विज्ञान एवं प्रौद्योगिकी विभाग
DEPARTMENT OF
SCIENCE & TECHNOLOGY
सत्यमेव जयते

National Mission On
Interdisciplinary Cyber-Physical Systems (NM-ICPS)

National Mission On Interdisciplinary Cyber-Physical Systems

Quarterly Bulletin - July 2024

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National Mission on Interdisciplinary Cyber-Physical Systems (NM-ICPS)

ENVIRONMENT

Technology Innovation Hub
IITG TIDF

EDUCATE . INNOVATE . IMPACT
IIT Palakkad Technology IHub Foundation
Driving automation for energy and safety

AGRICULTURE

AWaDH
Agriculture and Water Technology Development Hub

TIH Foundation
for IoT & IoE

DEFENCE

the innovation hub

I-HUB
QUANTUM
TECHNOLOGY
FOUNDATION

3i Hub

INFRASTRUCTURE

PRAVARTAK
CATALYSING INNOVATION

IIITB COMET
FOUNDATION

HUBDATA
IIIT HYDERABAD

ARTPARK

HCI

IIT Tirupati
Navavishkar
I-Hub Foundation

TEXMiN

TiHAN
IIT HYDERABAD

IHFC

iHub Anubhuti-
IIITD Foundation

TIH
iHub Drishti

HEALTHCARE

BITS
BioCyTiH
Foundation

About

National Mission on Interdisciplinary Cyber-Physical Systems(NM-ICPS)

The Union Cabinet has approved the National Mission on Interdisciplinary Cyber-Physical Systems (NM- ICPS) in December 2018 at a total outlay of Rs.3660 Crores for a period of five years to be implemented by Department of Science and Technology (DST).

Under the NM-ICPS, 25 Technology Innovation Hubs (TIHs) have been established in reputed institutes across the country. Each hub is a Section-8 Company, an independent entity within the Host Institute and has been assigned a Technology Vertical in the areas of advanced technologies such as Artificial Intelligence and Machine Learning: Technologies for Internet of Things & Internet of Everything; Data Banks & Data Services, Data Analysis; Robotics & Autonomous Systems; Cyber Security and Cyber Security for Physical Infrastructure; Quantum technologies etc.

The Mission aims at development of technology platforms to carry out R&D, translational research, product development, incubating & supporting start-ups as well as commercialization. The Mission is being implemented with all the TIHs undertaking activities under the four major categories i.e., **1. Technology Development 2. Entrepreneurship Development 3. Human Resource Development 4. International Collaborations.**

Objectives of the Mission:

1. Technology Development, translational research and commercialization in Cyber-Physical Systems (CPS) and associated technologies
2. Adoption of CPS technologies to address India specific National / Regional issues.
3. Produce Next Generation skilled manpower.
4. Catalyze Translational Research.
5. Accelerate entrepreneurship and start-up ecosystem development in CPS technologies.
6. Give impetus to advanced research in CPS technologies and higher education in Science, Technology and Engineering disciplines.
7. Bring India at par with other advanced countries and derive several direct and indirect benefits.

NM-ICPS is a comprehensive mission that brings together Academia, Industry, Government and International Organizations. The mission has created an ecosystem that fosters entrepreneurship, develops next generation skilled manpower, catalyses translational research and promotes the commercialization of CPS technologies. NM-ICPS is an ambitious initiative that has the potential to transform key sectors of the Indian economy like healthcare, transportation, education, infrastructure & defence make them more efficient, safe, and sustainable to place India at par with other advanced countries.

CONTENT

Environment

Agriculture

Defence

Infrastructure

Healthcare

Environment

“Sustainable Solutions, Digital Evolution: Nurturing Our Planet with Technology”

IIT Guwahati

Technology Innovation and Development Foundation

Theme: Environment

Technology Innovation Hub
IITG TIDF

Scan here

Hub Overview

Technology Innovation and Development Foundation at IIT Guwahati is dedicated to advancing Technologies for Underwater Exploration.
Projects range from developing underwater robots for tracking, surveillance, and monitoring to applications in defense research, earth science, health research, renewable energy, tourism, shipping, and skill development. The hub focuses on creating cost-effective solutions through research & development. Cyber-Physical Systems take center stage, integrating underwater computer vision, communication technologies, artificial intelligence, IoT, and diverse robotic systems for groundbreaking advancements in underwater technology.

Startups:

Intech Harness Private Limited

Intech Harness Private Limited, a startup supported under the TIH is working with the State Government of Gujarat in scaling the installation of its auto tech pumping controller switch for groundwater management technology in Bhuj under Atal Bhujal Yojana with 250 installations planned in phase-I. The startup has also signed an MoU with Indian Council of Agricultural Research (ICAR).

Human Resource & Skill Development:

Advanced Program on Entrepreneurship for Women

In collaboration with the Embassy of Israel, TIH at IIT Guwahati organized a program to empower women entrepreneurs with skills for sustainable business practices. The initiative covered green business models and eco-friendly product development.

Skilling Women Entrepreneurs

Drone/Anti-Drone Workshop

Workshop on Drones

The Drone/Anti-Drone Workshop at IIT Guwahati, hosted by TIH, delved into the strategic applications of drone technology in defence operations. Attendees gained insights into utilizing drones for surveillance, reconnaissance, and security missions, along with learning counter-drone strategies to mitigate threats. The workshop highlighted the integration of advanced drone technologies in bolstering national security and emphasized their pivotal role in environmental protection tasks like forest surveillance and pollution monitoring, showcasing their diverse benefits in defence and environmental conservation.

IIT Palakkad

IIT Palakkad Technology IHub Foundation (IPTIF)

Theme: Environment

IIT Palakkad Technology IHub Foundation
Driving automation for energy and safety

Scan here

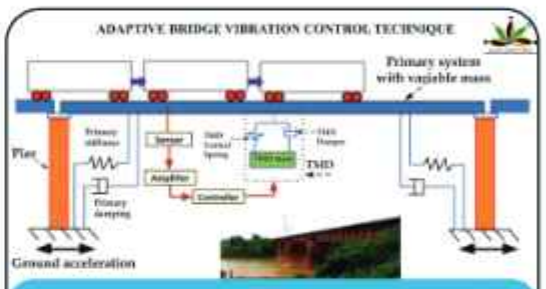
Hub Overview

IIT Palakkad Technology IHUB Foundation (IPTIF) works on Intelligent Collaborative Systems (ICS) aims to create a strong foundation and a seamless ecosystem for Cyber-Physical Systems, attracting available nationwide potential and harnessing expertise to foster research innovation, technology, and product development. IPTIF is dedicated to enabling a vibrant innovation ecosystem by providing a reliable platform for developing technologies on ICS, with special focus on energy and safety domains, thereby creating a value for the local, national and international ecosystem.

