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TiHAN IIT HYDERABAD

भारतीय सांकेतिक विज्ञान संस्थ हैदराबाद

भारतीय प्रौद्योगिकी संस्थान हैदराबाद

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NMICPS Technology Innovation Hub on Autonomous Navigation Foundation (TiHAN) at IIT Hyderabad

Funded by DST National Mission on Inter-Disciplinary Cyber Physical Systems

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TiHAN-IITH: Vision

Hub for Safe, Sustainable, Smart Next Generation Mobility

Real-time Autonomous Navigation and Data Acquisition Systems (Unmanned - UAVs, ROVs, etc.)

Quality Data Acquisition for Aerial/Terrestrial Mobile Environments Multi-sensory Perception Scenario (UAVs, ROVs.), AI Framework, Real-time Edge Compute Architecture, Communication Networking, Testing Validation, Simulators (Virtual/Physical), Design

Standard Operating Procedures (Autonomous UAVs, ROVs, etc.)

Testbed/Living Labs for Autonomous Navigation Systems (Aerial and Terrestrial Vehicles)

Autonomous Transportation Systems (Aerial/ Terrestrial/Surface)

Agriculture & Farming
Infrastructure & Environment
Defence & Surveillance

Re-imagine ways of working with industry and academic partners to accelerate change

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TiHAN – IITH: Activities

TiHAN-IITH: Source for fundamental knowledge and technologies (IPs, Publications, Products, Commercialisation as Licencing, ToTs…) in the technology vertical of *Autonomous Navigation and Data Acquisition Systems*.

… and we do this every day

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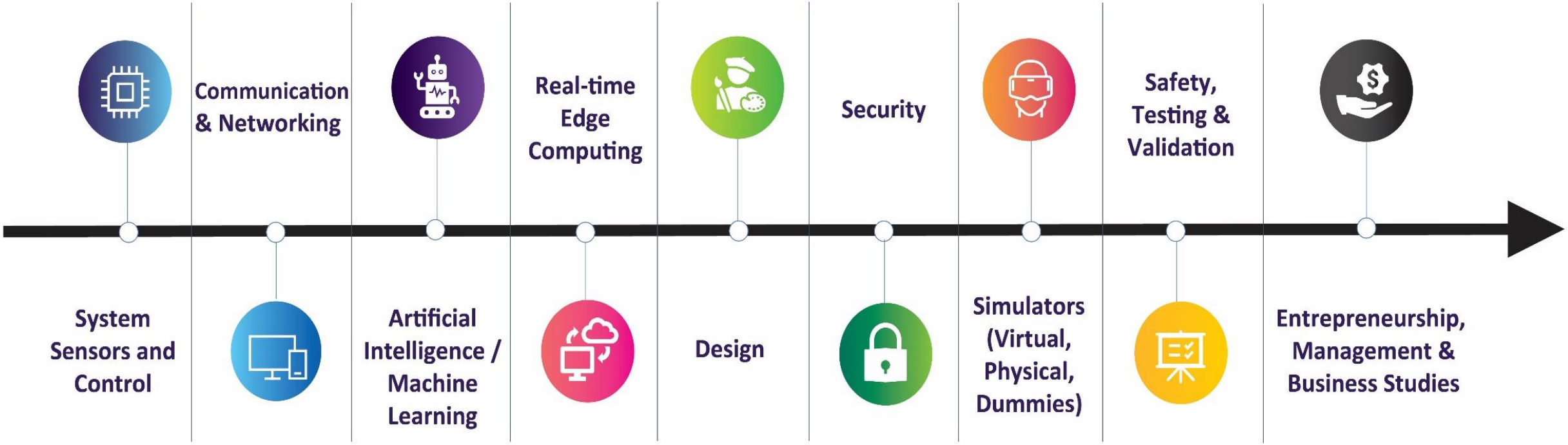
TiHAN Core Research/Work Groups



