International Workshop on Lean Satellite - 2018

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La SEINE

Kyutech

Kyushu Institute of Technology

International Workshop
on Lean Satellite- 2018
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Day 1 (Monday, January 22, 2018)

9:00-9:10	Yuji Oie, Kyushu Institute of Technology *Welcome Address*
9:10-9:40	Mengu Cho, Kyushu Institute of Technology *Lean Satellite Evolution*
9:40-10:40	Robert Sproles, Spire Global, Inc. *From Idea to Orbit - How Spire builds, tests, and operates a constellation of commercial cubesats*
10:40-11:00	Coffee Break
11:00-11:30	Joseph Casas, NASA MSFC *Lean Enablers for Managing Lean Satellite Science and Technology Payload Missions*
11:30-12:00	Jordi Puig-Suari, Cal Poly / Tyvak *Is the Lean Satellite Philosophy Becoming Mainstream*
12:00-12:30,	Cesar Bernal, Innovative Solutions In Space *ISIS experience with Lean Satellites*
12:30-13:30	Lunch & Group Photo
13:30-14:00	Riccardo Di Roberto, GAUSS SRL *GAUSS Approach to the Lean-Satellite Methodology*
14:00-14:30,	Daniel Rockberger, NSLComm *Nano Sat from Demonstration Mission to Service Mission*
14:30-15:00,	Hirokazu Masui, Kyushu Institute of Technology *Report of results of environmental testing in CeNT and future strategy for mass-producing of Lean satellite*

15:00-15:20	Coffee Break
15:20-15:50	Klaus Schilling, University of Wurzburg ***Advanced Industry 4.0 Production Methods for Satellites in New Space***
15:50-17:20	Panel Discussion ***Lean Satellite Mass Production***

Day 2 (Tuesday, January 23, 2018)

9:00-9:20	Tsegaye Kassa Gogie, Bahir Dar University *Validation of linear time series ionospheric Total Electron Content model over low latitude Ethiopian GPS stations*
9:20-9:40	Dagvasumberel Amartuvshin, Kyushu Institute of Technology *Visual-Inertial attitude propagation for small satellites*
9:40-10:00	Wang Zhaokui, Tsinghua University *Concept and design of an astronaut auxiliary robot; Intelligent Formation Personal Satellite*
10:00-10:30	ADRIAN C. SALCES, Kyushu Institute of Technology *Overview and Updates of the BIRDS-2 Project's Store-and-Forward (S&F) Mission*
10:30-11:00	Fernando Aguado Agelet, University of Vigo *FIRE-RS Project*
12:00-	Bus departure for excursion
13:35-	Toyota Factory
16:00-	TOTO museum
18:30-	Dinner
21:30-	Return to Kokura

Day 3 (Wednesday, January 24, 2018)

9:00-9:20	MD Mojammel Haque, BRAC University *Sustainability of "BIRDS" collaboration through lean satellite program using network based intelligent monitoring system*
9:20-9:40	Faure Pauline, Kyushu Institute of Technology *Report on a university-based strategic planning for sustainable space activities*
9:40-10:00	Rei Kawashima, UNISEC-Global *Future perspectives of UNISEC-Global; Vision 2030-All*
10:00-10:30	Fernando Stancato, Embraer *SMAE I: A BRAZILIAN MICROGRAVITY TOOL*
10:30-10:50	Coffee break
10:50-11:20	Stephan Stoltz, Astro- und Feinwerktechnik Adlershof GmbH *COTS based reaction wheels in Orbit experiences from TET-1 and BIROS*
11:20-11:50	Naomi Kurahara, Infostellar, Inc. *TBD*
11:50-12:20	Jyh-Ching Juang, National Cheng Kung University *On IoT-enabled Lean Satellites*
12:20-13:20	Lunch
13:20-13:40	Takashi Yamauchi, Kyushu Institute of Technology *Safety design and verification for lean satellite II*
13:40-14:00	Sangkyunn Kim, Kyushu Institute of Technology

