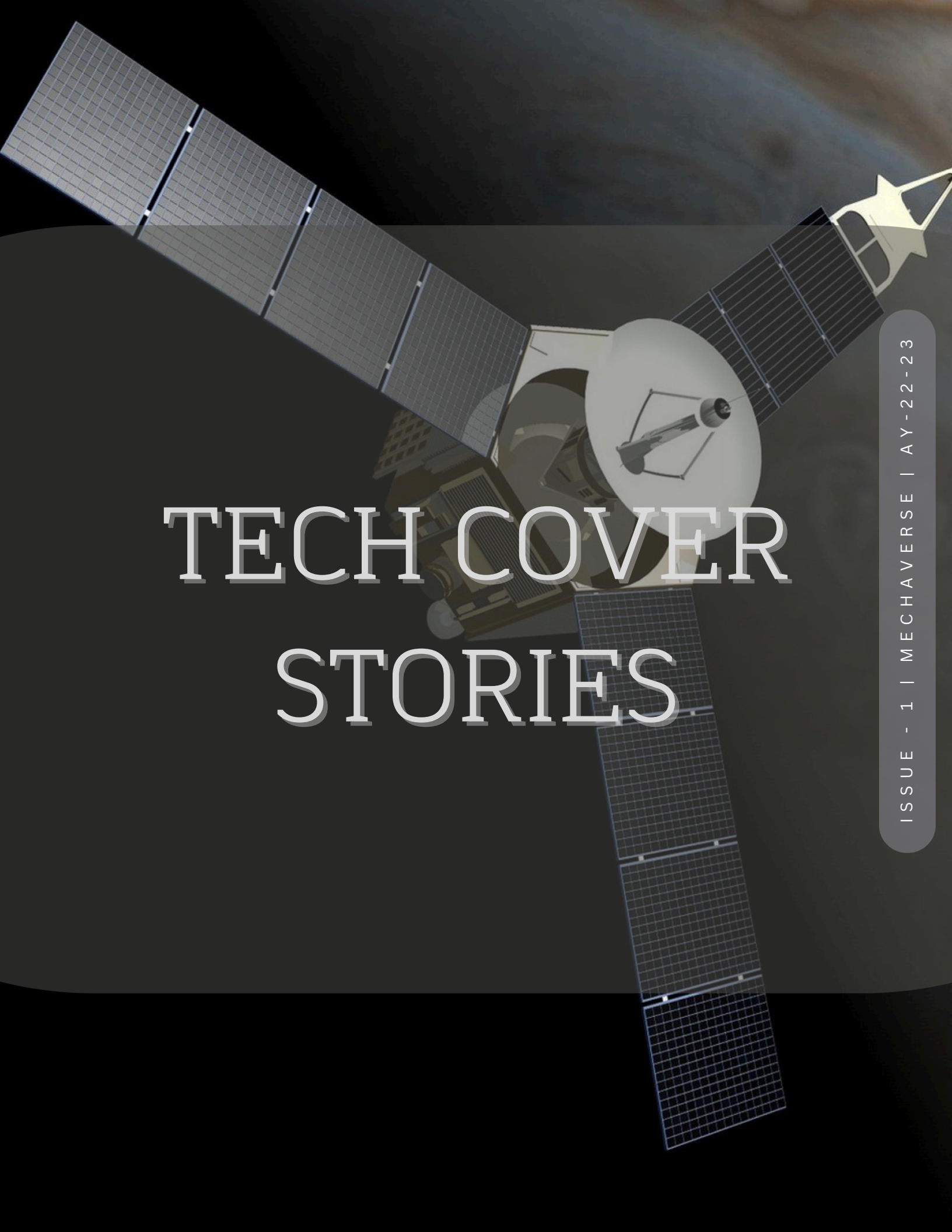


1. Amrutha Pattath Saseendran - During theevent, the speaker passionately discussed her educational journey and the diverse opportunities offered by colleges in the UK and Germany. She emphasized the importance of educational loans as a viable option to support aspiring students. Additionally, the audience gained valuable iinsights nto the promising placement prospects available upon completing studies in these countries



2.Shirshendu Piplai - The speaker captivated the audience with his compelling life story, offering a glimpse into the enriching experience of living in Sweden. He highlighted the excellence of the Master's course at KTH University and provided valuable advice on preparing for higher studies, including scholarship opportunities and necessary documents. Moreover, he shed light on the abundant placement opportunities available, inspiring aspiring students to embark on a promising academic journey.

3**.Sibangi Bhowmick** - The speaker eloquently shared her personal journey in the UK, providing valuable insights into life there and the unique experience at the University of Edinburgh. She emphasized the availability of scholarships to support aspiring students and discussed the exciting placement opportunities specifically tailored for mechatronics engineering students



TECH COVER STORIES

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Swarm Robotics: An Overview

Swarm robotics is a field of robotics in which principles of swarm intelligence are applied to realize complex objectives by interaction of numerous autonomous robots. In contrast to traditional robotic systems, where typically a single robot may be highly sophisticated and controlled centrally, swarm robotics takes advantage of thousands of simple robots working together by means of local communication and interaction rules. The emergent behavior of the swarm is more than its parts.