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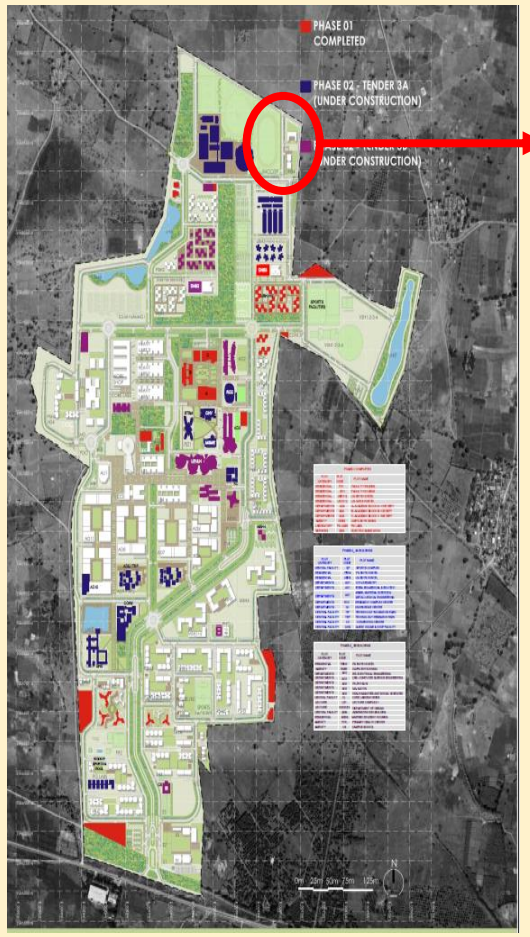
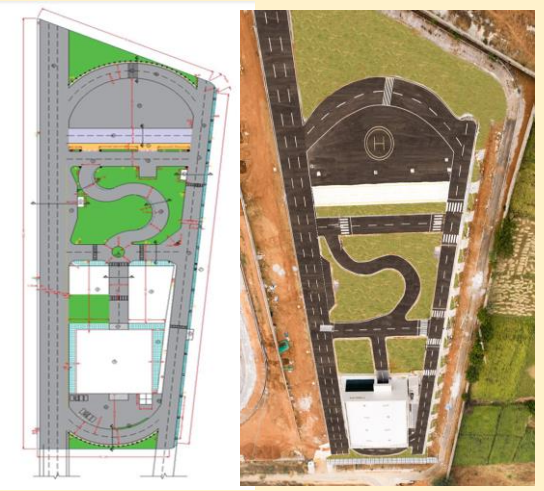
1. Autonomous Navigation Testbed (Aerial/Terrestrial) at IITH

Testbed Facility

- A first of it's kind state-of-the-art testbed for Autonomous Navigation (Aerial/Terrestrial)
- Technology development and thorough validation before going for real field deployment
- Facilities include – Proving Grounds, Test tracks, Mechanical integration facilities like Hangers, Ground control stations, State of the art Simulation tools (SIL, MIL, HIL, VIL), Test tracks/circuits, Road Infra – Smart Poles, signalized & unsignalized Intersections, Environment Emulators like Rainfall Simulators , V2X Communications, Drone Runways & Landing area, Control Test centers…





Location of Testbed Within IITH

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2. TiHAN Testbed Inauguration Events

विज्ञान एवं प्रौद्योगिकी विभाग
DEPARTMENT OF SCIENCE & TECHNOLOGY

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NMICPS TECHNOLOGY INNOVATION HUB ON AUTONOMOUS NAVIGATION (TiHAN) FOUNDATION - IIT HYDERABAD

Prof. BS Murty, Director, IIT Hyderabad
solicits your august presence for inauguration of

TiHAN - IITH AUTONOMOUS NAVIGATION TESTBED (AERIAL & TERRESTRIAL)

04th JULY 2022

Chief Guest

Dr. Jitendra Singh
Hon'ble Minister of State (Independent Charge) for Science and Technology & Earth Sciences

In the presence of

Dr. Srivari Chandrasekhar
Secretary, Dept. of Science & Technology (DST) Government of India