	Evolution of BIRDS 1U CubeSat Standard BUS
14:00-14:20	Turtogtokh Tumernjargal, Kyushu Institute of Technology *Development status of Software-Configurable Interface Board for 1U CubeSat*
14:20-14:50	Evelyn Honore-Livermore, *Norwegian University of Science and Technology* *Survey of Lean Satellite Development Management Software*
14:50-15:10	Coffee break
15:10-15:30	Kiran Kumar Pradhan, Kyushu Institute of Technology *Shortening of Development time of Lean satellites*
15:30-17:00	Panel Discussion *Lean Satellite Fast Delivery*
17:00-17:20	Conclusion

Name: Mengu Cho
Affiliation: Kyushu Institute of Technology
Title: Lean Satellite Evolution
Abstract:
Review on development of lean satellite activities in the past one year will be given. Standard activities such as ISO-19683 and TS-20991 were completed. IAA SG4.18 report was approved. Overview of lean satellite activities in Kyutech and Japan will be presented.

Name: Robert Sproles
Affiliation: Spire Global, Inc.
Title: From Idea to Orbit - How Spire builds, tests, and operates a constellation of commercial cubesats
Abstract:
The development and standardization of cubesats has introduced not just research opportunities, but commercial opportunities as well. Spire was founded in 2012, launched their first satellite in 2013, and today operates a constellation of 50+ satellites. This growth is enabled by a tightly integrated design, manufacturing and test facility which has allowed Spire to create, grow and constantly refresh a constellation of lean satellites. This talk will focus on how Spire develops, manufactures, tests and operates their constellation of commercial cubesats, and what lessons can be applied to both individual satellite builds and future constellations.

Name: Joseph Casas
Affiliation: NASA MSFC
Title: Lean Enablers for Managing Lean Satellite Science and Technology Payload Missions
Abstract:
This discussion will address some of the key considerations of the management approach within a governmental organization in the development of lean satellite science and technology missions.

Name: Jordi Puig-Suari
Affiliation: Cal Poly / Tyvak
Title: Is the Lean Satellite Philosophy Becoming Mainstream
Abstract:
The lean satellite approach was born from the high-risk educational activities that lead to the CubeSat revolution. For a long time, that development philosophy was restricted to very low-cost nano satellites. However, in recent years, a number of larger missions have embraced and successfully incorporated the lean satellite ideals into much larger systems. Currently, the lean satellite approach is moving into new areas such as mega constellations (e.g. OneWeb) or interplanetary missions (e.g. JPL's MarCO). This latest developments seem to indicate that the lean satellite approach is becoming more mainstream and it is becoming relevant in more traditional space industry applications. The presentation will explore this evolution and consider future applications for lean satellites.

Name: Cesar Bernal
Affiliation: Innovative Solutions In Space
Title: ISIS experience with Lean Satellites
Abstract:

ISIS will present its experience in the adoption and implementation of Lean Satellite definition and approach in particular in the CubeSat and the testing fields; it will include ISIS experience with projects such as PLUGIN, INVEST, QB50, RemoveDebris, AIM and other relevant projects in the area of CubeSats and MicroSats.

Name: Riccardo Di Roberto
Affiliation: GAUSS SRL
Title: GAUSS Approach to the Lean-Satellite Methodology
Abstract:

GAUSS has started its business in 1990 as a university laboratory with the "Low-Cost and Fast-Delivery" approach in its DNA. This precondition was demanded by the constrained launch dates of micro-satellites, which ensued every two years. This tight scheduling, together with the limitation of the available financial resources, required a new course for fast prototyping of updated satellite components, while keeping a limited number of system iterations between PDRs and FRRs.

GAUSS is nowadays a private Company, with far more resources and projects than before, but the engineering approach has not changed.
Clients often request delivery dates based on available launches, therefore the deadline is a fixed parameter in the mission, and project management must elaborate a swift scheduling in order to proceed from the mission concept to the overall system ready for integration. This often goes concurrently with limited financial resources allocated to the activity, since many projects happen to come from public and academic institutions. GAUSS has then improved its "lean" philosophy since the university days, for all the steps involved in a typical micro/nano/pico satellite mission.

