

**MINUTES OF THE MEETING OF MEMBERS OF HUB GOVERNING BOARD OF NMICPS TECHNOLOGY INNOVATION HUB ON AUTONOMOUS NAVIGATION (TIHAN) FOUNDATION HELD ON MONDAY 27<sup>TH</sup> JUNE 2022 AT #620 BLOCK-A, CONFERENCE ROOM, IIT HYDERABAD, KANDI CAMPUS, SANGAREDDY, MEDAK, TELANGANA, INDIA-502285 AT 10.00 AM.**

Time of commencement of the Meeting: 10.15 AM

Time of conclusion of the Meeting: 11.30 AM

**1. ATTENDANCE**

Sr. No.	Name	Designation	Mode of Attendance Physical/Electronic mode
<b>Directors:</b>			
1.	Dr. Kiran K Kuchi	Chairman	Physically
2.	Dr. Rajalakshmi Pachamuthu	Member	Physically
3.	Dr. Ekta Kapoor	Head, FFT, DST	Physically
4.	Dr. J B V Reddy	Scientist - E, FFT, DST	Physically
5.	Mr. Manoj Kumar	Director (F), DST	Physically
6.	Prof. Surya Kumar S	Academic Member	Physically
7.	Dr. Bheemarjuna Reddy Tamma	Academic Member	Physically
8.	Mr. Samir Kumar	Industry Member	Physically
9.	Mr. Kumar N. Sivarajan	Industry Member	Through VC from Bengaluru
10.	Dr. Gopichand Katragadda	Industry Member	Through VC from Bengaluru
<b>Invitees:</b>			
11.	CA Saurabh Dashottar	Internal Auditor	Through VC from Hyderabad
12.	CS Jayata Agarwal	Practising Company Secretary	Through VC from Jaipur

**2. ELECTION OF THE CHAIRMAN:**

As per article 27 of Articles of Association of the company, the Director of IIT Hyderabad (Host Institute) is deemed to be the chairman of TiHAN Foundations and as per Mission communications; Chairman of Host Institute will be Chairman of the HGB. But due to some



unavoidable circumstances, Prof. B S Murty was unable to attend the meeting. He appointed Dr. Kiran K Kuchi, Dean R&D to become a chairman of the meeting on his behalf.

Thus, Dr. Kiran K Kuchi was elected as the chairman of the meeting and occupied the chair.

### **3. QUORUM:**

At 10.15 A.M, the Chairman (Dr. Kiran K Kuchi) welcomed the Members present physically and through video conferencing. Thereafter, the Chairman announced that the requisite quorum was present and called the Meeting to order. The Chairman extended a warm and hearty welcome to all the members present at the Meeting of Hub Governing Board (HGB) of the Company.

### **4. LEAVE OF ABSENCE:**

Leave of absence was granted to Mr. Krishna Bodanapu, Prof. B S Murty for not attending the meeting, due to unavoidable circumstances and had requested for the same.

### **5. CONFIRMATION OF MINUTES OF THE FIRST MEETING OF MEMBERS OF HGB HELD ON 24<sup>TH</sup> DECEMBER 2021:**

Minutes of the meeting of the Hub Governing Board held on 24<sup>th</sup> December 2021 duly initialed by the Chairman were placed before the Board and Board approved the same. Prof. Rajalakshmi explained the activities done and decisions taken in previous meeting to all the members. Adding Prof. Surya Kumar informed the board about Prof. Mohan Sangeneni, being appointed as an Advisor – Innovation Translational Research mentor of IIT Hyderabad, and with his mentorship, there are four Industry connections started under TiHAN. One MoU is already signed with ICAT and other interactions are ongoing.

### **6. REVIEW ON THE ACTIVITIES AND ACCOMPLISHMENTS OF THE HUB SO FAR:**

Prof. Rajalakshmi - Project Director/Member Secretary informed the members about the activities carried out by TiHAN in last six months. First of all, she explained about the Research and Technology that Nurturing the R&D portfolio of the hub and promoting commercially viable translational research. She further informed about increase in CPS Research Base Hub projects - 9 collaborative R&D projects already ongoing and 17 Collaborative R&D projects administrative process are ongoing. She informed the board about the number of Technology (IP, Licensing, Patent Etc.) that 5 (1 copyright on Autonomous navigation testbed, 3 patents - Bio-inspired UAV, System with HSI, Energy efficient biomimetic, 1 Trademark on TiHAN Logo.

She has also explained about the technology Products that 13 (Bio-inspired UAVs, UAV with high end sensors-Lidar/HIS, First Version of Hindi ASR, Driving Under Influence Simulator, Inhouse developed UGV and UAV kits, Vaman Boards, DSRC-RSU, Autonomous/Remote Operated Surf Board, A Conversational Hindi chatbotis developed using an open source tool, A speaker recognition system is developed using GMM technique, A Hindi Text to speech synthesizer is developed using deep learning based tacotron2 model).



She further informed about the activities taken by the TiHAN in Research and technology development, Industry Collaboration, Innovation, Entrepreneurship Start-up Ecosystem, International Collaborations, Human Resource and skill Development and Intelligent testbed.