Project Updates:

Adaptive Feedback-Based TMD System for Passive Control of Rail Bridge Vibration

The TIH is developing a vibration absorption system that provides the optimum tuning effect under variations in the system properties during any dynamic excitation under random load. Bridge structure is subjected to wide frequency band of excitation due to moving load, random excitations.



Vibration Absorption System

Startups:

Breeze Power Mills

Breeze Power Mills, a startup supported by the TIH has developed Breeze Mill - Low wind Speed Turbine that captures even the gentle breeze to give power from wind speeds as low as 3.0 km/hr, hitting peak performance at 11 km/hr, and continuing to do so up to 60 km/hr. Designed and tested over 8 long years, the machines are fine-tuned to convert breeze into electricity with unrivaled efficiency. India being a low wind speed area, the crucial aspect of the research has been to make the blade form capable of extracting maximum energy from the lowest wind speed possible.


Breeze Mill

Skill Development:

IIT Palakkad Technology IHub Foundation (IPTIF), in association with the Research Innovation Network Kerala and the Kerala Startup Mission conducted a one-day workshop on Faculty Entrepreneurship at IIT Palakkad. The event was a special congregation of faculty-led startups and potential faculty founders in the region to discuss the opportunities and challenges of running a deep-tech startup. Over 180 participants attended the workshop.


Faculty Entrepreneurship Workshop

Environment Agriculture Defence Infrastructure Healthcare

Agriculture

"Innovative technology in agriculture enables farmers to optimize efficiency, reduce waste, and increase yields"

IIT Ropar

IHub Agriculture And Water Technology Development Hub(AWaDH)

Theme: Agriculture

AWaDH
Agriculture and Water Technology Development Hub

Scan here

Hub Overview

The goal of iHub - AWaDH is development of technologies to support environmentally sustainable and profitable agriculture, quality food for all, and the preservation of biodiversity. It aims at providing technological solutions to the Agricultural & Water related issues through deployment of CPS in Food Processing, Rural Development, Fisheries, Textiles, Electronics, Fertilizer, Atomic Energy etc.

Project Updates:

Wireless Soil Moisture Node

The TIH has developed a Wireless Soil Moisture Node. This module measures soil moisture through capacitance changes, offering wireless connectivity and extended battery life. Data is sent to an AWS cloud gateway for AI-based crop health forecasts, benefiting agriculture, landscape irrigation, greenhouse management, and soil health monitoring.

Soil Moisture Sensor

Startups:

INDRA - Revolutionizing Wastewater Management

INDRA Water Systems Private Limited, incubated at iHub - AWaDH, is revolutionizing decentralized wastewater treatment. INDRA's SPECTRUM technology integrates CPS for real-time efficiency while transforming wastewater management in India.


Decentralized Wastewater Treatment Plant

Deployment:

Autonomous Biodiversity Monitoring Device

The CPS device "Biodiversity Scanner," the world's first 24/7 autonomous biodiversity monitoring device, is experiencing a global surge. This device has been developed by the TIH in collaboration with Syngenta, and its deployments are rapidly expanding. This quarter saw over 100 devices shipped, with deployments in key locations like Switzerland, Australia, and the UK. This significant increase strengthens the scanner's global impact on automatic species identification.


Deployment in Australia

IIT Bombay

Technology Innovation Hub for IoT and IoE

Theme: Agriculture

TIH Foundation for IoT & IoE

Scan here

Hub Overview

The goal of the TIH is to create a self-sustaining IoT and IoE entrepreneurship ecosystem, increase Technology Readiness Levels (TRLs) in IoT R&D to build and commercialize reliable IoT products. Technology developments are currently aligned with the needs of the industry and has also developed a uniquely structured four-level IoT course.

Project Updates:

SAMADHAN System

SAMADHAN, developed under the TIH is an end-to-end IoT system for the management of grapevine yards to mitigate the challenges of climate extremities, improper management of irrigation and fertigation. The canopy microclimate monitoring sensors along with soil moisture, EC, pH and NPK sensors give real-field conditions of the farmland on i-SARATHI mobile app. The system can be used to make smart decisions based on the real-field data for water management, prevention of diseases prone to unpredictable changes in weather conditions. The system is compact, low-cost, solar-powered system and rain-dust proof. SAMDHAN systems have been deployed at National Research Centre for Grapes, Pune and more systems are planned to be deployed.

SAMADHAN system deployment at National Research Centre for Grapes, Pune

Startups:

Segritech

Segritech, a startup supported by the TIH specializes in hardware AI solutions tailored for the quality inspection of post-harvest perishables, notably fruits and vegetables. Their flagship product is cost-effective and portable smart sorting machine capable of handling over 10 varieties of produce. Specifically designed for farm-level processing, the machine integrates computer vision and deep learning technologies to ensure precise sorting and grading.

Segritech Machine

Environment Agriculture Defence Infrastructure Healthcare

Defence

"The integration of advanced technology in defense is crucial for national security, strategic advantage, and civilian protection"

IIT Roorkee

Divyasampark IHub Roorkee for Devices, Materials and Technology Foundation

Theme: Defence

Scan here

Hub Overview

iHUB DivyaSampark at IIT Roorkee is a Technology Innovation Hub that aims to enable innovative ecosystem in CPS and becoming the source for the next generation of digital technologies, products and services by promoting translational research, enhancing core competencies, capacity building, training to provide solutions for national strategic sectors and becoming a key contributor to 'Digital India' and 'AatmaNirbhar Bharat'. The Hub is working as a networked platform, acting as a cushion between different stakeholders like researchers, industry, start-ups, policymakers, investors (Angel, VC, PE) and opening doors for global partnerships to push the boundaries of innovation.

Project Updates:

Campus Immersion Program

The TIH has established two additional spokes at HNB Garhwal University and BITS Pilani, expanding the innovation ecosystem to a family of 26 spokes.

Spoke at BITS Pilani

Startups:

Dtown Robotics Private Limited

The incubated startup unveiled their first nano-category commercial UAV system, NUNO 4K on June 1st, 2024, from Dehradun, featuring indigenous technology for all-inclusive services and maintenance.

NUNO 4K drone

About NUNO 4K drone: Weighing under 249 grams, it boasts a 4K camera with a CMOS 1/3" sensor, 32-minute flight time, and a 4 km range. Equipped with advanced failsafe features and a robust Ground Control Station, it's designed for defence applications like surveillance and reconnaissance, setting new standards in UAV technology.

