UNISEC-Global The 41st Virtual Meeting

February 17th, 2024, 22:00-24:00
(Standard Japan time GMT +9)

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Table of Content

1. Opening Remarks 3

L.V. Muralikrishna Reddy, UNISEC-India 3

2. Presentation on "Small Satellite Initiatives in India and Opportunities for Academia" 4

R. M. Vasagam, Indian Space Research Organization 4

3. Presentation on "Spacecraft RF Characterization" 6

Puneet Kumar Mishra, IEEE Aerospace & Electronics Systems Society 6

4. Presentations on "Insight into RISC-V and AI & ML for Space Applications" 8

Cyril Prasanna Raj P. and Antony Louis Piriyakumar, Cambridge Institute of Technology 8

5. Presentation on "*Think big, stay SMALL*, A vision for Space Internet of Things 10

R. Venkatesha Prasad, Delft University of Technology 10

6. Presentation on "NanoSat Learning Experiences and RISC-V in Space Applications" 11

Nikhil Riyaz, Delft University of Technology 11

7. Presentation on "Orbital Simulations for Nano Satellites Using MATLAB" 12

Inbisat Yousuf Nath, Central University of Kashmir 12

8. Announcement and Acknowledgment 13

Haruka Yasuda, UNISEC-Global 13

9. Participant Statistics 14

1. Opening Remarks

L.V. Muralikrishna Reddy, UNISEC-India

Dr. L.V. Muralikrishna Reddy is the youngest President of one of India's oldest professional body of engineers. Dr. Reddy obtained his Bachelor's Degree in Chemical Engineering, Master's in Energy Systems, and Doctorate in Energy Management. He has done self-less extraordinary service for the welfare of engineers and development and growth of the Institution of Engineers (India). He has an experience of over 24 years of multifaceted professional experience leading and pursuing contemporary research, technology development and engineering projects. He has been involved in projects including Non-Invasive Glucometer by using Near Infra-Red Technology, 6 Projects (DRDO and DST funded) Nitric Oxide Bio-Systems, MICAVs, MEMS based Sensors, MAV Wing-Morphing / Structures, and Green Skill Project with ADB. He has filed 9 international patents and published many research papers, monographs and created IEI Patent & IPR Cell. He is currently the President of UNISEC-India, President of The Indian Technology Congress Association and 75 Students' Satellites Consortium Mission.

Pictured: Prof. Reddy while giving the opening remarks

Highlights:

- The theme of the 41st Virtual UNSIEC Global Meeting resonates deeply with the satellite community
- **Small satellites have profound impact in academia, particularly in the current Indian context**
- Significant impact in campuses through the student CubeSat projects
- Educational empowerment by offering hands on and practice and based on curriculum
- India's national education policy aligns with real-life designing, building and deployment
- Research opportunities in fields of observation, atmospheric sciences and communication technology
- Promoting innovation and progress by tackling complex problems
- Interdisciplinary collaboration platform to collaborate between different stakeholders
- Competency development through development of skills, opportunities for students to grow
- With UNISEC's support, India's space entities have become a dynamic hub for small satellite initiative
- Involvement of academia, research institutions, startups and governmental agencies
- **"SemiCon India" initiative has promoted India's self-reliance in electronics and semiconductors**
- Focuses on increasing homegrown capacity and launching both rockets and satellites
- Indian Technology Congress Association initiated the Flagship 75 student's satellites mission
- Collaborating with The Karnataka State Government, 2.5 million+ students have been reached
- **The 75 students satellite project - facilitated by ISRO and the Government of India**
- **UNISEC's insights have been paramount in all initiatives**
- Initiatives showcase limitless potential of human ingenuity and appeal to further forge collaboration
- Overall, main focus has been to empower students to become the upcoming innovators