She has also presented the target report of 2 years and fund status as on 25/06/2022.

She has also updated status on progress & presented a video to members about a first of its kind state-of-the-art Testbed for Autonomous Navigation (Aerial/Terrestrial) being developed at TiHAN IIT Hyderabad. The Facilities includes Proving Grounds, Test tracks, Mechanical integration facilities like Hangers, Ground control stations, Anti drone detection systems, State of the art Simulation tools (SIL, MIL, HIL, VIL), Test tracks/circuits, Road Infra – Smart Poles, Intersections, Environment Emulators like Rainfall Simulators, V2X Communications, Drone Runways & Landing area, Control Test centers.

Aerodynamics and Bioinspired Research Activities was also explained to the members, under which Bioinspired flight mechanisms that insects and birds. 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, Bioinspired Quad wing Nano UAV. She informed the about Flapping Wing Micro Aerial Vehicle (MAV), Dragonfly Based Quad wing UAV –Space Exploration, Nano Aerial Vehicle with TENG Device and explained its features. She informed the board about everything in detailed.

She further informed about the industry collaboration with Suzuki Motor Corporation: Autonomous Vehicles Project- Autonomous vehicles–ADAS, develop point to point navigation system using multi-sensory perception, efficient computing, and real-time actuations, algorithm developments specifically to various Indian scenarios, Vehicles from Japan has arrived at IITH for this research and development, Data collection and algorithm developments are going on.

The board was also informed about the Autonomous Vehicle -Waypoint Based Navigation and its Objective is to navigate the electric vehicle autonomously on the predefined waypoints, Sensors used for controlled motion of the vehicle, Communication was established between Autera (Processor of the vehicle) and NI Controller, ROS framework was used for registering the nodes with the ROS Master.

She further informed about advanced Driver Assistance System (ADAS) Testing at TiHAN Testbed, ADAS –AEB –Vulnerable Road Users (VRU) -Car to Pedestrian, Car to Pedestrian Nearside Adult (CPNA), Car to Pedestrian Longitudinal Adult (CPLA), Lane Departure Warning System (LDWS), Automatic Lane Keep Assist (ALKS), Traffic Light Detection and Classification, Autonomous Navigation in Shuttle, Adaptive Cruise Control (ACC), Object Tracking For Autonomous Vehicles Using The Camera, Pedestrian Detection and Indian Scenarios -Speed Bump Detection: By using deep learning technique both marked and unmarked speed bumps are accurately detected even when they have very distinct features.

The board was also informed about the Advanced Air Mobility Solutions, Swarm of network drones, and Autonomous Swarm Coordination Technique. Controlling multiple drones in parallel and asynchronously using socket programming, A central GCS for low latency communication.



Prof. Surya Kumar informed the board about the collaboration between TiHAN & iTIC for Technology Business Incubation cells of IIT Hyderabad for support for Entrepreneurship activities like startups, GCC, PRAYAS, EIR, DIAL, and CPS-Seed Support System.

#### **7. BUDGET DISCUSSION:**

Dr. Rajalakshmi presented the fund utilization received from DST till date. She informed that the first Instalment amount of Rs. 20.25 Crores was received from DST and utilised for the purpose. The second Instalment of Rs. 32.38 Crores from DST was sanctioned on 10-06-2022.

#### **8. SUGGESTIONS FROM THE MEMBERS, DISCUSSION, AND ACTION PLAN:**

The Chairman invited all the Industry Representatives for their Opinions and Suggestion. Following points were discussed & suggested by the Board members

- DRDO is interested in drone swarms, like collective behavior, spatial awareness, etc. Explore possibility of collaborations through board members.
- Explore pool of startup funds from iDEX, TDF, etc.
- The success stories of the HUB must be shares on the social media and online platforms.
- Policy for commercialization and Royalty for technologies transfer to Industries to be developed for TiHAN.
- Members suggested focusing on next-generation technologies like swarms.
- Members are impressed and happy with the working of the TiHAN and that the funds from 1<sup>st</sup> installment have been utilized in proper manner.

#### **9. ANY OTHER MATTER WITH THE PERMISSION OF THE CHAIR:**

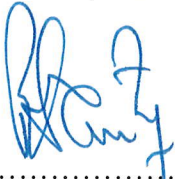
Prof. Rajalakshmi informed the board that TiHAN-IITH is committed to achieve the targets as per project and will adhere to the recommendations from DST as per the meeting - National Workshop on Technology Innovation in Cyber-Physical Systems at IIT Madras on 6-7 May 2022.

**VOTE OF THANKS:**

Chairman announced the summary of the discussion, recommendations and decisions taken in the meeting. Before the conclusion of the Meeting, Chairman made the roll call at the conclusion of the meeting and ensured presence of quorum throughout the meeting.

With the item of the agenda being transacted, the chairman thanked the members for making it convenient to attend the meeting and thanked them for their active participation.

Thereafter, the chairman declared the meeting as concluded.



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**Prof. B. S. Murty**  
Chairman of HGB



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**Prof. Kiran K Kuchi**  
Chairman of the Meeting



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**Prof. P Rajalakshmi**  
Project Director/Member Secretary