Ballice Smart Devices Private Limited

Ballice Smart Devices Pvt. Ltd., an incubated startup under the TIH has developed a fully automated, cost-effective fire sensing and testing system. This innovative system is now operational at the National Institute of Solar Energy (NISE).

Fire Sensing and Testing System

IISER Pune

I-Hub Quantum Technology Foundation

Theme: Defence

I-HUB QUANTUM TECHNOLOGY FOUNDATION

Scan here

Hub Overview

I-HUB Quantum Technology Foundation is a section-8 company hosted by IISER Pune and funded by the Department of Science and Technology, Government of India under the National Mission on Interdisciplinary Cyber-Physical Systems.

I-HUB QTF promotes development of Quantum Technologies through four verticals: Quantum Information & Metrology; Quantum Communications; Quantum Materials & Devices; and Enabling Technologies; and via these aims to harness the quantum phenomena to develop advanced computing systems as well as for more immediate applications in precision sensors, navigation devices for GPS, geological mapping, atomic clocks, encrypted communication and novel materials. Beyond technology development, the Hub facilitates technology translation, incubation and human resource development.

Human Resource & Skill Development:

Train the Trainer Workshop

The workshop was jointly organized by I-HUB QTF and NVIDIA, aimed at preparing individuals for the era of Quantum Computing. 40+ faculties/scientists from 30+ institutions were trained. This, in-person, hands-on workshop featured engaging talks and tutorials.

Train the Trainer Workshop

Online Certification Course on Quantum Computing

The TIH has recently launched an online certification course on “Introduction to Quantum Computing”. This online certification course, delivered by frontline researchers in the field, offers a broad introduction to this rapidly evolving area.

Online Course on Quantum Computing

Workshop on Capacity Building in Quantum Technologies

I-HUB QTF organized a Workshop on Capacity Building in Quantum Technologies at IISER, Pune. This exercise was organized in associationwith the Department of Higher & Technical Education, Govt. of Maharashtra, to fully equip the state technological universities for the future in quantum technology, as capacity building and skill development is critical for the state to achieve their goal to be quantum ready.

Workshop on Capacity Building in Quantum Technologies

IIT Kanpur

C3iHub
(IHUB NTIHAC Foundation)

Theme: Defence

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Hub Overview

C3iHub (Cybersecurity and Cybersecurity for Cyber-Physical Systems Innovation Hub) addresses cybersecurity issues of the Cyber-Physical Systems and devises technologies to protect. C3iHub focuses on verticals: critical infrastructure-security, automotive-security, UAV-security, tamper-proof data storage and cybercrime prevention, and associated horizontal layers: hardware security, network security, firmware security, etc.

Project Updates:

Digital Degree Wallet App

C3iWallet Launched

C3iHub launched Digital Degree Wallet App (C3IWallet) in the 57th IIT Kanpur Convocation. More than 2000 students were awarded the blockchain-powered Self Sovereign Identity (SSI) digital degrees. C3IWallet securely stores the degrees, certificates in students' Android or iOS wallets, allowing them to verify their degrees easily. With QR codes generated from user's verified credentials, C3IWallet simplifies credential verification procedure. The degrees are instantly sharable, and globally verifiable.

Startups:

BlockStash Intelligence

C3iHub's start-up BlockStash Intelligence has developed blockchain-based first-ever indigenous cryptoforensic tool (BROWSE by BlockStash) that provides 24/7 monitoring of crypto transactions and investigation of cryptocrimes. The tool offers exclusive features assisting LEAs, e.g., multi-blockchain explorer, address tagging, case management, auto investigation, network visualization, address clustering and report generation. Blockstash collaborates with over ten LEAs. West Bengal and Telangana Police have procured the tool for five years.

Crypto Transaction Network Visualization in BROWSE Dashboard

Collaborations:

C3iHub IIT Kanpur, Chhatrapati Shahu Ji Maharaj University (CSJMU) Kanpur, and Chhatrapati Shahu Ji Maharaj Innovation Foundation (CSJMIF) have signed a tripartite MoU to offer a vocational course on cybersecurity to students at CSJMU Kanpur University, targeting nearly 50,000 participants.

Environment Agriculture Defence **Infrastructure** Healthcare

Infrastructure

"Infrastructure is the backbone of economic growth. It improves access to basic services such as clean water & electricity, creates jobs & boosts business"

IIT Madras

IITM Pravartak Technologies Foundation

Theme: Infrastructure

Scan here

Hub Overview

IITM Pravartak Technologies Foundation is the Technology Innovation Hub (TIH) of IIT Madras. IITM Pravartak focuses on new knowledge in SNACS through extensive and application-oriented research and gladly prepares young India for the next generation of world-class technologies. IITM Pravartak contributes to the areas of national priority such as health care, agriculture, education, infrastructure and upskilling, including targeted training for economically weaker sections.

Startups:

TuTr Hyperloop Private Limited

Hyperloop is a proposed high-speed transportation system for both passengers and freight using capsules supported by an air-bearing surface within a low-pressure tube. TuTr Hyperloop Private Limited is a startup building a pod prototype with a maximum speed capability of 150 kmph. It has a standard power train of 650V which is a full-scale specification. It is a magnetic levitating vehicle with a total weight of 1.2 tons. The shell design is inspired by a falcon and analysed in CFD to reduce the drag. Currently, the startup is in discussion with Indian Railways, Southern Railways & Kolkata Metro for deployment of the technology in the real world application.

Pod Prototype Developed by the Startup

Collaborations:

IITM Pravartak Technologies Foundation has partnered with SLASSCOM (Sri Lanka Association of Software and Service Companies), a driver of innovation, knowledge and growth for the entire IT industry in Sri Lanka for establishing collaborative Centres of Excellence, joint academic programs, student exchange programs and a vibrant startup ecosystem with skilling in cutting-edge technologies.

IIIT Bangalore

IIITB COMET Foundation

Theme: Infrastructure

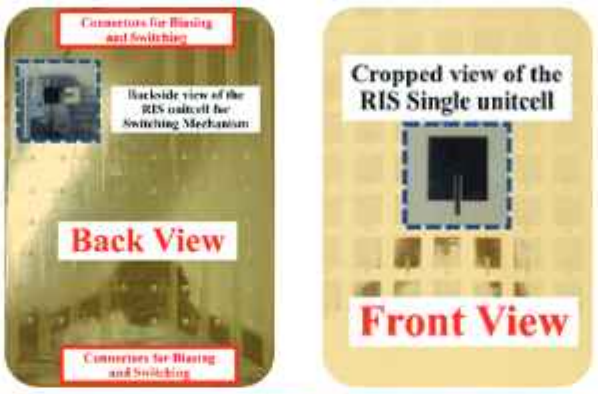
IIITB COMET FOUNDATION

Scan here

Hub Overview

IIITB COMET Foundation is set up to spearhead innovations in the next generation of communication systems, indigenously develop technologies to power 5G communication address the critical demand of seamlessly connecting people, businesses & industries, and lay the foundations for 6G networks. IIITB COMET Foundation initially is focusing on the verticals of 5G infrastructure as well as 5G applications such as Industrial IoT, eHealth, education, automotive V2X, AI/ML and AR/VR.

