भारतीय सांकेतिक विज्ञान संस्थ हैदराबाद
भारतीय प्रौद्योगिकी संस्थान हैदराबाद
Indian Institute of Technology Hyderabad

Invited Participants only
Limited seats (50)
For registration:

https://forms.gle/nexQMHs2VJbsE6Gc6

Invited-speaker

Prof. Kohei Shimasaki
Assistant Professor
Smart Robotics Laboratory
Graduate School of Advanced Science and Engineering, Hiroshima University
E-mail: simasaki@hiroshima-u.ac.jp

A Symposium on

Advanced Measurement Techniques in Dynamic, Vibration and Robotics

25 February 2025

Conference room | C block | MAE, IITH

Timings	Talk Details	Presenter
9:30 - 9:35	Opening Remarks by HOD – MAE	Prof. Ashok Kumar Pandey
9:35 - 9:45	Brief about the Research Activities at MAE by Prof. Prasanth	Prof.Prasanth Kumar R
9:45 - 10:45	**Smart Inspection and Monitoring Using High-Speed Cameras**	Prof. Kohei Shimasaki
	High Tea: (10:45 - 11:00)	
11:00 - 11:30	FLEX-GRIP: A Soft Robotic Gripper with Flexoelectric Effects	Prof. Prakhar Gupta
11:30 – 12:00	Overview Of Acoustic Research at IIT Hyderabad	Prof. Venkatesham B
12:00 - 12:30	A Systematic Approach to Design Pneumatically Actuated Soft Robots	Prof. Prabhat Kumar
12:30- 13:00	Dynamic Characterization of Micro to Macroscale Mechanical Systems	Prof. Ashok Kumar Pandey
	Lunch: (13:00 - 14:30)	
14:30 - 15:00	Open-loop Centering of Parts on a Horizontally Vibrating Frictional Table	Prof. Chandrika Prakash Vyasarayani
15:00 - 15:30	Next-generation NDE: Ai-enabled Phased Array Ultrasonic Imaging for NDE	Prof. Thulsiram G
15:30 - 16:00	Situational Awareness: Enhancing Guidance, Navigation, and Control of Unmanned Systems	Prof. Himabindu Allaka
	Interaction Session: (16:00 - 16:45)	

Prof. Ashok Kumar Pandey
IIT Hyderabad

Prof. Prasanth Kumar R
IIT Hyderabad

Prof. Venkatesham B
IIT Hyderabad

Prof. Chandrika Prakash Vyasarayani
IIT Hyderabad

Prof. Prakhar Gupta
IIT Hyderabad

Prof. Prabhat Kumar
IIT Hyderabad

Prof. Thulsiram G
IIT Hyderabad

Prof. Himabindu Allaka
IIT Hyderabad

भारतीय सांकेतिक विज्ञान संस्थ हैदराबाद
भारतीय प्रौद्योगिकी संस्थान हैदराबाद
Indian Institute of Technology Hyderabad

A Symposium on: Advanced Measurement Techniques in Dynamic, Vibration and Robotics

Prof. Kohei Shimasaki
Hiroshima University

Smart Inspection and Monitoring Using High-Speed Cameras

In this talk, I will introduce applications developed as part of the Smart Inspection and Monitoring Project at the Digital Manufacturing Education and Research Center of Hiroshima University. The presentation will cover technologies for "visualizing vibrations" and "wide-area simultaneous visualization" using high-speed cameras. Additionally, I will showcase case studies involving the detection of bearing abnormalities and rotor balance evaluation using a rotor kit, which is commonly used for vibration diagnostics certification by the Japan Society of Mechanical Engineers.

Prof. Prakhar Gupta
IIT Hyderabad

FLEX-GRIP: A Soft Robotic Gripper with Flexoelectric Effects

Flexoelectricity is a phenomenon of generation of polarization in dielectric materials subjected to non-homogeneous deformations. Unlike piezoelectricity, which requires a non-centrosymmetric crystal structure and responds to uniform strain, flexoelectricity depends on strain gradients and is particularly significant at large deformations and small scales. This makes it useful for applications in nanoactuators, sensors, and energy harvesting. The current work presents the mathematical modeling of a soft robotic gripper incorporating the flexoelectric effects. This study will provide valuable insight into optimizing gripping design for delicate object handling, robotics, and biomedical engineering applications.

Prof. Venkatesham B
IIT Hyderabad

Overview of Acoustic Research at IIT Hyderabad

The Acoustics Lab promotes research in Engineering Noise Control and Sound Quality, focusing on noise source identification using direct and inverse methods, path solution development, acoustic material characterization, and sound quality design. Its modular equipment allows customization for various tests. Research includes experimental, numerical, and theoretical studies to develop quieter solutions. We collaborate with industry to understand design challenges and create ready-to-implement solutions. A key focus is nature-inspired acoustics, such as low-frequency absorbers modelled after honeybee hives and leaf-inspired serrations for quieter drone propellers. The current research work is focussed on integrating the Data driven methods for source identification, Physics informed Neural network (PINN) for sound prediction in automotive applications.

