

MINUTES OF THE MEETING OF MEMBERS OF HUB GOVERNING BOARD OF NMICPS TECHNOLOGY INNOVATION HUB ON AUTONOMOUS NAVIGATION FOUNDATION HELD ON MONDAY, 30th OCTOBER 2023 AT #201 BLOCK-A, BOARD ROOM, IIT HYDERABAD, KANDI CAMPUS, SANGAREDDY, TELANGANA, INDIA-502284 AT 1.30 P.M.

Time of commencement of the Meeting: 1.35 P.M.

Time of conclusion of the Meeting: 2.30 P.M.

1. ATTENDANCE

Sr. No.	Name	Designation	Mode of Attendance Physical/Electronic mode
Members:			
1.	Prof. B S Murty	Chairman	Physically
2.	Prof. P Rajalakshmi	Project Director	Physically
3.	Dr. J B V Reddy	Mission Director, NM-ICPS, DST	Through VC from Delhi
4.	Mr. Rohit Kumar		
5.	Dr. Swati Rawal Dang		
6.	Ms. Tanushri Sharma		
7.	Dr. Gopichand Katragadda	Industry Member	Through VC from Bengaluru
8.	Dr. Aravind Rengan	Academic Member	Through VC from Hyderabad
9.	Prof. Bheemarjuna Reddy Tamma		Physically
10.	Prof. Chandrashekhar Sharma		Physically
Invitees:			
11.	Dr. Naga Praveen Babu Mannam	Executive Team	Physically
12.	Dr. Venkata Satyanand Mutnuri		Physically
13.	CA Saurabh Dashottar	Auditors	Through VC from Hyderabad
14.	CA Soniya Dashottar		
15.	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 NMICPS TiHAN Foundation, and as per Mission communications, Chairman of Host Institute will be Chairman of the HGB. Thus, **Prof. B. S. Murty** was elected as the chairman of the meeting and occupied the chair.

3. QUORUM:

At 1.30 p.m., the Chairman 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 members at the Hub Governing Board Company Meeting (HGB).

4. LEAVE OF ABSENCE:

Leave of absence was granted to Mr. Krishna Bodanapu, Dr. Kumar N. Sivarajan, and Mr. Sameer Kumar for not attending the meeting due to unavoidable circumstances and had requested the same.

Dr. Ekta Kapoor (Mission Director, DST) could not join. Therefore, leave of absence was granted to her also.

5. CONFIRMATION OF MINUTES OF THE MEETING OF MEMBERS OF HGB HELD ON 3RD JULY 2023:

Minutes of the Hub Governing Board meeting held on 3rd July 2023 duly initialed by the Chairman was placed before the Board and approved. Prof. P Rajalakshmi explained the activities and decisions taken in the previous meeting to all the members.

6. TIHAN TARGETS AND ACCOMPLISHMENTS SO FAR:

Prof. P Rajalakshmi informed the members of the HUB regarding the targets and accomplishments achieved till date as per the target set.

She explained the Research and Technology that Nurtures the R&D portfolio of the hub and promotes commercially viable translational research. She explained the increase in CPS Research Base Hub projects - 25 collaborative R&D projects. Periodic project reviews have been done through an expert project review committee. 14 collaborative R&D projects (6 R&D Women Scientists and 8 R&D Collaborators) are selected, and under administrative process is ongoing for project execution. She informed the board about the **Technology Development**: No of Technologies (IP, Licensing, Patent etc.) – 19 (includes 3 - copyrights, 12 - patents, 3 - Software IPs- and 1 - Trademark), Technology Products - 68, Publications, PR, and other Intellectual activities – 188, Increase in CPS Research Base – 67. **Entrepreneurship Development**: Technology Business Incubator (TBI) - 3, Start-ups & Spin-off companies – 20, GCC - Grand Challenges & Competitions - 6, Promotion and Acceleration of Young and Aspiring technology entrepreneurs (PRAYAS) - 2, CPS-Entrepreneur in Residence (EIR) – 10, Dedicated Innovation Accelerator (DIAL) - 1, CPS-Seed Support System (CPS-SSS) - 0, Job Creation – 275. **Human Resource Development**: Graduate Fellowships – 239, Post Graduate Fellowships – 88, Doctoral

Fellowships – 58, Faculty Fellowships – 10, Chair Professors – 4, Skill Development - 3271, Postdoctoral Fellowships – 17. **International Collaborations:** International Collaborations - 18.

Mr. Rohit Kumar raised the concern about the status of job creation. He suggested training the people to get the job and tracking of such information must also be done for the same.

Prof. B S Murty suggested keeping the data on which companies need the skills that TiHAN-IITH is educating the students and should keep on sending information to them like list of students who got trained at TiHAN-IITH. and who got trained via skill development programmes. Focused training to company officials can be provided. He also suggested to communicate the timings of the autonomous campus shuttle vehicle to all campus residents. Suggested to mention the campus vehicle activity on the IITH website for broader reach.

Dr. Swati Rawal Dang recommended generating new opportunities for individuals as per their needs. Further the information about the number of jobs created and leading creation by TiHAN-IITH must be mentioned in the records.

On Entrepreneurship, Prof. Rajalakshmi said start-up funding had attracted private funding like CSR, VCs, and equity-based Incubation activities. She further informed about the technology commercialization, promotional outreach, and Accelerator programs for early-stage start-ups. For Technology Business Incubator, the collaboration between TiHAN-IITH & iTIC for the Technology Business Incubation cell of IIT Hyderabad for support for Entrepreneurship activities like startups, GCC, PRAYAS, EIR, DIAL, and CPS-Seed Support System is working successfully. She also presented the deployment of Autonomous Campus shuttle in Vizag Naval Dockyard, under the collaboration with WESEE team.