Project Updates:



Prototype Reconfigurable Intelligent Surface (RIS)

IIITB COMET Foundation has fabricated a prototype Reconfigurable Intelligent Surface (RIS). RIS is one of the foundational technologies for 5G-Advanced and 6G mobile networks. The fabricated prototype is currently under testing and will be refined in further iterations.

Events:

IIITB COMET Foundation conducted the "COMET 5G Springboard 3.0" event to attract start-ups and entrepreneurs in the Advanced Communication Systems (ACS) and allied areas for possible incubation and funding support. COMET is in the process of onboarding a cohort of 5 start-ups based on detailed technical and business review.

COMET 5G Springboard 3.0

Collaborations:

IIITB COMET Foundation entered into discussions with IICT (International IoT Communication Technologies), Germany. COMET and IICT are discussing possible collaborations to (i) offer training programs in IoT and related data analytics; (ii) offer certification programs for start-ups and entrepreneurs who are looking to benchmark their IoT solutions/products; and (iii) jointly undertake Indo-German project ventures under the 2+2 model.

Visit from IICT for Collaboration

IIIT Hyderabad

IHub-Data

Theme: Infrastructure

HUBDATA
IIIT HYDERABAD

Scan here

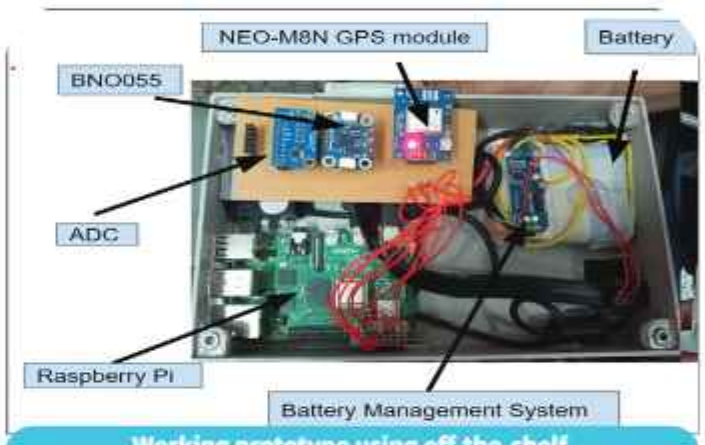
Hub Overview

iHub - Foundation for Data (iHub-Data) is dedicated to enhancing national research and deploying solution in data banks, data services, data analytics. The Hub aims at putting together large-scale datasets as well as developing solutions based on such datasets through applied research. The research is primarily focused towards creating the highest global academic standards for the betterment of society.

Project Updates:

Behavior Analysis of Two-Wheeler Driver ADAS for Reduction of Road Fatality

The project aims to enhance road safety by analyzing driver behavior. Different riding patterns, such as sudden acceleration, sleepy driving, normal driving, and haphazard driving, were simulated and studied using data from sensors on a predetermined route. IHub-Data is working closely to translate this research work into a refined prototype towards commercialization.



Working prototype using off-the-shelf components

Collaborations:

The TIH has signed a tripartite MoU between International Institute of Information Technology Hyderabad (IIITH), IHub Data and Minus Zero.

Tripartite agreement with Minus Zero

Tripartite agreement with Muffakham Jha College

The TIH has also signed a MoU with Muffakham Jah College of Engineering and Technology to provide Minor degree certification in AI/ML to BTech students.

IISc Bengaluru

I-Hub for Robotics and Autonomous Systems Innovation Foundation (ARTPARK-IISc)

Theme: Infrastructure

ARTPARK
AI & Robotics Technology Park, I-Hub @ IISc

Scan here

Hub Overview

I HUB for Robotics and Autonomous Innovation Systems Foundation(ARTPARK-IISc - AI & Robotics Technology Park) is a unique non-profit (section-8) organization promoted by the Indian Institute of Science (IISc) to foster innovations in AI & Robotics by bringing together the best of the startup, industry, research, and government ecosystem. It is funded by the Department of Science & Technology (DST), Govt. of India, under the National Mission on Interdisciplinary Cyber-Physical Systems (NM-ICPS) and the Govt. of Karnataka. ARTPARK @ IISc is driving advances in robotics, autonomous systems and AI through translational R&D in areas of Intelligent Healthcare, Automation for Logistics and Skilling for the AI age.

Project Updates:

5G Test Bed

A 5G Test Bed for advanced technology deployment, use cases testing and demonstration is being set up. The TIH is also setting up one of the 100 Bharat 5g Labs envisaged by the Department of Telecommunications.

Technology Demonstration

The TIH is in the process to carry out a few internal programs in the area of Drone Corridors, Factory Digital Twin and Vehicle Assist in collaboration with research institute (IISc), industry and a few startups.

Visit by DST Team to ARTGarage facility

Visit by DST Team to ARTGarage facility

Collaborations:

The TIH is in process to collaborate with multiple startups, industries and service providers such as AlgoBotix, Niral Networks, Resonous, Lekha Wireless, Tejas Networks, Matter, Nokia, Qualcomm, Airtel etc.

IIT Mandi

iHub and HCi Foundation

Theme: Infrastructure

IIT Mandi iHub & HCi Foundation
Technology in Harmony with Human Needs

Scan here

Hub Overview

iHub and HCI Foundation is a Technology Innovation Hub (TIH) established by IIT Mandi as part of the National Mission on Interdisciplinary Cyber-Physical Systems (NMICPS) scheme of Department of Science and Technology, Govt. of India.

The Hub is focused on Human-Computer Interaction with a vision to nurture research in the area, enable technology translation for industry, and build scale in skill development.

Project Updates:

Domain based Legal LLM for the enterprise (High court of Punjab and Haryana) with New-Age Digital Infrastructure

To improve the efficiency, accessibility, and transparency of the Indian judicial system and hence reduce the pending cases, using the opensource Indian legal database, the TIH is creating a domain based legal LLM. The TIH is implementing pilot project for high courts by facilitating E-courts with an aim to provide online access (accessibility), automate case management (efficiency) through new age technology intervention like Large Language Model (LLM) to digitize court processes (transparency) thereby reducing pendency.