Dr. B.V.R. Mohan Reddy
Chairman, Board of Governors, IIT Hyderabad

Schedule

11:00 AM	• Inauguration of TiHAN-IITH Testbed on Autonomous Navigation (Aerial & Terrestrial) • Technology Demonstrations - Autonomous Electric Shuttle Vehicle - Unmanned Aerial Vehicle/Drones Bio-inspired Micro/Nano drones, Air-Cargo Drones, Accurate Navigation and Landing, BVLOS - Autonomous E-Bike - Autonomous Humanoid Robot - Tour of Test Track
11:40 AM	Proceeding to A-Block Auditorium
11:45 AM	Welcome address by Prof. BS Murty – Director IITH
11:48 AM	R&D at IITH by Prof. Kiran K Kuchi – Dean (R&D)
11:51 AM	Brief on TiHAN-IITH by Prof. P. Rajalakshmi - Project Director
11:54 AM	Address by Dr. BVR Mohan Reddy - Chairman, BoG, IITH
11:59 AM	Address by Dr. Srivari Chandrasekhar - Secretary, DST
12:09 PM	Address by Dr. Jitendra Singh Hon'ble Minister of State (Independent Charge) of the Ministry of Science and Technology & Earth Sciences
12:24 PM	Vote of Thanks – Prof. Raja Banerjee, Dean (Administration)
12:27 PM	National Anthem

Click here to Join : https://youtu.be/IUvcs40w9NQ

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TiHAN Testbed Inauguration Events

Foundation stone for the TiHAN Testbed for Autonomous Navigation Systems was laid on December 29, 2020 by Shri Ramesh Pokhriyal 'Nishank', Honorable Minister of Education, Govt. of India at IIT Hyderabad

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TiHAN Testbed on Autonomous Navigations

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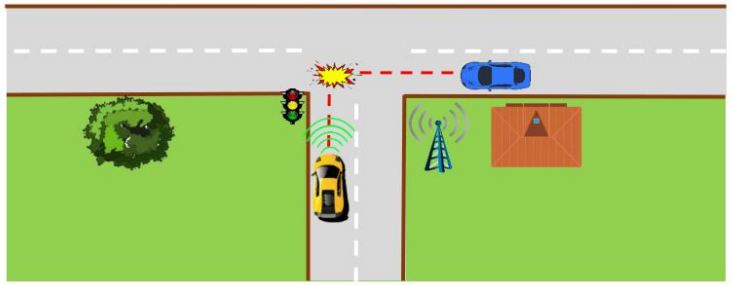
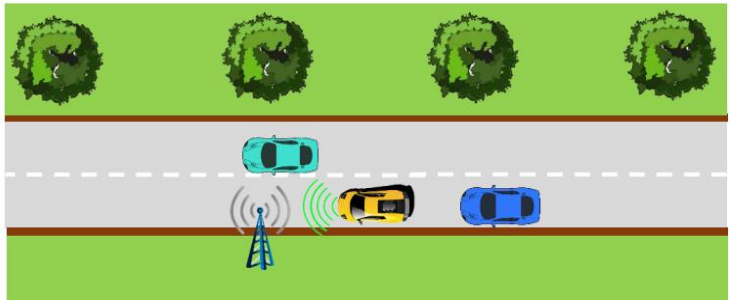
Some Use Cases at TiHAN Testbed:

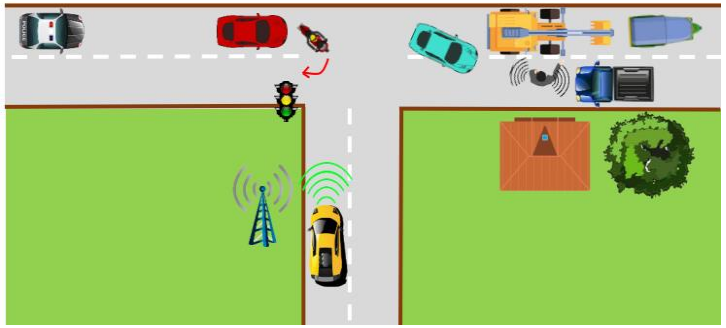
(a) Intersection Collison Warning



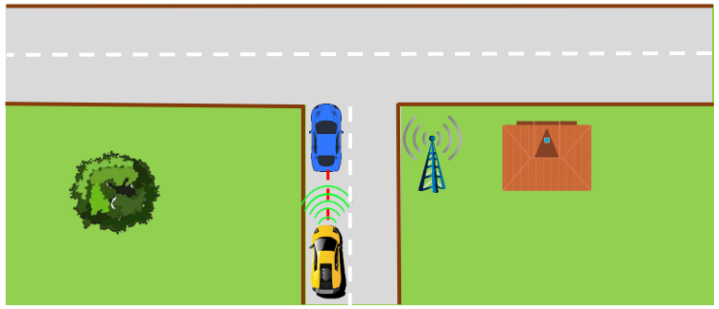
(b) Lane Change Warning



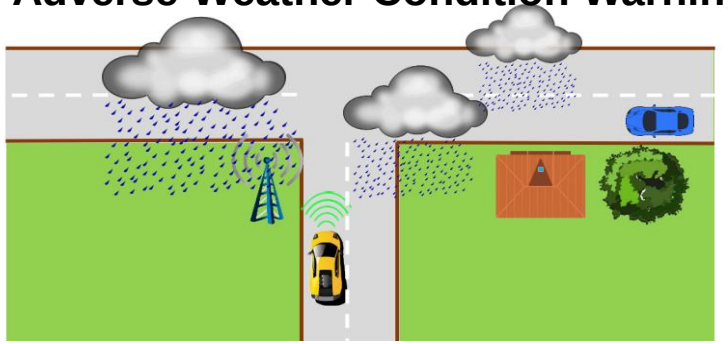
(f) Traffic Condition Warning



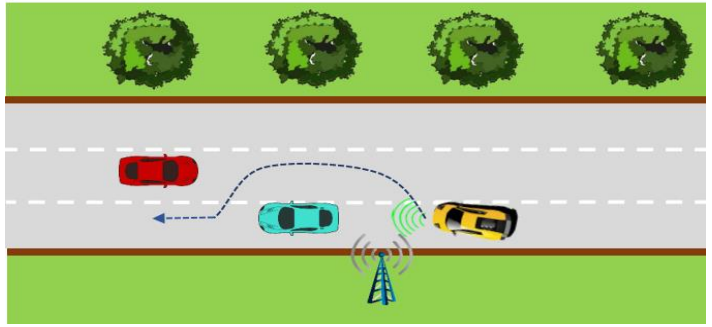
(c) Co-operative forward Collison Warning