2. Presentation on "Small Satellite Initiatives in India and Opportunities for Academia"

R. M. Vasagam, Indian Space Research Organization

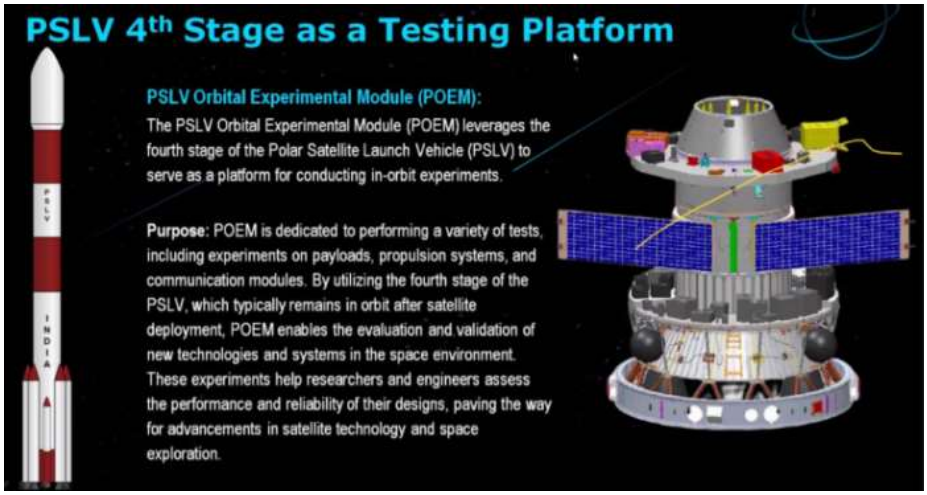
Padma Shri Awardee Prof. R.M. Vasagam is an eminent scientist of ISRO and a specialist in space systems including satellites and launch vehicles. In his career spanning close to three decades in the Indian Space Research Organization (ISRO), he held responsibilities including the Project Director for of India's First Geo-Stationary Communication Satellite: APPLE— India's first indigenous geostationary communication satellite project, and later the Director of the Advanced Technology and Planning at the ISRO Headquarters. He was later the Vice Chancellor of Anna University and is currently the Chancellor of Dr. M.G.R. Educational and Research Institute. After graduating from PSG College of Technology in 1963, he completed his Master of Engineering in Electrical Engineering from Indian Institute of Technology Madras in 1965. Up to now, he has been awarded with The Hari Om Ashram Prerit Vikram Sarabhai Research Award in 1981 by PRL, Department of Space, Govt. of India, Padma Shri in 1982 by the Govt. of India, and IEEE Centennial Medal, Bangalore Section in 1984.

Pictured: Prof. Vasagam explains opportunities for industry and academia using small satellites

Highlights:

- Congratulated the Japanese S3 Launch Vehicle Mission
- **Also announced the launch of Indian Meteorological satellite**
    - Indian-built launch vehicle and Indian-built satellite system
    - For meteorological and atmospheric sciences
- These instances show the vast opportunities these missions will further bring up
- Small satellites are possible due to advancements in the electronic technology and software design
- Revolutions by CalPoly, Stanford and NASA have been breakthrough in building satellites
- Made use of the decommissioned missions to launch small satellites
- Have allowed students to get an exposure to not just CubeSat but also nano-satellites
- Cost effective way of testing ideas before venturing into operational systems
- Allows research in orbital systems
- Experiential learning - demonstrated uniquely by institutions
- Miniature systems have been made possible by the electronic technology
- Propulsions - very small thrusters by making use of the hall effect
- Communication - advancements including the inter-satellite links, cloud storage
- Internet of things are now getting into operational mode
- Remote sensing satellite - 600 to 800 kg category
- Same category was condensed into 100 kg through the Indian mini satellite
- **Small satellite launch vehicle - developmental flight 2 (SSLVD2)**
    - exclusively tailored to get satellites into orbit

- **SSLVD2 goes up to 500 km into lower orbit and has the capability to launch multiple satellites**
- Private sector is very much involved in satellite industry
- Bangalore is a hub for such industrial companies opened by many former students
- Entrepreneur companies in the aerospace field are building companies to develop small satellites
- **Applications of small satellites:**
    - Earth observation: deforestation and pollution monitoring
    - Disaster management: providing real time data, communication link, damage assessment
    - The data received during a major cyclone in India allowed saving ~250,000 people
    - Communication: internet of things as a tool for economic, agricultural, commerce fields
    - allows remote area coverage in island nations, border area and inaccessible mountain regions
    - Scientific Research: can be used to collect continuous space weather and cosmic ray data
    - University of Toronto built satellites exclusively for payloads - breakthrough in astronomy
- **Launch Opportunities Initiatives**
    - Piggy back launches - small satellites utilize the excess space
    - Orbits can be altered after main payload is released
    - Successfully demonstrated Indian polar satellite launch vehicle (PSLV)
    - New Dedicated Small Satellite Launch Vehicle (SSLV) - 120 tons of lift off mass
    - 3 solid stages and 1 small liquid trim stage which puts the satellite in proper orbit
    - Compared to PSLV, launch in SSLV is effective
    - SSLV launches through New Space India Ltd (NSIL)
- **Challenges**:
    - Size: complex interdisciplinary product hence sensors are very critical
    - Weight: Emphasis on lightweight designs
- Advances in miniaturization by innovating compact and efficient solar panel for power and sensors
    - Allows functionality within limited space
- **Indian National Space Promotion and Authorization Center (IN-SPACe) supports private sector**
- Additionally, also nurtures innovation - currently works with more than 50000 educational institutions
- Involving Management schools since they offer entrepreneurship/ initiative courses
- PSLV Orbital Experimental Module - Performs tests including payloads, propulsion systems and COM
- International partnerships with countries like Argentina, Canada, Japan
- Promoting constellation creation and inter-satellite links as well as cloud storage data
- Small watellites soon will become an integral part of space economy
- AI for onboard processing will enhance the satellite technology
- Periodical updating the algorithm to ensure a long 15 years life
- Crucial for scientific research in fields of quantum communication and fast data transmission
- **Acknowledgement of Chandrayan-3 Mission and Mangalyan**
- A successful mission is important; interdisciplinary nature of the entire program comes into picture
- The Indian Engineering curriculum allows two interdisciplinary electives
    - Small satellite elective
    - Space robotics elective