The breakthrough nature of the project is faster Data Rates, Increased Capacity, Improved Power Efficiency, Enhanced Performance, Extended Coverage which allows faster file transfers of large files with robust Human-Computer Interaction.

Startups:

Wellnesys Technologies Private Limited

Wellnesys Technologies, a startup supported under the TIH is developing smart yoga mats integrated with Hardware + Software systems for preventive healthcare and faster rehabilitation using deep learning and advanced computer vision model. The mat has a slew of innovative features such as enhanced posture tracking which provides step-by-step instructions and real-time corrections with feedback.

Skill Development:

IIT Mandi iHub organized a placement drive for its flagship Skill Development program- Kisan Drone Operator (KDO) program beneficiaries. The event was conducted in collaboration with NSDC. AVPL International, a leading organization in the drone ecosystem, aligned with the strategic priorities of Government of India, visited the campus to recruit our skilled KDO program.

IIT Tirupati

Navavishkar I-Hub Foundation

Theme: Infrastructure

IIT Tirupati
Navavishkār
I-Hub Foundation

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Hub Overview

The IIT Tirupati Navavishkar Hub Foundation (IITTNiF) is set up to host Technology Innovation Hub (TIH) focusing on cutting-edge technology in Positioning and Precision Technology (PPT) which includes Positioning, Navigation, Timing, GIS, Remote Sensing and other non-invasive technologies.

Human Resource & Skill Development:

The TIH organized a one day International workshop on Hyperspectral Remote Sensing. About 41 participants took an active part in the vibrant sessions. Sessions were followed by a hands-on session demonstrating the processing of the hyperspectral remote sensing data and drone based capturing of the data.

The TIH organized a seminar on Navigating the Depths: Innovations in Underwater Navigation, showcasing cutting-edge underwater navigation technologies, the latest innovations and developments in this field, and real-world uses of underwater exploration. About 80 participants from academics as well as industries joined this seminar.

Inauguration of the seminar

DST Participating in the Seminar

Seminar on Navigating the Depths

IIT (ISM) Dhanbad

Technology Innovation in Exploration & Mining Foundation

Theme: Infrastructure

Scan here

Hub Overview

Technology Innovation in Exploration & Mining (TEXMiN), the Mining Technology Innovation Hub has been set by GoI at IIT (ISM) Dhanbad, under the National Mission on Interdisciplinary Cyber-Physical Systems (NM-ICPS), to undertake Technology Development, Capacity Building, and promote Innovation & spur Start up-eco-system in the mining sector to achieve 3S Mining (Safe, Smart, and Sustainable Mining leading to Mining 4.0).

Project Updates:

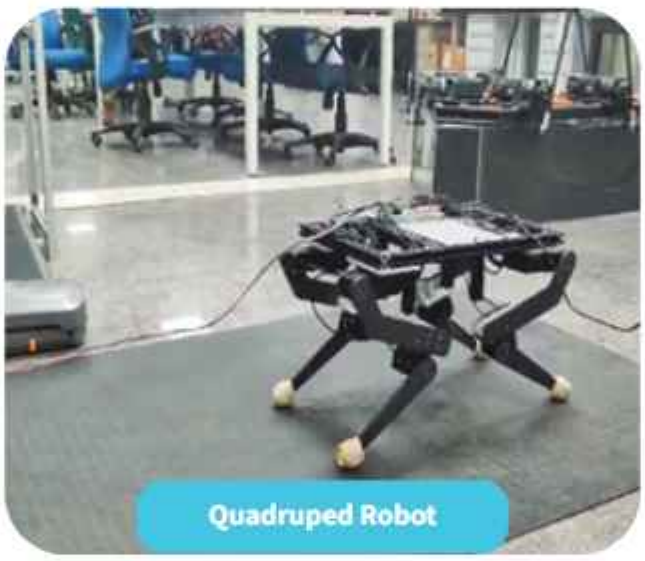
Automated Water Sprinkling System

The TIH has successfully demonstrated use of "Automated water sprinkling system" for dust control in haul roads for mining activities.

Automated water sprinkling system

Quadruped Robot

The TIH has successfully developed and deployed Quadruped Robot for mining applications.



Quadruped Robot

Collaborations:

TEXMiN signed a Memorandum of Understanding (MoU) with the TATA Steel Industrial Consulting (TSIC). Through this collaboration both entities will provide technical support and consultancy services to integrate cutting-edge software and digital methodologies into exploration, mining, and beneficiation processes, enhancing operational efficiency within the sector.

MoU Signed with TSIC

IIT Hyderabad

NMICPS Technology Innovation Hub on Autonomous Navigation Foundation

Theme: Infrastructure

Scan here

TiHAN
IIT HYDERABAD

Hub Overview

TiHAN, a Section 8 company at IIT Hyderabad under the NM-ICPS scheme of the Department of Science & Technology focuses on Autonomous Navigation Technologies that play a critical role in enabling vehicles and robots to navigate safely and efficiently in a wide range of environments, from urban streets and highways to off-road terrain and indoor facilities.

Project Updates:

Autonomous Campus Shuttle

Autonomous Campus Shuttle (ACS) developed under the TIH featured in the Japanese TV program Asa-Ichi of NHK, which examined the various aspects of autonomous driving technology. Mr. Suzuki Hiroshi, the Ambassador of Japan to India visited TiHAN-IIT Hyderabad Testbed and was apprised of the collaborative projects and innovation happening at TiHAN.

Autonomous Campus Shuttle

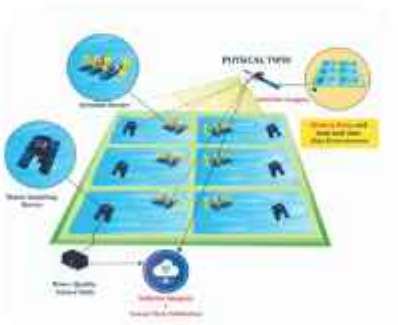
Startups:

SmartKosh Technologies Private Limited

SmartKosh Technologies Private Limited, a startup supported by the TIH has been granted a patent for battery states co-estimation technique using dual square root unscented Kalman filter.

VertoX Labs Private Limited

VertoX Labs Private Limited, a startup supported by the TIH has been selected for the paid pilot with Ministry of Housing and Urban Affairs (MOHUA) under AMRUT 2.0.