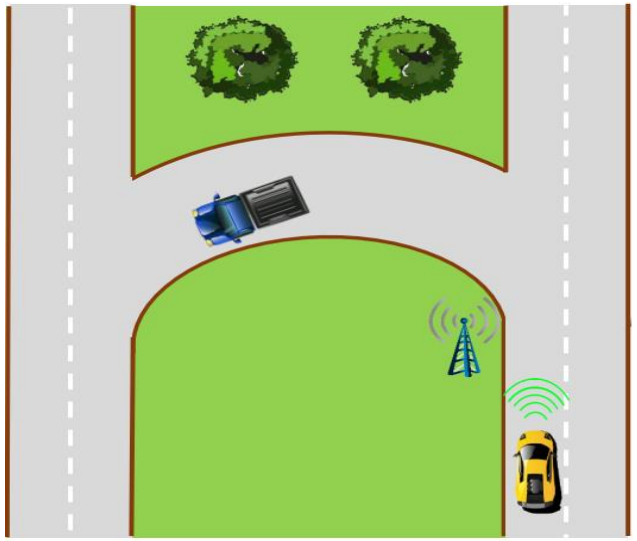
(d) Adverse Weather Condition Warning



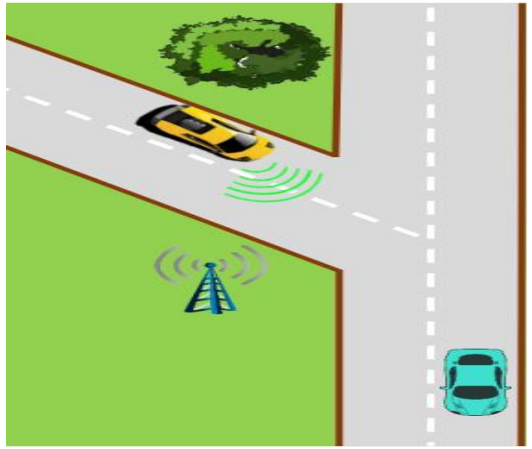
(h) Overtaking Vehicle Warning



(e) Curve Speed Warning



(g) Merging Traffic Warning



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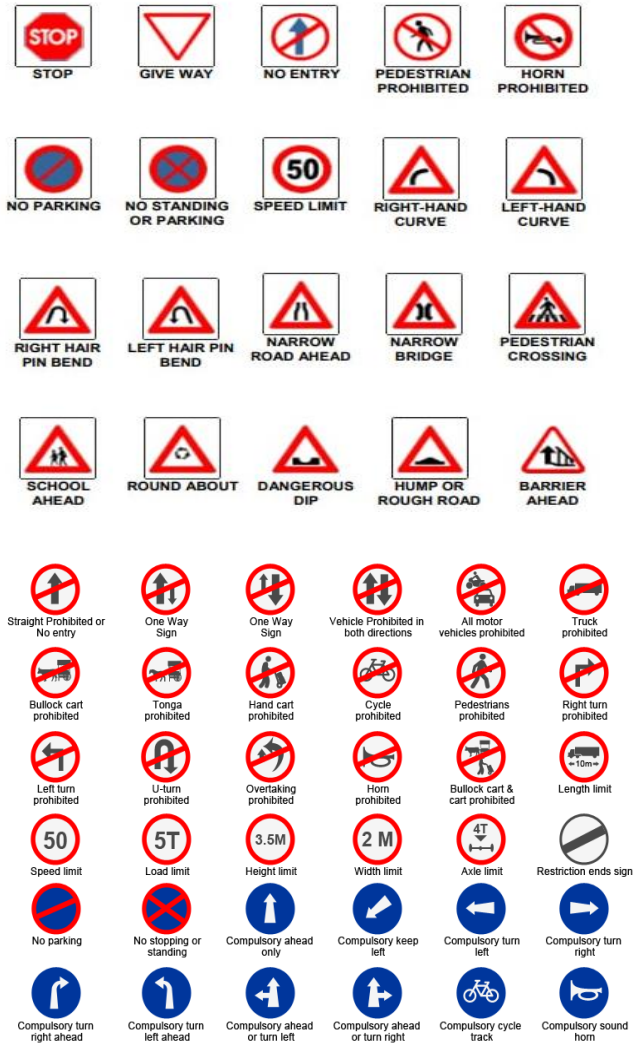
Indian Traffic Sign Detection and some Indian Road Conditions



(a) **Speed Bumper Detection**

(b) **Pothole Detection**

(c) **Indian Road Marking Detection**

(d) **Behavior of Autonomous Vehicles in Rain, Snow and Fog Conditions**

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2. Autonomous Ground Vehicles (AGVs)

Autonomous System on Vehicle (SoV) - Research and Development: Testing and Validation in Testbed for different levels of autonomy

Autonomous Electric Vehicles

Autonomous/Smart Campus Shuttle E-cart

SIL/MIL/HIL/VIL, Testing and Validation, SAE/ISO, Indian Scenarios: tight integration with the system architecture development

(Feasibility for configuring various sensors and their placement. Support for different computing platforms with use cases)

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AGVs R&D in TiHAN Testbed - Ongoing

M1 Category – Car to Pedestrian

M1 Category – Car to Car

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3. Autonomous Aerial Vehicles (UAVs)

Small category drones (2-25 Kg)