Pictured: PSLV's 4th stage as a testing platform for in-orbit experiments

3. Presentation on "Spacecraft RF Characterization"

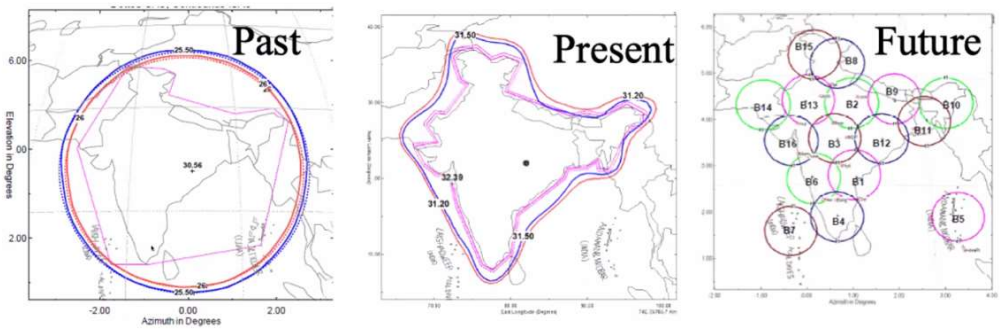
Puneet Kumar Mishra, IEEE Aerospace & Electronics Systems Society

Prof. Puneet Kumar Mishra is one of the Board of Governors of IEEE Aerospace and Electronics Systems Society, Region 10 (Asia and Pacific) India. He is also an eminent scientist of ISRO. He has done RF Characterization of 47 Satellites, 325 Antennas and Radomes. Prof. Mishra earned his M.Tech (RF & Microwave) from IIT Roorkee in the year 2004. He is currently a Senior Member of IEEE, a Fellow of IETE & IE, and a Life Member of ASI. He has published more than 30 papers and won 3 best paper awards. He is a Senior Member of IEEE, USA and life member of Astronautical Society of India, Society of EMC Engineers (India), and Antenna Test & Measurement Society (India). He has published more than 35 technical papers. He is on the board of reviewers of journals like the IEEE Transactions on Antennas and Propagation, IEEE Antennas and Wireless Propagation Letters, and IET Microwaves, Antennas & Propagation.

Pictured: Prof. Mishra's presentation focused on RF technology for satellites

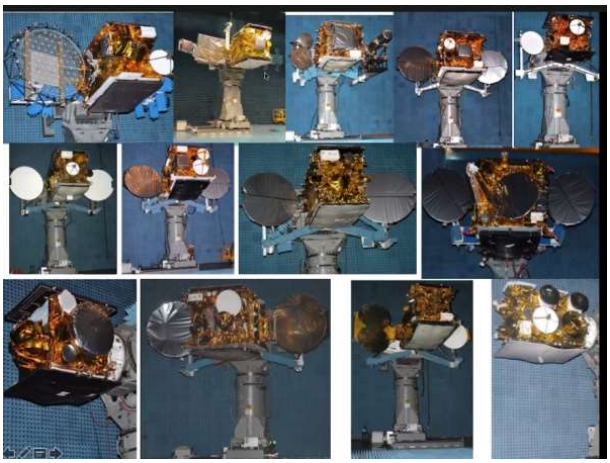
Highlights:

- Global space industry is $335.3 billion, satellite industry itself is $208 billion
- This is the palace where we should be working and is the right time in doing so
- The industry is seen to be growing exponentially
- Students, young professionals and startups are co-operated with more in the current space race
- **Antenna testing parameters:**
    - Polarization verification
    - Radian pattern measurement
    - Beam shift
    - S/C body effect
- **Payload parameters:**
    - Equivalent Isotropic Radiated Power (EIRP)
    - Saturation Flux Density (SFD)
    - Gain/Temperature (G/T)
- Passive Inter Modulation (PIM), Auto compatibility and Tracking verification are few other tests
- Antennas on ground: subsystem levels and integrated spacecraft levels
- **R/F Test at integrated S/C Levels:**
    - Required to verify the mounting of all antennas on the spacecraft
    - GEO satellites will look towards the equator, antenna will also look at the equator
    - Equator has very few countries and hence will have small coverage
    - A mechanical bias can be provided to the antenna and can communicate with other regions
    - To verify the spacecraft body induces no disturbances/ impact
    - To ensure that there is no degrading impact by performing Space Environment Tests
- Antenna or payload performances are challenged during tests specially in the mechanical aspects
- A Gaussian pattern of circular footprint used to be noted