Collaborations:

TiHAN has signed an MOU with ARAI-Advance Mobility Transformation & Innovation Foundation (AMTIF), to collaborate on research and development of innovative technologies and to support startups, and innovators working on multimodal mobility.

MOU Signing Ceremony

Autonomous Navigation and Data Acquisition Systems (UAVs, ROVs, etc.)

IIT Delhi

I-Hub Foundation for Cobotics

Theme: Infrastructure

IHFC

Scan here

Hub Overview

The vision of the IHFC is to focus on the research and development of novel technology in the areas of robot analysis, design and control, communication, computer architectures, machine learning, artificial intelligence & the design of embedded systems and power topologies. The IHFC aims at serving various sectors like medical robotics, agriculture, disaster management, defence, industry.

Project Updates:

Smart Basket

An automated shopping system, referred to as the "Smart-Basket," has been designed to streamline the shopping process by integrating a mobile application, barcode reader, and a cloud database. It aims to enhance convenience for shoppers by allowing them to scan and add items to their cart, track their purchases, and make payments through the app. The developed technology is currently at TRL 4-5.

Smart Basket

Bending of Orthopedic Plates Machine

Developed (TRL 4-5) under the TIH, this a fully automated approach to plate bending which reduces operative time by digitally pre-bending plates, eliminating the need for manual bending during surgery.

Orthopedic Plates Bending Machine

Multimodal Grasper Technology

A novel robotic system (TRL4-5) has been built with hybrid graspers that seamlessly combines grasping, manipulation, and locomotion, enhancing versatility and efficiency. It features a unique grasper capable of in-hand manipulation with force control and shape conformation, along with uncommon multimodal locomotion capabilities, making it suitable for a wide range of applications, including industrial tasks, search and rescue, inspections, environmental monitoring, and academic research in robotics.

Multimodal Grasper

IIT Indore

IITI DRISHTI CPS Foundation

Theme: Infrastructure

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Hub Overview

IITI DRISHTI CPS Foundation, created as a one-stop shop for CPS solutions with a specific focus on system simulation, modelling and visualisation. The hub has created an ecosystem which works as a focal point for the convergence of the efforts of academia, industry and government agencies for technology development and commercialization.

Project Updates:

OASIS: Online Aerial image-based Surface Information System

OASIS, a unique reference mapping feature for captured images, significantly enhances data collection and enables real-time land-cover analysis. The OASIS application has been tested in simulated environments. A prototype desktop app and a customizable Android app for drone controllers have been developed, with demonstrations in areas such as Thandrapadu and Jagannathgattu near the IIITDM Kurnool campus. The development included converting real-time images to corresponding masks, validating OASIS's capability to handle live data effectively.

Drone with customizable interface for OASIS implementation

Startups:

Gud Medicare Solutions Private Limited

GudMed, a pioneering startup in digital healthcare and supported under the TIH has been selected for nationwide technology integration of OCR (Optical Character Recognition). GudMed is transforming the landscape of healthcare technology in India through their innovative solutions which are enhancing the technology used in pharmaceutical services. The startup is in the process to advance the digitalization of Electronic Health Records (EHR) and Electronic Medical Records (EMR).

Electronic Health Records

Electronic Medical Records

IIT Jodhpur

Technology Innovation Hub - iHub Drishti Foundation

Theme: Infrastructure

TIH
iHub Drishti

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Hub Overview

The TIH on Computer Vision and Augmented and Virtual Reality (CV and ARVR), named as iHub Drishti Foundation focuses on the core research areas of Seeing and Sensing, Dependability, Real-time Computer Vision Systems, and Data Collection, Curation, and Annotation. iHub Drishti has identified the following application areas for developing technologies: Computer Vision for Autonomous Systems; Computer Vision for Better Living: Healthcare and Biosphere; Imaging for Document Analysis; CV and VR for Industry 4.0; Dependable AR-VR for X (including games).

Project Updates:

Concealed Object Detection and Recognition System

The TIH is working on advanced Terahertz (THz) imaging systems, which combine high-resolution sensors and advanced algorithms to improve concealed object detection accuracy and reliability. THz imaging is ideal for security applications such as airport screening and public safety, where detection of hidden weapons, explosives, and contraband is critical.

Initial Impressions of the Proposed System

Spindle-mounted Vision-based On-machine Inspection System for CNC Milling

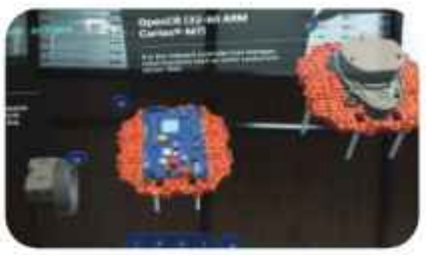
The TIH is developing a hardware setup with a spindle-mounted vision probe that is integrated in a 3-axis CNC milling machine for manufacturing inspection. The TIH has developed an image-based deep-learning modelto estimate end mill wear parameters & provide tool state feedback to the machine operator. The algorithm estimates the Remaining Useful Life (RUL) and tool wear state from the mobile camera images, viz. initial, intermediate, and worn. A mobile application is developed to display the wear state and RUL for assisting machine operators in replacing/regrinding decisions.

(a) New tool; (b) initial state; (c) intermediate state; (d) worn tool

Deployment:

MIRE: Mixed Reality based Interactive platform for Robotics Education

Mixed Reality (MR) platform termed MIRE has been designed to introduce school students to the fundamentals of robotics. MIRE is a unique, interactive, and engaging educational platform that makes an introduction to robotics both engaging and accessible, particularly for school students. MIRE provides holistic information about four different types of robots in a single, cost-effective, interactive setup.



IIIT Delhi

iHub Anubhuti-IIITD Foundation

Theme: Infrastructure

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iHub Anubhuti-
IIITD Foundation

Hub Overview

iHub Anubhuti-IIITD Foundation aims at building a tripartite collaboration between industries, academia and government agencies by developing data-driven Cognitive Computing and Social Sensing solutions, mainly in the verticals - Healthcare, Education and Law Enforcement & Security.

Project Updates:

Ministry of Rural Development (MoRD) Chatbot

The innovative multilingual application, developed by iHub Anubhuti-IIITD Foundation, has entered the User Acceptance Testing phase. The MoRD Chatbot is now live on popular platforms like WhatsApp and Slack, providing seamless access to a variety of reports related to the Pradhan Mantri Gram Sadak Yojana (PMGSY) scheme. The chatbot is making it easier for users to retrieve and interact with essential information effortlessly. A comprehensive user manual has been created to guide clients through the testing process, helping them to explore and understand the full range of the chatbot's functionalities and capabilities.