Quad Wing Dragonfly

Flapping Wing MAVs

Bio Inspired Flapping Wings UAVs

Hyperspectral on Drone

Lidar on drone

Unmanned Aerial Vehicle Research at TiHAN

Complex structure, stability, Integration of payload & capacity, Increased sensor complexity and integration, Limited power, Endurance, hybrid fuel, Operational Range, communication and control links, Compute Platforms

Micro and Nano Drones Bio-Inspired Flies (<2Kg)

Next Gen Hybrid Mobility Ground & Aerial Vehicle (Flying Cars)

TIHAN (PAV) Personalised Air Vehicle for Urban Air Mobility (UAM)

TIHAN Air Cargo – Heavy Payload Applications

Medium and Large Drones (above 25 Kg)

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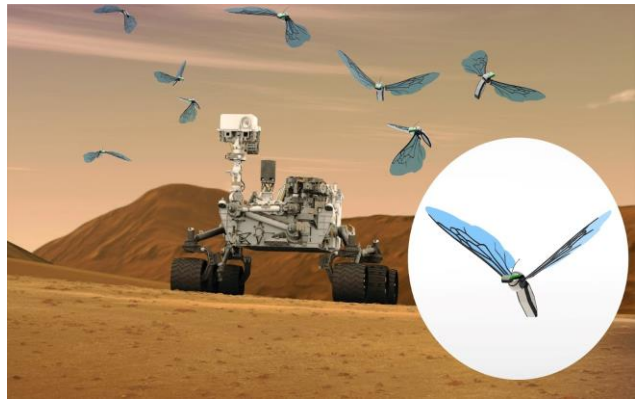
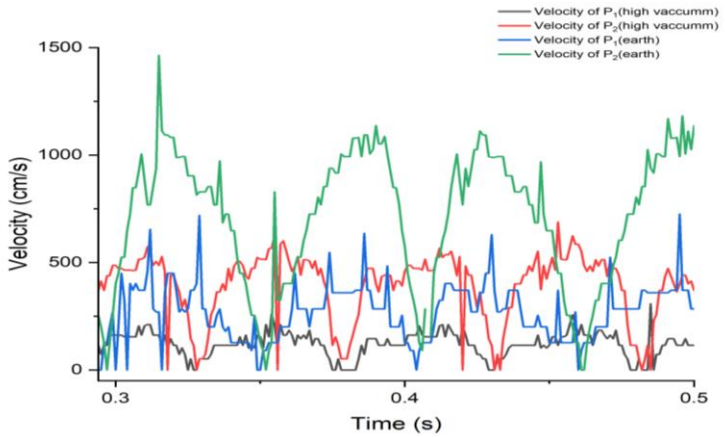
Autonomous UAVs - Ongoing

Bio-inspired Flapping Wings UAVs

Precision Landing of UAVs

3. Bioinspired MAVs/NAVs for Space Applications: Presented in NASA Mars Exploration Conference, March 2022, Pasadena, USA





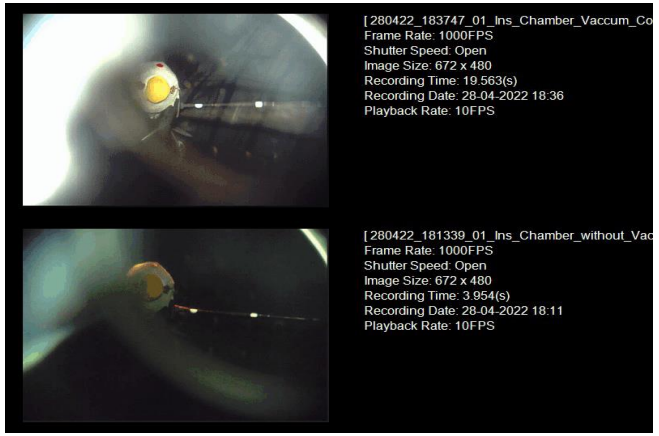
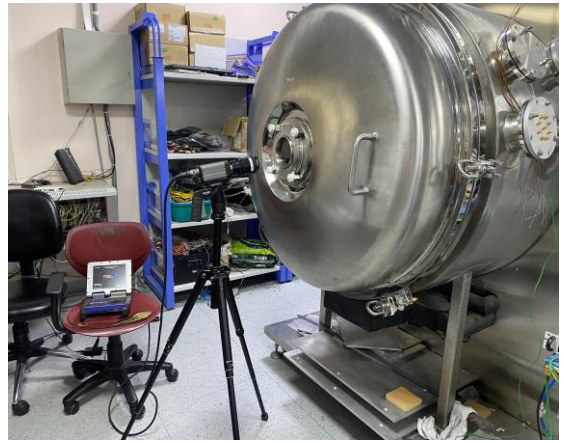