On Industry relations, Prof. Rajalakshmi informed the board about the joint R&D initiatives on a cost sharing basis, consultancy projects with both govt. and private entities. To date, TiHAN-IITH has made collaborations with 34 Industries. Suzuki Motors Corporation sent vehicles from Japan for RnD on ADAS for Indian Scenario and testing in the TiHAN-IITH testbed, and for this research and development, Data collection and algorithm developments are going on. She also Informed Collaboration between TTL, DYSL, NATRAX, and LTTS.

She further explained that TiHAN at IIT Hyderabad importantly focuses on the research, design, and development of autonomous navigation and data acquisition systems for UAVs, ROVs, etc. Autonomous navigation and data acquisition systems refer to technologies and systems that enable ground vehicles, robots, UAVs/drones, or other autonomous platforms to navigate and collect data without human intervention.

Autonomous navigation and data acquisition systems have a wide range of applications, from self-driving cars and delivery drones, air taxis, heavy payload drones at high altitudes to surface and underwater vehicles and agricultural machinery. These systems continue to evolve and play a

significant role in various industries, promising increased efficiency, safety, and data-driven insights.

Mr. Rohit Kumar asked the details about the heavy payload to which Prof. Rajalakshmi explained satisfactorily. Mr. Rohit Kumar informed that the Indian army is looking for something like this payload solution in hilly terrain conditions.

Prof. P Rajalakshmi further explained about Testbed on Autonomous Navigation (Aerial/Terrestrial) which is setup at IITH and informed about Testbed with Mechanical Integration Facility, Test circuits/tracks, and required Equipment, Area to setup testbed in IITH Campus and Master Plan and Design. TiHAN has also registered copyright on Testbed as it is one of its kind in the country. 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, Signalized and unsignalized Intersections, Environment Emulators like Rainfall Simulators, V2X Communications, Drone Runways & Landing area, Control Test centres, WiFi, BVLOS, CV2X, 5G, Edge Cloud.

Prof. Rajalakshmi explained the usage and development of Unmanned Aerial Vehicles (UAVs) in the fields of agriculture, health care, and military, etc. Based on the weight, UAVs are classified as Nano, Micro, Small, Medium, and Large Aerial Vehicles. More precisely, Nano, Micro, and small UAVs are widely used for defense applications such as Intelligence, Surveillance, and Reconnaissance. Micro Aerial Vehicles (MAVs), which come under a weight less than or equal to 2kg, are preferable for Surveillance applications. Due to the lightweight and flapping effect, the autonomous flight of MAVs is a major challenge in robotics. An autonomous Flapping MAV is developed which includes autonomous operations like take-off, cruising, landing, and loitering mode.

She further explained about the TiHAN activities related to ground vehicles like Rikshaw, Passenger Car, Micro-Van and utilization of LIDAR as well as other sensors mounted on these vehicles for autonomous navigation deployment providing video demos of accomplishments carried out till date.

She further mentioned the board about end-to-end connectivity multi model transportation solutions for Indian Scenario going forward. Energy efficient autonomous navigation enabled different modes of electric vehicles i.e., e-bikes to be integrated as navigation system.

She also explained to the members about the OEM - Collaboration ADAS for Point-to-Point Autonomous Navigation System Adaptable to Indian Scenarios and SOP/Regulatory/Policy Frameworks for Autonomous Navigation. Presented the Regulatory Framework for Autonomous Vehicles, SoP for UAVs in Agriculture for quality data acquisition using RGB, SOP for bridge

inspection using UAVs and the respective workshops conducted for the same with the relevant stakeholders.

Prof. Rajalakshmi inform the members about the success stories of the TiHAN Foundation till date, about the start-ups and Collaboration with Government/Industry/Line Ministries & PSUs.

7. BUDGET DISCUSSION:

Prof. Rajalakshmi presented the funds received from DST and utilization of the same to date. The total fund allotted from DST was Rs. 91.43 crores for four years, of which Rs. 63.96 crore was utilized i.e., 69.96 %. She also informed the board about the funds received from external sources like Suzuki Motor Corporation, Japan, DYSL-AI, DRDO, Tata Technologies Limited, Pune, and L&T Technology Services Ltd which is around Rs. 1.235 Crores.

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

Mr. Rohit Kumar asked about the difference between technology for swarming drones. Prof. Rajalakshmi informed that it is for distributed networking which address large area surveillance purposes and other drone technologies are for entertainment purposes or drone show.

It was suggested to publicize the drone-based agriculture technologies to government agencies and start generating revenue.

Dr. J B V Reddy suggested having a detailed plan from a future sustainability perspective for TiHAN. He suggested providing solutions to Line Ministries via developed technologies. Having identified a huge potential for revenue generation, Mr. Rohit Kumar also asked about the future sustainability of TiHAN.

Mr. Gopi Katragadda gave his concluding remark that the goal could be to ensure global-first technology. By doing an appropriate scan of IP and general publications and knowing India needs specifically which are unique to India, we can create such an opportunity and suggested Indirect job creation activities via partial training can also be counted as job creation.

VOTE OF THANKS:

Prof. Rajalakshmi announced the summary of the discussion, recommendations, and decisions taken in the meeting. Before the conclusion of the Meeting, CS Jayata Agarwal, Company Secretary, made the roll call after the meeting and ensured the presence of a quorum throughout the meeting.

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

Thereafter, the members declared the meeting as concluded.

Signatures:

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Prof. B. S. Murty
Chairman of HGB

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Prof. Rajalakshmi
Project Director/Member Secretary