Pictured: Past, present(middle) and future(right) RF footprint examples

- By shaping the reflectors, the footprint has been detailed to only cover the Indian mainland presently
- In the future, specific areas within India are aimed to be positioned
- 5G, 6G and beyond will have high data rates
- The size/dimensions of antenna cannot be made too large due to the launch capabilities
- A multiple beam antenna design – same size antenna but focusing energy on a small land portion
- High quality Plane waves, Low cross-pol
    - Highly accuracy positioning system and highly sensitive receiver is required to achieve this
- Compact range: a facility where we can simulate the ground stations
- RF waves are initially spherical in nature, cylindrical when propagating and becomes plain waves
- Reflection allows the creation of space conditions for radio frequencies
- Zero G fixture: Simulates micro gravity environment
- Antennas are attached with mechanical hinges designed for micro gravity
- Co-pol contours aligning states; there is no degrading impact of the spacecraft body with the antenna
- This reduces operational time of the satellite which used to be few months
- All reference data collection can be done prior to the launch.
- Raster scan: to generate 3D radiation pattern and footprint
- Measurement window is chosen, azimuth cut measurements are performed at various elevation angles
- **India requires azimuth scan angle of -5° to +5° and elevation of 0° to 8°**
- A single-beam payload has one beam to transmit and one beam to receive, 2 beams can be simulated
- In a multi-beam payload:
    - All the number of ground feeds should be simulated to map out the beams exactly to test
- Noise floor spectrum verifies the integrity of waveguide joints
- Frequency response measures the variation of transponder gain with regard to frequency
- Maximum variation of gain with frequency over specified bandwidth is gain flatness
- Maximum rate of change of gain with frequency over specified bandwidth is gain slope
- IMP is affected by the non-linear characteristics of High-Power Amplifier in transponder chain
- EIRP is the product of transponder output power and transmitting antenna, transponder is in saturation
- SFD measures the flux density required at the input of the transponder
- PIM – Passive devices like antenna reflector's tests
- **Analysis and simulations are very important in present scenario**

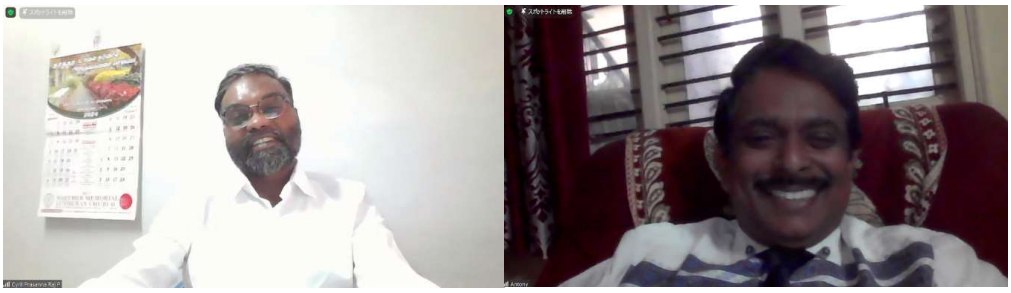


Pictures: Prof. Mishra presenting about different kinds of antennas

4. Presentations on "Insight into RISC-V and AI & ML for Space Applications"

Cyril Prasanna Raj P. and Antony Louis Piriyakumar, Cambridge Institute of Technology

Dr. Cyril Prasanna Raj P. is the Director at Cambrian Consultancy Center and Industrial Research, Cambridge Institute of Technology (CIT). He has more than 26 years of experience in industry, research and academics. His core competency is in electronic product design and VLSI design. Over the last 10 years he is involved in deploying & facilitating problem solving initiatives including innovation and product design. He has facilitated innovation workshops and generated over 500 ideas for medical and agricultural applications. Dr. D. Antony Louis Piriyakumar is currently a professor in the department of Artificial Intelligence and Machine Learning (AIML) and serving as Dean (Research and development) and Head of the department of AIML at CIT from March 2020. He worked in various managerial positions at Siemens corporate technology in Bengaluru for 13 years. He also taught at Madurai Kamaraj University, Pondicherry University, PES University and Stuttgart University with the total of 12 years of experience. He is also a registered Indian patent agent (IN/PA3041). He has WIPO certifications in patent search and patent drafting. He is also Cyber Crime Intervention Officer and a Bug bounty researcher. He is also a IEEE senior member and ACM member. He was nominated as Distinguished Visiting of AICTE INAE from 2018-2023.