Prof. Prabhat Kumar
IIT Hyderabad

A Systematic Approach to Design Pneumatically Actuated Soft Robots

Soft robots are constructed from flexible materials that generate movement through elastic deformations. They are utilized in a range of applications, such as handling delicate objects and navigating intricate or sensitive environments, and are typically powered by pneumatic or hydraulic forces. Despite the growing demand for soft robots across various engineering fields, their design remains largely manual due to the absence of systematic methodologies. We will introduce a systematic methodology for designing a single unit of pneumatically actuated soft robots, taking into account the design-dependent characteristics of the actuation.

Prof. Ashok Kumar Pandey
IIT Hyderabad

Dynamic Characterization of Micro to Macroscale Mechanical Systems

Measurement of dynamic systems involve accurate measurements of damping as well as resonance frequencies corresponding to different mode shapes. In our laboratory, we have performed vibration measurements of various mechanical systems at different length scales. For a microscale system, microcantilever of different shapes and types are measured under different pressure conditions using a micro scanning laser vibrometer. For a mesoscale systems, scanning laser vibrometer and accelerometer based systems were used to characterize beams in liquid, bolted structure, and tire, etc. In this talk, I will be presenting different examples showcasing these techniques in brief and will talk about the future requirement for more efficient measurements.

25 February 2025

C block, MAE, IITH | Conference Room,

भारतीय सांकेतिक विज्ञान संस्थ हैदराबाद
भारतीय प्रौद्योगिकी संस्थान हैदराबाद
Indian Institute of Technology Hyderabad

A Symposium on: Advanced Measurement Techniques in Dynamic, Vibration and Robotics

Prof. Chandrika Prakash Vyasarayani
IIT Hyderabad

Open-loop Centering of Parts on a Horizontally Vibrating Frictional Table

In this work, we study a particle sliding on a horizontally vibrating frictional table. This dynamical system has applications in parts manipulation within robotics and manufacturing. We first show numerically that, upon vibrating the table in a specific open-loop way, the particle moves to a target location under Coulomb friction alone. We then turn to analytical treatment of the system. The governing equations have strong nonlinearities due to the friction. We apply the method of multiple scales (MMS) near a 1: 2 resonance in two frequencies relevant to the forcing. Application of the MMS requires some difficult integrals, for which we develop asymptotic approximations. The MMS slow flow has logarithmic nonlinearities, is valid near the target location on the table, and is easy to integrate numerically since it retains parametric excitation only in slow time. The slow flow matches very well with full numerical solutions. This problem has a practical motivation, novel elements in the application of the MMS, a satisfactory slow flow.

Prof. Thulsiram G
IIT Hyderabad

Next-Generation NDE: AI-Enabled Phased Array Ultrasonic Imaging for NDE

Nondestructive Evaluation (NDE) techniques are vital for ensuring quality throughout the structural component lifecycle, from raw material inspection to finished product evaluation and in-service monitoring across diverse industries. Our group's research aims to focus on developing and deploying a robust NDE method for characterizing metal and composite structures. Specifically, we propose leveraging advanced phased array ultrasound imaging to enhance image resolution and minimize scanning time. Furthermore, we aim to integrate artificial intelligence algorithms to model ultrasonic wave dynamics, enabling the generation of rapid and accurate defect datasets to develop an automated defect recognition system."

Prof. Himabindu Allaka
IIT Hyderabad

Situational Awareness: Enhancing Guidance, Navigation, and Control of Unmanned Systems

Situational awareness is critical for the autonomy of unmanned systems, enabling them to perceive, analyze, and respond to dynamic environments. This talk explores how multi-sensor fusion enhances guidance, navigation, and control (GNC) by integrating vision-based sensing, radar, and IMU data. We discuss sea state estimation for real-time vessel stability, radar-vision fusion for obstacle detection, and dynamic modeling for adaptive decision-making. Beyond obstacle avoidance, these techniques enable proactive course and speed adjustments based on environmental conditions. A case study on ship navigation through waves and obstacles highlights the broader impact of sensor-driven autonomy across multi-domain unmanned systems.

CO-ORDINATOR
Prof. Himabindu Allaka
Assistant Professor, Office: 604, C-Block
Department of Mechanical and Aerospace Engineering
Indian Institute of Technology Hyderabad
Kandi - 502284, Sangareddy, Telangana, India
Mobile: +91 9000733709 , Email: Himabindu.allaka@mae.iith.ac.in,

25 February 2025

C block, MAE, IITH | Conference Room,