Fig. Bioinspired Quad wing testing in vacuum conditions



Ref: Naga Praveen Babu Mannam, Prasanth Kumar D, P Rajalakshmi. (2022). A Low-Cost Bioinspired Dragonfly Concept for Mars Exploration: Analogous to Mars Ingenuity Helicopter. Low-Cost Science Mission Concepts for Mars Exploration, March 29 - 31, 2022, Pasadena, USA.

Some Industry Visits/Collaborations to TiHAN IITH

Suzuki Motor Corporation (SMC) Japan Visit

Continental - UK team

Dr. Derrick, Science Director, Naval Research Global, US Embassy Singapore

ZF along with German team Visit

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Visit of Dr. Kris Gopalakrishnan to TiHAN during IITH Foundation Day 9 April 2022

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4. TiHAN collaboration with ICRISAT for UAV Based Agricultural Research

ICRISAT (International Crop Research Institute for Semi-Arid Tropics) received project from TiHAN in 2021 for developing pipeline for UAV based field phenotyping of dryland crops. Dryland crops are crop of poorest and smallholder farmers mainly dual type (grain and stover). The crop improvement is comparatively slow due to manual phenotyping in breeding process. UAV based phenotyping can leverage the rapid improvement in yield and stover for livestock.

The work has been showcased during PM Shri Narendra Modi Ji visit to ICRISAT Hyderabad.

UAV based field phenotyping research at ICRISAT and TiHAN

Prime Minister Shri Narendra Modi visit to ICRISAT- Update on UAV based Digital technologies .

5. Outreach and Skill Development Programs

Skill on Wheels for ZPH School at Sangareddy

UGV Kit

UAV Kit

- School Education Department, Sangareddy District, Govt of Telangana has given permission to TiHAN to conduct Skill on wheels programmes to Zila parishad schools in Sangareddy to educate the young minds on autonomous vehicles.
- The first Skill on Wheels programme was successfully conducted on April 20th 2022 at Government School Sangareddy. The workshop will provide opportunities for children to interact with resource persons of IIT Hyderabad and get hands-on experience working with autonomous vehicles (UAV and UGV). https://tihan.iith.ac.in/skill-on-wheels/
- Conducted 25 skill development programs at various levels in the area of autonomous navigations

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5. M.Tech Program in Smart Mobility

- TiHAN in collaboration with IIT Hyderabad has established a New Interdisciplinary 2-year M. Tech program on Smart mobility which is first of its kind in the country.
- Different departments of IITH- Computer Science, Civil Engineering, Electrical Engineering, Mathematics, Mechanical & Aerospace, Design, Entrepreneurship
- First batch of SM 2020 has achieved 100% placement in core/prominent companies.

End to End Connectivity : Multi-modal Transportation Solutions for Indian Scenarios – Going Forward

- **Energy efficient autonomous navigation enabled different modes of Electric Vehicles:**

e-bike

UAM Based PAV

UAM Based PAV

Autonomous Cars

e-bike

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TiHAN - IITH

Destination for Next Generation Mobility Solutions

Platform for collaborative research between Academia, Industry, R&D Labs – National and International

For more details: https://tihan.iith.ac.in/

Email: office.tihan@iith.ac.in, tihan.pd@iith.ac.in

Social Media's Link

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Linkedin: https://www.linkedin.com/company/tihan-iit-hyderabad/

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