IIIT Delhi Chatbot

The IIIT Delhi chatbot is made to serve as an example of how students, faculty and future aspirants can get information about the University w.r.t. admission process, latest curriculum, and research areas offered - in an easy way which democratises information. The chatbot has been tested internally extensively by the iHub Anubhuti-IIITD Foundation technology team, and is in process to be handed-over to the IIIT Delhi authorities for User Acceptance Testing.

Collaborations:

iHub Anubhuti-IIITD Foundation collaborated with the Assam Government project for Digitalization of Land Records and Revenue.

Collaboration for Digitalization of Land Records and Revenue

IIT Patna

Vishlesan I-Hub Foundation

Theme: Infrastructure

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Hub Overview

The multidisciplinary Vishlesan I-Hub Foundation at IIT Patna under Technology Incubation Hub (TIH) in the technology vertical - "Speech, Video & Text Analytics" targets to leverage Research and Engineering capabilities of Sustainable Development Goals and achieve the mandate of National Mission on Interdisciplinary Cyber Physical Systems. The Vishlesan I-Hub at IIT Patna also encourages to leverage other related areas for technology development , innovation, professional education, entrepreneurship, brand building, technology commercialization, and product management for the dissemination and deployment of intellectual property, and for public outreach.

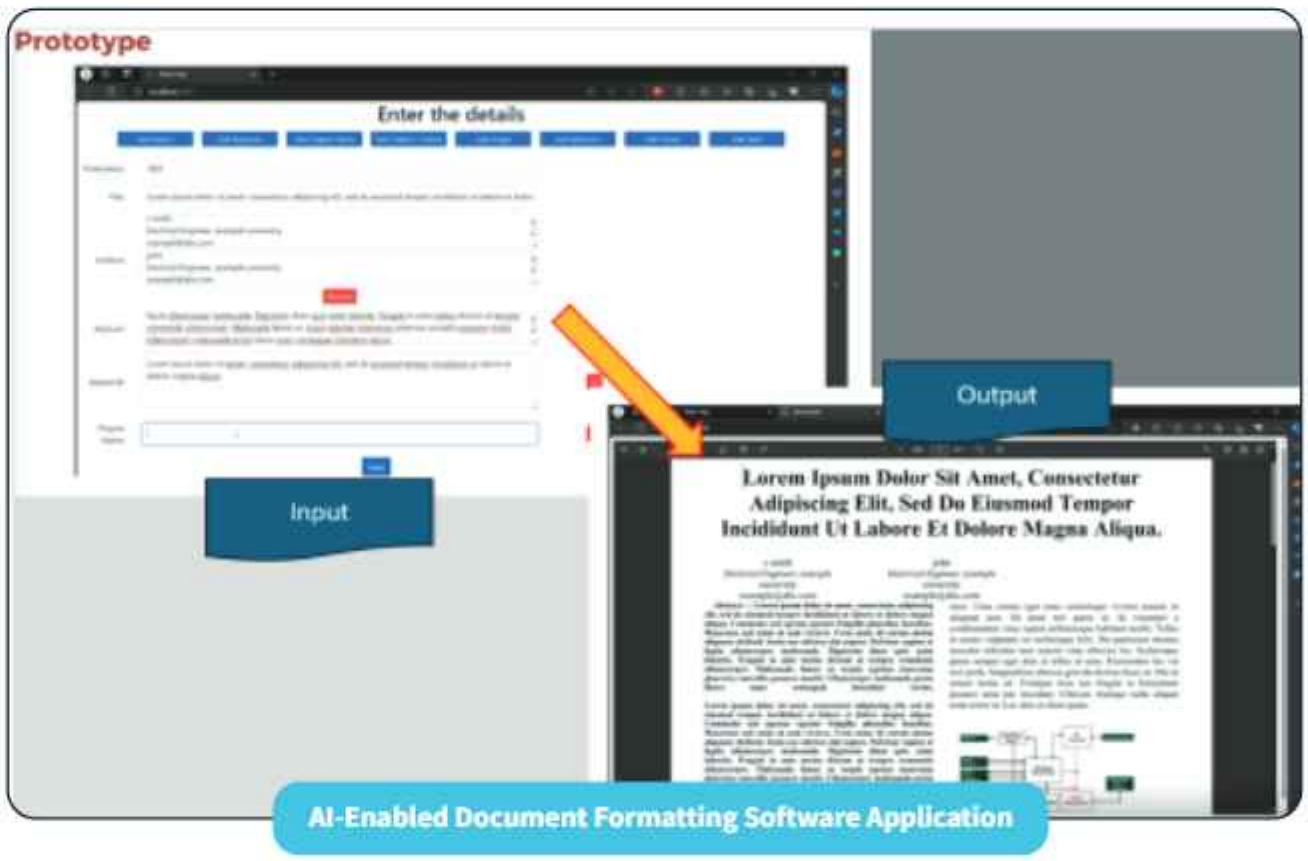
Project Updates:

AI and IoT Driven Software-Hardware System

The TIH is working on developing AI and IoT Driven Software-Hardware System for Pharma 4.0. This project leverages the principles of Industry 4.0 to create a highly efficient, agile, and responsive pharmaceutical production environment. So far, under the project IoT and sensor network development and Real-time Monitoring Dashboard has been achieved.

AI-Enabled Document Formatting Software Application

This solution is aimed at streamlining document formatting processes, improving efficiency and consistency. Emphasis is placed on intuitive user interfaces, seamless integration with existing document management systems, and advanced AI algorithms for automating formatting tasks. The advanced stage product will integrate LLM.



AI-Enabled Document Formatting Software Application

Collaborations:

The TIH has collaborated with Lincoln University College (LUC) Malaysia for joint incubation of Startups. The TIH will induce 15 startups to the incubation center at LUC Malaysia under co-incubation model.

Healthcare

"Technology has the potential to bring about positive changes in healthcare and improve the lives of millions"

BITS Pilani

BITS BioCyTiH Foundation

Theme: Healthcare

BITS BioCyTiH Foundation

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Hub Overview

BITS BioCyTiH Foundation is a Sec-8 Company of BITS Pilani that aims to foster Research, Innovation, Skill Development & Training in Bio-CPS through mentoring and nurturing startups and entrepreneurs, and industry-academia collaborations to undertake cutting edge research and provide affordable solutions in the areas of healthcare, agriculture, water and environment.