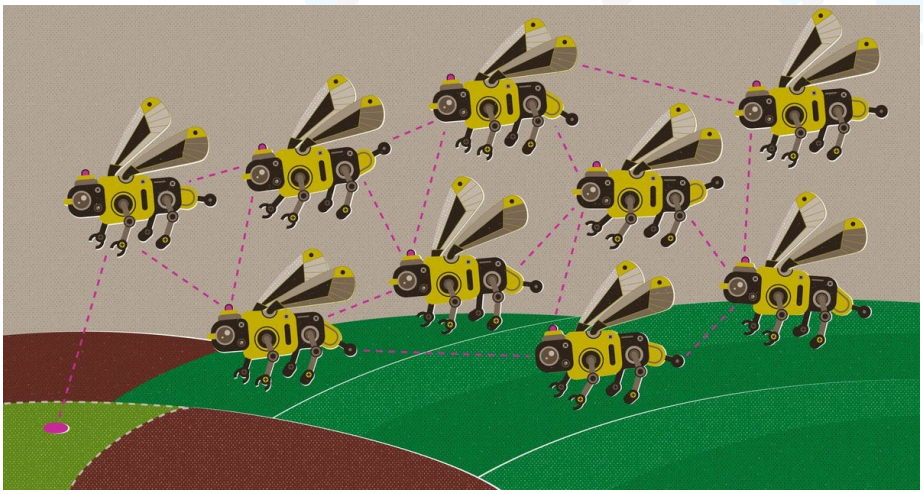
Core Concepts and Mechanisms

- Local Communication:

Swarm robots communicate with neighboring peers using techniques like Bluetooth, infrared, or radio signals. They do not need global information, which decreases communication overhead and increases scalability.

- Distributed Control:

Each robot operates based on local rules and does not rely on a central controller. This decentralized architecture ensures that the system remains functional even if individual robots fail.



Tech Snippet #02 - Autonomous Parking Systems

Stanley Robotics in France developed robotic valets that autonomously move cars into designated parking spots, optimizing space usage in airports and malls. Yeefung Robotic Parking in China offers robotic parking solutions for high-density urban areas.

Emergent Behavior:
By following straightforward rules, for instance, alignment, cohesion, or obstacle avoidance, the system of agents presents cohesive global collective behaviors such as flocks, foragers, or the formation of roads.
Self-organization:
It is also able to adjust to environmental modifications. This creates dynamic reconfiguring of the swarms; the task it does is also quite robust and adaptive.
Mathematical Modeling of Swarms
Graph Theory- Representing how nodes and edges characterize robot-to-robot interaction in a system of robots
Cellular Automata-Simulating a grid's local interactions.
Particle Swarm Optimization (PSO): Optimizes group behavior for tasks such as pathfinding or coverage.
These models help design and predict swarm behavior under varying conditions.

Credit - University of Sttugart

Tech Snippet #03- Robotics in Music

Shimon (Georgia Tech) – A robotic musician that composes and plays music using deep learning and AI. It can analyze musical patterns and improvise jazz performances.

Toyota's Partner Robot – A humanoid robot that plays musical instruments like the violin and trumpet with precision, demonstrating robotic dexterity and control.

Applications of Swarm Robotics

Autonomous Exploration:

Swarms of small robots equipped with sensors can collaboratively map unknown terrains, such as caves or disaster zones, by sharing partial maps through local communication.

Precision Agriculture:

Robots can pattern to optimize the distribution of fertilizers, monitor crop health, or manage pests by using vision or chemical sensors.

Targeted Drug Delivery:

Microscale swarm robots (e.g., nanobots) can deliver drugs to specific areas of the human body by navigating through blood vessels.

Construction:

Inspired by termites, swarms can autonomously build structures like walls or shelters by transporting materials cooperatively.

Credit - Micael Rubenstein, Hardvard University

Tech Snippet #04- Waymo's Self-Driving Cars

Waymo, a subsidiary of Alphabet, operates self-driving taxis that communicate with smart traffic systems to navigate traffic, optimize routes, and ensure passenger safety in cities like Phoenix, Arizona.

Challenges in Swarm Robotics
Scalability: While there are more robots, the coordination has to be effective and interference minimal.
Energy Constraints: The operational lifetime is limited by the autonomy of the nodes and the recharging logistics in the case of a swarm.
Algorithm Design: Local rules to achieve global efficiency for specific tasks is another open area of research.
Communication Overhead: There has to be an optimal trade-off between local interaction being effective but communication bandwidth limited.
With advancements in AI, sensors, and energy storage, swarm robotics is ready for increasingly complex missions. Future studies may include, but are not limited to:
Swarm Adaptability: Developing dynamic role-switching robots based on task demands
Human-Swarm Interaction: Human interfaces for intuitively guiding or intervening in the behavior of the swarm
Bio-hybrid Systems: Biological organisms integrated with robotic systems to harness the natural capabilities provided by biological agents, such as bio-sensing or locomotion.