For a small private Company point of view, as of GAUSS, where employees are fewer than 12, one of the Lean-Satellite methods employed is the choice of highly-skilled and multitasking personnel,

each one capable of following the whole project at system level, while progressing at each assigned subsystem level under tight fixed deadlines. Electronic and structure departments are located in the same facility, next to each other, in order to speed up prototyping of newer hardware. Since time is a precious resource at GAUSS, most iterative tasks are automated. The electronic department has plenty of test hardware remotely controlled, in order to increase the lab productivity during final AIT tasks of electronic subsystems, such as QA tests and RF efficiency envelopes, while lowering the overall cost for testing new hardware. The ground station utilized to track GAUSS' and Clients' Satellites is completely automated with an advanced AI; human operator assistance is required only for 15 minutes every 7 days. Fast prototyping is essential in order to meet tight deadlines. The structure department examines early designs for mission compliance with several load simulations software and then prints select parts using accurate 3D-printers, before entering production phase with flight materials. This enhances manufacturing yield and lowers the number of finite parts to be produced before flight model.

Hence the Lean-Satellite approach influences several managing aspects of aerospace Companies that wish to thoroughly commit to it.

Name: Daniel Rockberger
Affiliation: NSLComm
Title: Nano Sat from Demonstration Mission to Service Mission
Abstract:

In this presentation i would like to talk about the transformation and differences from a demonstration mission with a cubesat to provide space heritage for a new technology and then the transfer in design when trying to come up with a full service providing platform.

It could be that the cubesat platform is not able to perform as a full service satellite and a larger more costly type is needed.

I will talk about the key metrics of this transition.

Name: Hirokazu Masui
Affiliation: Kyushu Institute of Technology
Title: Report of results of environmental testing in CeNT and future strategy for mass-producing of Lean satellite
Abstract:
Center for Nanosatellite Testing (CeNT) in Kyutech has provided environmental tests to Lean satellites since 2010. The environmental testing is a necessary for ensuring the reliability of Lean satellite. Especially for Lean satellite using COTS parts, it is important to evaluate reliability by environmental testing. However, to keep the advantage as short delivery and low cost of Lean satellite, a balance point between reliability and cost should be found. We obtained various findings of environmental test though the actual environmental tests of Lean satellites. This presentation will introduce the lessons learned from past results. In addition, we will discuss about mass-producing of Lean satellites. Kyutech developed 5 1U-cubesats as BIRDS-1 and are developing 3 1U-cubesats as BIRDS-2. 5 or 3 1U-cubesats are assembled, integrated and tested at the same time. We will discuss problems related to mass production of Lean satellite, which was revealed by our Birds-project satellite.

Name: Klaus Schilling
Affiliation: University of Wurzburg
Title: Advanced Industry 4.0 Production Methods for Satellites in New Space

Abstract:

Realization of growing numbers of small spacecraft in mega-constellations requires the transition from traditional manufacturing methods to more advanced automated production approaches. This influences the complete satellite lifecycle, starting from a satellite design supporting automated production to a mandatory disposal at the end of life.

A modular satellite bus layout and a backplane approach are described, enabling human-robotic interaction for integration. Robotic transport vehicles connect different integration and test steps in the satellite production process, in order to satisfy the high quality assurance requirements. Advanced networked production methods, in particular for automotive component suppliers, are analysed in the "industry 4.0"-demonstrator plant of the Zentrum für Telematik.. Here experiences will be reported from adapting these facilities to the specific application example of a CubeSat integration.

Name: Tsegaye Kassa Gogie
Affiliation: Bahir Dar University
Title: Validation of linear time series ionospheric Total Electron Content model over low latitude Ethiopian GPS stations

Abstract:

Modeling of the ionospheric Total Electron Content (TEC) precisely is a crucial aspect of Positioning, Navigation and Timing services envisioned for the Global Navigation Satellite System applications as well as Earth Observations System, satellite communication, and Space weather forecasting applications. In this paper, linear time-series modeling has been carried out on ionospheric TEC at two different Ethiopian GPS locations, at Arbaminch, ARMI (geographic 6.06 N, 37.56 E) and Bahir Dar, BDMT (geographic 11.6 N, 37.36 E), for the year 2014 in the 24thsolar cycle. The impact of solar and geomagnetic activity on periodic oscillations of TEC has been investigated. Results confirm that the correlation coefficient of the estimated TEC from the linear model TEC and the observed GPS-TEC is around 96%. Besides, geomagnetic activity is identified as the key component that influences ionospheric daily average TEC while periodic component reveals the seasonal dependence of TEC. The accuracy of the model has been assessed by comparing the International Reference Ionosphere (IRI) 2016 model TEC and TEC measurements. Consequently, the IRI 2016 model over estimated the observations whereas the linear model has nicely agreed with GPS-TEC measurements with an average RMSE around 0.05 and 96% correlation coefficient. Finally, under various geophysical conditions, our findings

are supposed to contribute for the ongoing efforts in optimizing the ionospheric now-casting regional and global models.

Name: Dagvasumberel Amartuvshin
Affiliation: Kyushu Institute of Technology
Title: Visual-Inertial attitude propagation for small satellites
Abstract:
Robust, accurate, efficient attitude determination system is a key component for earth observation small satellites. However, achieving highly accurate attitude determination and control system is challenging due to the satellite's small form factor. Small satellites often carry a vision sensor as part of their payload. But, most of these sensors are only used for earth imaging and scientific missions. In addition, visual features in an imager's field of view provides valuable attitude references to attitude determination system. It increases the capability to maintain robust and efficient estimation of satellite's attitude. The proposed attitude determination approach is a vision-based and inertial-aided attitude propagator that can propagate a satellite's attitude in three degrees of freedom by tracking the motion of the visual features in an imager's field of view and combining it with inertial sensor measurements. Simulation results are presented to demonstrate the feasibility of the proposed concept.

Name: Wang Zhaokui
Affiliation: School of Aerospace Engineering, Tsinghua University
Title: Concept and design of an astronaut auxiliary robot; Intelligent Formation Personal Satellite

Abstract:

China Space Station will launch around 2020. Operating on orbit for more than ten years, the long-term care of the Space Station and the implementation of complex scientific studies will mainly depend on the astronauts. However, available astronaut time is usually limited. The improvement of astronauts's work efficiency becomes particularly important for space missions. To assist astronauts and help improving their work efficiency, an in-cabin robot called Intelligent Formation Personal Satellite (IFPS) is now under development. Based on regularly updated map inside the cabin and the advanced 3D SLAM algorithm, the robot can fly autonomously everywhere in the Space Station without any cooperative identifiers. Formation flying and face-to-face interacting with the served astronaut through gestures and voice, the robot offers assistance tasks such as data inquiry, panoramic video recording and HD video recording in the Space Station. The primary design of IFPS and the research of key technologies will be mainly discussed.

Name: Adrian C. Salces
Affiliation: Kyushu Institute of Technology
Title: Overview and Updates of the BIRDS-2 Project's
Store-and-Forward (S&F) Mission
Abstract:
This presentation will discuss an overview and recent development updates of the BIRDS-2 Project's store-and-forward (S&F) mission, which aims to demonstrate and explore the use of a lean S&F CubeSat constellation for collecting data from ground sensor terminals deployed in remote or isolated areas. Due to their substantially lower cost and shorter development time compared to larger satellites, it is attractive to employ lean satellites, especially CubeSats, for the said application. However, because of its very simple architecture, small size, and tight power budget, there are more stringent technical and communication challenges that must be addressed to enable the said idea. Thus, the S&F mission will also investigate such issues.

Ongoing development of an experimental onboard S&F payload is being done at the Kyushu Institute of Technology in Japan as a technology mission of the joint global multi-nation BIRDS-2 Project. Meanwhile, building (and deployment) of ground sensor terminals are being (will be) done in collaboration with stakeholders in the Bhutan Royal Government's Ministry of Information and Communications, Universiti Teknologi Mara (UiTM, Malaysia), and University of the Philippines-Diliman (UPD).