Project Updates:

Myeloid Detection Kit

This innovative single-tube, premixed assay enables both qualitative and quantitative detection of all transcripts related to CML and AML-M2, reducing errors caused by multiple pipetting. The assay boasts a faster turnaround time and extended shelf life at 4°C, ensuring easy transport, storage, and accessibility of diagnostic tools. This simple and cost-effective CML detection method enhances drug administration, prolonging patient survival and potentially leading to the development of point-of-care handheld instruments for bedside use.

Myeloid Detection Kit

Point-of-Care Device for Measurement of Glycated Heamoglobin

This innovative project integrates a new Cerberus molecule with a nano-interface on a paper electrode-based electrochemical platform.

Device for Measurement of Glycated Heamoglobin

The result is an affordable point-of-care device designed to quantify HbA1c. The technology is at TRL 5 and the device features rapid and high-affinity HbA1c quantification using an in-house developed sensing element, disposable electrode, and read-out. This cost-effective point-of-care technology will enhance diabetes diagnosis and management.

Startups:

Ripple Healthcare Private Limited

Ripple Healthcare supported by the TIH has developed Hip Pro+, which is an IoT-enabled smart wearable device with protective cushions covering hip bones protecting elderly from the traumatic and often deadly fall-induced hip injuries. With an acceptable design offered at a fractional cost, it empowers the elderly to lead a dignified lifestyle.

Hip Protection device and testing

IIT BHU, Varanasi

I-DAPT Hub Foundation

Theme: Healthcare

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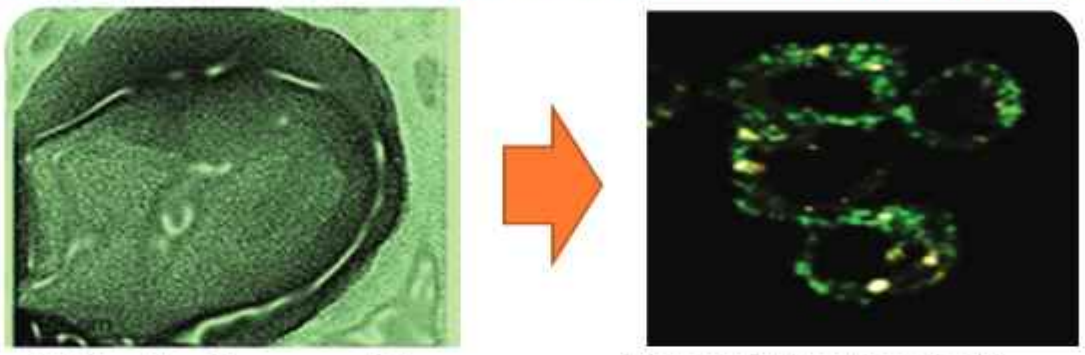
Hub Overview

I-DAPT Hub Foundation at IIT (BHU), Varanasi was set up to address the emerging needs of the country in the area of Interdisciplinary Data Analytics and Predictive Technologies (I-DAPT). I-DAPT Hub Foundation aims to use the interdisciplinary nature of data analytics and predictive technology to achieve the mission of modernization of socio-technical systems and existing services with disruptive innovations and inventions of novel products, processes and technologies. I-DAPT Hub Foundation at IIT (BHU) is presently working on five thrust areas i.e. Telecommunications, Power, Road Transport and Highways, Defence Research and Development, and Health and Family Welfare.

Project Updates:

Novel Polymeric Nanomedicine for Cancer Therapy (TRL: 5)



siRNA Based Cancer Treatmen

I-DAPT Hub Foundation IIT (BHU) Varanasi is working with the School of Biomedical Engineering, Indian Institute of Technology (BHU) to leverage the siRNA based cancer therapy. Under this project, novel polymer nanomedicine has been developed (siRNA-plex) with novel designed polymer Nanoparticles and novel designed siRNA. This nanomedicine targets the specific gene of the breast cancer leading to programmed cell death (cancer cells) with very high efficacy. This could be one of the efficient medicine for the targeted cancer therapy.

Bouy Mimicking a ROV (TRL4)

To replicate a hydrophone array on an ROV, a prototype of buoy with data recorders on a floating platform in a waterproof case has been developed under the TIH. Platform movement mimics underwater challenges faced by ROVs.

Prototype with top view of the buoy

Vision-Based Leader-Follower Control in Multi-Robot Systems (TRL 5)

The TIH has developed a vision based leader-follower control in Multi-Robot Systems using the visual data to synchronize the movements of multiple robots, with one robot (the leader) directing the others (the followers). Camera 3D data was processed using custom filters and masks to create left and right matrices. Additionally, LIDAR data was used to ensure the follower maintains a safe distance from the leader while navigating the path. This leader-follower vision based control method is particularly valuable for tasks like surveillance, search and rescue operations, and transportation.

Trajectory of Leader and Followers Robots

IIT Bhilai

IIT Bhilai Innovation And Technology Foundation

Theme: Healthcare

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Hub Overview

IIT Bhilai Innovation and Technology Foundation (IBITF) operates in Fintech arena focusing on identifying impactful solutions leveraging emerging technologies like Blockchain, IoT, AI/ML, and e-payments, with a primary emphasis on applying these technologies to the Agriculture and MediTech sectors.

Project Updates:

SMART-ER: Strengthening the Emergency Care Systems in Chhattisgarh through Digital Hybrid Healthcare

The SMART-ER aims to develop an AI-assisted hybrid digital healthcare system to enhance emergency care across Chhattisgarh and nearby regions, benefiting patients in remote and resource-limited settings. The primary goal is to create a user-friendly interface for healthcare providers to manage time-sensitive emergencies like heart attacks through an AI-integrated Clinical Decision Support System (CDSS). Additionally, the project seeks to establish a 24x7 tele-access framework for emergency medicine experts to support peripheral healthcare centres, optimize digital technology for standardized patient assessments, and improve real-time consultation.

AIIMS, Raipur recently launched the SMART-ER solution in the Emergency and Trauma Department for ST-Segment Elevation Myocardial Infarction (STEMI) management. This innovative solution, has collaboratively been developed by IBITF and AIIMS Raipur.

Deployment of Smart-ER in AIIMS, Raipur

Skill Development:

Rasayan Mukt - Zeher Mukt, Tikau Kheti Ka Prashikshan

IBITF conducted a two-day workshop, "Rasayan Mukt - Zeher Mukt, Tikau Kheti Ka Prashikshan," at IIT Bhilai. The workshop was designed to provide in-depth training on Indian Knowledge System (IKS) based farming techniques that focusses on chemical-free and toxin-free sustainable agriculture practices. In the workshop, over 150 farmers participated from various states across India.

Preparation of Organic Soil Conditioner

Testing of Soil Parameters

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23 Active Technology Innovation Hubs
Across the Country

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