Further Reading:

- https://www.sciencedirect.com/topics/engineering/swarm-robotics

Tech Snippet #05- AI-Powered Tutoring Robots

Robots like EMYS and Miko are interactive educational robots that help students learn math through games, puzzles, and guided problem-solving. They are widely used in schools for personalized learning experiences.

FACULTY ACHIEVEMENTS

Ms. D. Gayathiri, has successfully completed the 5-day Online FDP on "Inculcating Universal Human Values in Technical Education" organized by All India Council for Technical Education (AICTE) from 3rd to 7th April 2023.

Dr. Madhavan Shanmugavel, has participated in the Online Course on “Remote Sensing & GIS Applications in Agriculture”, organised by **ISRO - Department of Space & Indian Institute of Remote Sensing, Dehradun.**

This Online Course was conducted on 25-07-2022 to 29-07-2022

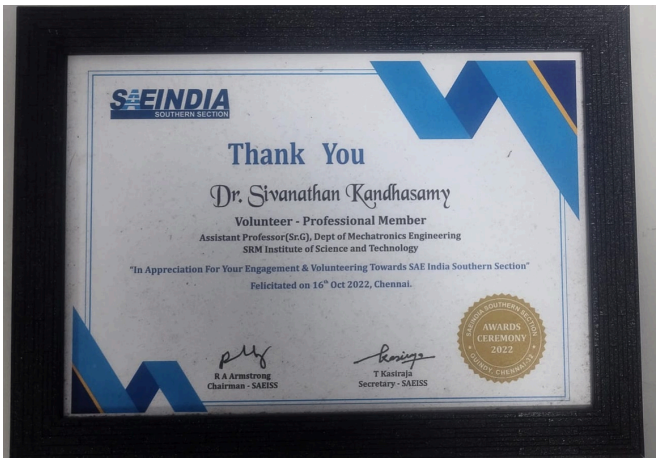
Our esteemed faculty member, **Dr. K. Sivanathan,** recently lent his expertise to the international stage, serving as a Session Chair at the ADMMS 2022 conference (Advances in Design, Materials, Manufacturing and Surface Engineering for Mobility). Held at SRMIST from November 21st-25th, the conference drew researchers and experts from around the globe.

Tech Snippet #06- Flexible Electronic Skins for Robots:

Electronic skins equipped with sensors and conductive materials are allowing robots to sense pressure, temperature, and texture. These skins are being developed for robotic limbs and wearable devices, enhancing the interaction between robots and their environment.

Dr. K. Sivanathan received recognition for his valuable contributions to the International Conference on Advances in Design, Materials, Manufacturing and Surface Engineering for Mobility (ADMMS 2022). The conference took place at SRMIST, Kattankulathur from November 25th-26th, 2022.

Dr. Sivanathan Kandhasamy's dedication to the engineering community was recognized by SAE India Southern Section at their awards ceremony on October 16, 2022, in Chennai. His engagement and volunteering efforts have positively impacted the organization, reflecting his commitment to the profession.



He also lent his expertise as a judge for the SAEISS Dr. G Padmanabham Memorial Electric Two Wheeler Design Competition 2022. The event, held at SRM Institute of Science and Technology, Chennai, on October 17th-18th, showcased innovative designs in electric mobility.

STUDENT ACHIEVEMENTS

Fahad B, Shrudeep S R, first year students for participating in FUTSAL (INTER COLLEGIATE TOURNAMENT – 2023) organized by Club Inferno, Department of Computer Science, CSH in association with Directorate of Sports, SRMIST, Kattankulathur held between 03rd & 4th February 2023

Dhanajay S Panth, first year student, certificate awarded for getting Second Runner-Up in the IDEA-IGNITE conducted by Swift Coding Club held on 18th February 2023.

C**hirag V Jain,Manan Wadhwa,** first year students have participated in ROBO RACE event held during Expello'23 conducted by Mechatronics Department on 5th April 2023 at KCG College of Technology, Karapakkam, Chenna

Allen Thankachan, Raees K A, second year students have participated in Physical Round (Phase 3) eBAJA of BAJA SAEINDIA 2023, organized by SAEINDIA from 5th to 8th April 2023 at Chitkara University - Baddi in Baddi, Himachal Pradesh.

Lalithesh K, Tejas M K, Dharini S, Preetham M, Pranjal Bhargava, first year students, on behalf of SRM Team Robocon, recognizing their outstanding contribution and exceptional results displayed throughout the SolidWorks workshop, held from 19th-21st of April, 2023.

Vijay Solanki C, Parth Pal, Naresh Sriram G, Nishant Kiran Kasar, Rahil Kothari, second year students, on behalf of SRM Team Robocon, recognizing their outstanding contribution and exceptional results displayed throughout the SolidWorks workshop, held from 19th-21st of April, 2023.

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