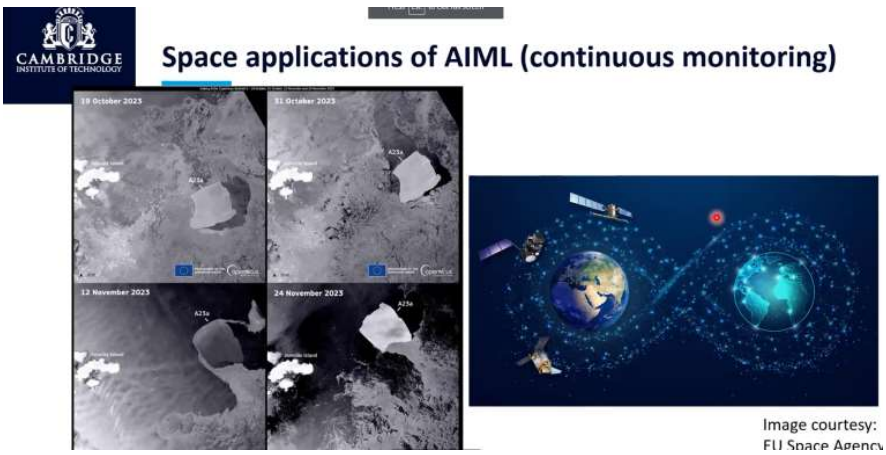


Pictured: Dr. Raj P and Dr. Piriyakumar(R) during their presentation

Highlights:

- Dr. Raj P. presented on RISC-V
- RISC-V is an open-source instruction set architecture, develop custom processors
- RISC-V can design from embedded designs to super computers
- Lot of attraction is present towards RISC-V for space applications
- NASA is trying to see if they can use RISC-V processor for high performance computing
- ESA has done lots of workshops on importance/ awareness on RISC-V for space applications
- India, particular the universities, are currently trying to build an ecosystem within the country
- Shifting up in performance by customizing applications and architecture
- Easy to adopt RISC-V while customers try to avoid monopoly suppliers
- RISC-V market is expected to be almost $1.07 billion industry by 2025
- Particularly used in cloud data center, automotive, mobile and wireless, industrial IoT, and Memory
- **In India, Government of India (GoI) has pushed for RISC-V development program**
    - Ministry of Electronics and Information Technology (METI) taking lead
    - METI launched Digital India Risk 5 Program
    - Local microprocessor development as part of Atma Nirbhar Bharat – Self Reliant India
    - Outcome: SHAKTI and VEGA processor was developed (RISC-V Processor)

- GoI also launched digital India Future Labs - entity to network industry, academia and startups
- Huge drive in the country to promote the processors
- Government of Karnataka has also gone into RISC-V
- Government of Karnataka has launched The Karnataka Digital Economy Mission
- **By 2030, aim is 10k+ startups in digital economy, 80k+ workforce and 5k+ job opportunities**
- Community of practice (COPI) at Cambridge Institute of Technology to drive RISC-V activities
- Follows purpose, people and practice theme with Seed, Drive and Growth phases,
- Develop products supporting local needs, RISC-V based CPUs, IPs, Products and Software
- 120 undergraduates have been trained in the last 4 months and internships to 1100 undergraduate
- Planning to conduct RISC-V hackathons across the country targeting 150k students in the next 3 years
- **All supported by Government of India**
- Product have been developed based upon RISC-V:
    - Lace defect detection system, sanitary pad vending machine
    - Sugarcane seed cutting machine and IoT enabled garbage collection vehicle
- **NANO SATELLITE LAB KIT is an ongoing project**
- Planned to be deployed to schools, colleges and other entities to teach students
- VEGA processor is appropriate for a lab kit for Nano-satellite
- Developing of RISC-V processor with customizer - verify IP, FPGA and chip set implementation
- Dr. Piriyakumar presented on AI and ML for space applications
- AIML history started back in 1642 and has made its way quite ahead in the present scenario
- Traditional programming involves giving data and program and getting an output
- ML involves providing data and expected output and getting a program set/ logic
- **Chat GPT had millions of parameters, ChatGPT3 had billions while ChatGPT4 had trillions**
- Space Applications of AIML
    - Detecting the fissures very early, the rate can also be detected
    - The future can be predicted in terms of what to expect due to climate change
    - **AIML integrated in CHANDRAYAN II confirmed the presence of Water/Ice on Moon**
- Moving in space eased up due to AIML - floating Alexa: voice based applications
- First time flying a Drone over mars was possible due to AIML
- **AIML has its own problems - lack of data, ethical issues**, fast computation, bias, scalability
- Explain-ability, low power requirements – **Many of these problems are SOLVED BY RISC V**
- RISC-V processor require very less power and simultaneously has high performance level
- **Market presence is exponentially increasing as well**
- The compiler and assembler can directly access and get into hardware
- Leveraging ISA, Complex operations, data intensive applications are all done by RISC V
- RISC V has nonstandard instructions for bit manipulation unlike previous times
- RISC-V requires optimal performance of hardware
- Concluding, RISC-V could be one of the key processors given the wide range of application it offers



Pictured: Dr. Antony explaining the space applications of AIML

5. Presentation on "*Think big, stay SMALL*, A vision for Space Internet of Things

R. Venkatesha Prasad, Delft University of Technology

Dr. R Venkatesha Prasad is an Associate Professor at Embedded Networked Systems group of Delft University of Technology (TU Delft) since 2013. Between 2005 and 2012, he was a senior researcher and adjunct faculty at TU Delft. He has supervised 18 PhD students (15 graduated, 3 ongoing) and 43 MSc students (36 graduated). He has (co-)authored more than 200 publications in the peer-reviewed international transactions/journals and conferences in the areas of Tactile Internet, Internet of Things (IoT), Cyber Physical Systems (CPS), Energy-harvesting, 60 GHz mm Wave networks, Smart-energy systems, Personal networks, Cognitive Radios and Voice over Internet Protocol (VoIP). He has been successful in acquiring and executing several European and Dutch national projects in the areas of IoT, Future home networks (60 GHz), Smart-energy systems, Personal networks, and Cognitive Radios.

Pictured: Prof. Prasad's presentation on Space IoT

Highlights:

- **Trend of satellites being smaller and smaller in size and weight**
- Small satellite jointly contributing to greater tasks together
- SWARM - necessary and useful together - power in large numbers
- Sensor wireless actuator Network in Space (SWANS)
- A collection of sensor and actuators but as miniaturized as possible
- **Continuous observation in a particular area is not possible through one big satellite**
- Small satellites contribute to the continuous watch and monitoring a specific area through small pixels
- Real-time data for warning and accurate weather report is contributed through it
- Orbiting Low Frequency Array (OLFAR); listening to the radio frequency from deep space
    - Extremely low frequency
- The idea is also to move behind the moon – might take some time but is doable
- Challenges: miniaturization, time synchronization, localization, data handling, energy aware computing
- Miniaturization allows fixating plenty of wires into a single PCB
- **Delfi-C3 Satellite – launched in 2008, survived till last year**
- Payloads: Thin Film Solar Cells (Dutch Space), Autonomous wireless sun sensors (TNO)
- Also, Radio-amateur transponder (TU Delft)
- Survived through a few occasions of solar flare and worked for 15 years
- A wireless sensor on board simply for test in the satellite was detected in the antenna of Netherlands
    - Delfi-next satellite launched in 2013, worked for 3 months
- Payload of Micro Propulsion System, particle spectrometer, solar cell degradation, transceivers, ADCS
- Miniature Moon Rover – Zebro
- Missioned for autonomous navigation and direct communication from Earth from Moon
- Payload is Zebro itself and a camera called SHRIMP of 3g

- To be launched, currently being worked upon
- A payload of 5kg can be adjusted upon it while the robot itself is 3.2 kg
- Can work on obstacles and hard terrains, tests have been performed in simulated moon soil
- Delfi-PQ: A triple unit PocketQube, weighs only 600g
    - Miniature propulsion system and ADCS
- SpacePixels: Chipsat
    - Currently being developed – Tests have been successfully completed
    - Operates on a single 2cm x 2cm solar cell
    - It can measure current of a big space system as well as the voltage of the battery
- GNSS – Supports both GPS and GLONASS using L1 bank
- 3cm x 4cm – first version, TTFF is only 30 seconds
- Maximum power consumption of 300mW at 5V

Pictured: Prof. R. Venkatesha Prasad presenting Zebro Models

6. Presentation on "NanoSat Learning Experiences and RISC-V in Space Applications"

Nikhil Riyaz, Delft University of Technology

Nikhil Riyaz is a research scientist at CIT/TU Delft, Netherlands. He is the former student representative of UNISEC-India. He has a wide experience in the area of technologies. He was a research intern at Indian Institute of Technology, Kanpur, Research and Development Intern at IBM, Vice Chairman at NHCE IEEE Student Branch Chair of Marine technology society's student branch. He is a founder of Dechedroid; a small scale 3D printing service facility and also was the Founding Director and CEO at TSU Technologies Pvt. Ltd.

Pictured: Nikhil Riyaz during his presentation on RISC-V applications in space

Highlights:

- ISA: Instruction set architecture that a processor understands and executes
- Interface between the language of software and hardware, highlights basic operations, data
- Determines machine language, instruction format
- Operation code indicating the task to be performed is the opcode
- Registers storage locations within the CPU for fast access
- Specifies the type of data the instructions operate on
- Types of ISA:
    - Complex Instruction Set Computing (CISC) - Complex instructions

    - Reduced Instruction Set Computing (RISC) – Simpler Instructions
    - RISC ARM – available on a lot of systems since a long time: Apple Devices, Samsung
- Change in Trend: companies slowly migrating towards RISC V
- RISC V - simple, efficient instructions
- Power and time efficiency and optimized for speed
- Customizable by oneself or through companies
- Open source - does not require a license and encourages collaborations and innovation
- Large number of resources and community support
- Industry adoptions might take some time since general purpose processors are not available
- Still widespread in telecom and automotive sectors and suitable for aerospace applications
- Most applications are specific purposes; once general-purpose chips are developed, industry will use it
- Active global community - continuous development and improvement
- Limitation in CubeSat is space and energy and needs power efficient processing
- RISC-V addresses the indeed for compact, power efficient processors
- Reduced instruction set and modular design make it ideal for small satellite application
- Image processing and applications requiring edge computing can be performed on the satellite itself
- **Cost: no license fees and reduced development expenses**
- **Performance: simplified instruction set, Efficient execution**
- **Design Flexibility: customization, only necessary components for streamlined solutions**
- Alternative to proprietary architectures and being used in vague sectors
- Fosters innovation in regions with diverse computing needs
- A potential alternative to tackle shortages that could arise due to geopolitical scenarios
- **Challenges:**
    - Integration challenge in the legacy existing systems, reluctant to migrant to something new
    - Fragmentation – Incompatibility might arise. need to ensure compatibility
    - Initial set up of libraries and code support is required – takes some time
- **Future Prospects:**
    - Advanced processor will be increased contributing to efficient performance
    - Increased integration in AI and Edge Computing given RISC V's adaptability
    - Exploration of RISC V in quantum computing
- Continued industry collaboration with involvement of organizations like Samsung and Qualcomm

7. Presentation on "Orbital Simulations for Nano Satellites Using MATLAB"

Inbisat Yousuf Nath, Central University of Kashmir

Ms. Inbisat Yousuf Nath is a PG Scholar of Physics at The Central University of Kashmir. She is also a Student Representative of UNISEC-India. She currently also interns at Indian Technology Congress Association (ITCA) and has experience of serving as the coordinator at Astronomy Department of ScienceOverse, scholar at Womanium, intern at Abdus Salam International Centre for Theoretical Physics (ICTP). She has worked on projects named Python Implementation for X-ray Spectral Analysis of Active Galaxies and QuantumSquareWellPy.

Pictured: Inbisat Yousuf Nath during her presentation on conducting simulations in MATLAB

Highlights:

- Bloom's taxonomy - assess the effectiveness of the teaching learning process from low to high orders
- Focusing on outcome-based education – learning by doing
- Satellite being an interdisciplinary and multidisciplinary project – ensures higher learning levels
- Many academic institutions hence encourage satellite projects
- **75 students' satellite mission - an initiative of ITCA and UNISEC India**
- Provides institutions the platform to build and launch their own satellite
- **Orbital mechanics and orbital analysis equally important to designing satellites**
- Orbital mechanics deals with the motion of celestial objects in space – under influence of gravity
- Rooted in Newton's law of motion and universal gravitation
- Crucial in planning and executing space exploration mission whether satellites or inter-orbital missions
- Important during satellite operation while optimizing the trajectories and minimizing collisions
- Spacecraft designing process requires orbital mechanics in terms of orbital transfer maneuvers
- Space debris can be tracked and mitigated its risks through orbital mechanics
- To ensure the safety and comfort of tourists during space tourism
- Three types of main orbits: Low Earth Orbit, Medium Earth Orbit, Geo-Stationary Orbit
- **Orbital Simulations is important for:**
    - Mission Planning: design trajectories that meet objectives accordingly
    - Orbit Determination: comparing actual automations, parameters for accurate predictions
    - Collision Avoidance: predict and assess risks to protect operational satellite/spacecraft
- Open-Source software tools available for orbital mechanics/ simulations/ mission design
    - NASA Open Software is the most famous one: The Orbit Determination Analysis Toolbox
    - GMAT is a commonly used software for mission designs available on YouTube as well
- **MATLAB –**
    - Powerful computational capabilities for object analysis and simulations
    - Wide range of functions and Toolboxes
    - Specifically for Aerospace Engineering Tasks
    - For design and analyzing satellite and GS scenarios
    - Propagate satellite trajectories
    - 3D visualization
    - Efficient numeric integration techniques
    - Offers optimization algorithms
- Identify eclipse intervals, and many more functions
- Students' Satellite Mission – 30+ satellite projects, 120-150 subsystem related projects in 2 years

8. Announcement and Acknowledgment

Haruka Yasuda, UNISEC-Global

Pictured: Yasuda-san announcing the latest updates from UNISEC-Global

Highlights:

- **Introduction of New Point of Contacts:**
  - UNISEC – Belgium : Dr. Ir. Jurgen Vanhamel KU Leuven
  - UNISEC – Mongolia : Tamir Baatarjav, National University of Mongolia

- **The 9th Mission Idea Contest (Preliminary Workshop)**
  - The MIC9 theme is "Lunar Mission"
    - Category A: Lunar Orbit CubeSat Mission (LOCM)
    - Category B: Lunar Surface Rover Mission (LSRM)
  - Requirements can be downloaded at PreMIC9
  - Website: https://www.spacemic.net/
  - Important Dates:
    - Abstract Submission Due: July 24,2024
    - Notification: September 10, 2024
    - Final Presentation: November 27, 2024 (South Africa)
  - Contact: info@spacemic.net

- **Launch Opportunity: J-Cube**
  - Special Discounted opportunities
  - 1U, 2U, 3U, deployment from International Space Station
  - Collaborate with UNISEC-Japan's University
  - Technical support will be provided
  - Contact: info-jcube@unisec.jp , http://unisec.jp/serviceen/j-cube

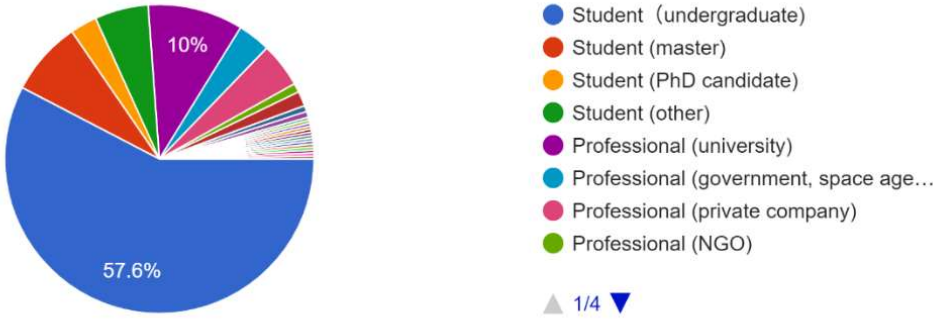
9. Participant Statistics

321 registered participants from **30** countries and regions for the 41st Virtual UNISEC-Global Meeting.

Country/Region	Number of registrations	Country/Region	Number of registrations
Argentine	1	Netherlands	3
Australia	1	Nigeria	2
Bangladesh	1	Paraguay	1
Bhutan	1	Portugal	1
Bulgaria	2	Romania	1
Burkina Faso	4	Russia	1
Chile	2	South Korea	1
Egypt	3	Taiwan	6
France	3	Tanzania	1
Germany	1	Thailand	3
India	257	Tunisia	2
Japan	10	Turkiye	3
Mexico	1	Uganda	2
Namibia	1	UK	2
Nepal	3	USA	1

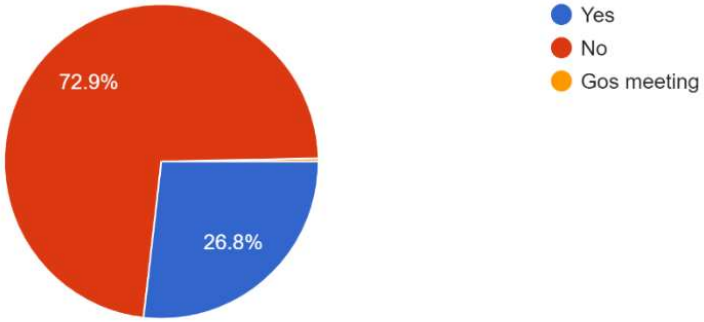
Student or professional?

321 responses



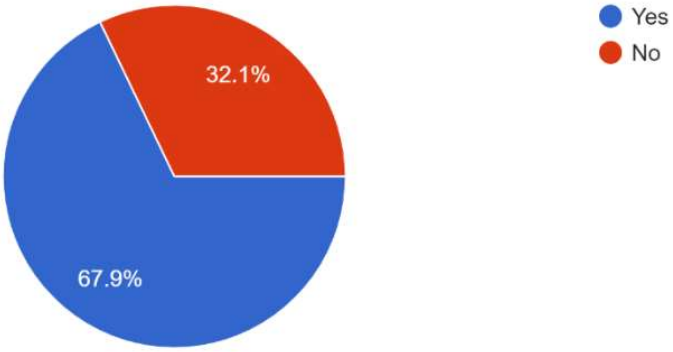
Have you participated in the UNISEC-Global Meeting previously?

317 responses



Are you familiar with space projects in India ?

308 responses

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6
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Thank you