Name: Fernando Aguado Agelet
Affiliation: University of Vigo
Title: FIRE-RS Project
Abstract:

FireRS (an acronym for wildFIRE Remote Sensing) aims to provide emergency agencies and/or coordination centres with an innovative tool for detecting and managing fire using new technologies. The new platform created in FireRS will provide almost real-time information, GPS positioning, fire perimeter, infrared images, propagation prediction, performance protocols, etc. The set consists of ground sensors, a dedicated picosatellite, a local and remote ground station as well as a mission control centre.

Name: MD Mojammel Haque
Affiliation: BRAC University
Title: Sustainability of “BIRDS” collaboration through lean satellite program using network based intelligent monitoring system

Abstract:

In developing countries satellite program is still very expensive because of its economic structure. To overcome this situation international collaboration can be a vital solution. "BIRDS" is one of the great example of international collaboration for capacity building in terms of satellite technology. The sustainability of "BIRDS" vision, it is necessary to continue research in the native nations. In this presentation we are proposing a cost-effective way of developing "LEAN Satellite" through international collaboration which will be managed by artificial intelligent based online monitoring system.

Name: Faure Pauline
Affiliation: Kyushu Institute of Technology
Title: Report on a university-based strategic planning for sustainable space activities

Abstract:

In 2015, Kyushu Institute of Technology initiated the Joint Global Multi-Nation Birds Satellite (BIRDS) project. In this project, young professionals from non-space faring nations, and without Master or PhD degree, participate to the design, development, testing, and operation of a 1U CubeSat. Upon graduation, the young professionals shall return to their home country and help establishing indigenous sustainable space activities. To help the young professionals acquiring the right tools and preparing them to successfully achieve the latter, the space strategic planning project was established in February 2017. During this project, young professionals from Bangladesh, Ghana, Mongolia, and Bhutan were invited to think about the strategy their home country should be following in the next ten years in order to achieve their country's goals in terms of space sciences, engineering, and utilization, while respecting the country needs and constraints. In this presentation, the efforts undertaken by the different young professionals are reported and the guidelines for each country space strategic planning are described.

Name: Rei Kawashima
Affiliation: UNISEC-Global
Title: Future perspectives of UNISEC-Global; Vision 2030-All
Abstract:
UNISEC-Global was launched in 2013 with a vision 2020-100,"By the end of 2020, let's create a world where university students can participate in practical space projects in more than 100 countries." Currently, 44 points of contact are working to realize the vision worldwide. It was accepted as permanent observer of UNCOPUOS in 2017, and is ready for contributing to capacity building for the twenty-first century which is defined as thematic priority #7 in the UNISPACE+50 scheduled in 2018. The key principle of the 2030 Agenda for Sustainable Development defined by UN is "no one will be left behind." If we apply the principle to our vision, it should be "Vision 2030-All," or "By the end of 2030, let's create a world where university students can participate in practical space projects in all countries."
How can we achieve the vision? How can we solve obvious and potential problems such as debris issues? In this presentation, focusing on lean satellite activities, the roles of capacity building and future perspectives of UNISEC-Global are discussed.

Name: Fernando Stancato
Affiliation: Embraer
Title: SMAE I: A BRAZILIAN MICROGRAVITY TOOL
Abstract:

The Brazilian Space Agency has a program called " Microgravity Project" which the objective is to promote studies in the microgravity area. As a ISS project participant, Brazilian experiments can be flying in the next years. As a preparation phase for the experiments it is planned a number of sub-orbital flights in the Brazilian rockets.

In 2001 a call of projects for a sub-orbital flight was put. This flight was going to be with a Brazilian motor and a microgravity platform from German Space Agency, DLR.

Four experiments were selected and later three other were added.

One selected experiment was the SMAE; Spatial Acceleration Measurement System. The objective was to measure accelerations from 0 to 90 Hz from 2 gs to 4 mili g and from 4 mili gs to 10 micro gs in order to give the experiment's team the microgravity environment information.

The project was done inside the SPACE group of the UNOPAR; Universidade Norte do Paran;. The group objective is to help form a critical mass for the national space program by hands on projects.

Three students participated in the SMAE project, construction, tests, flight and data analysis. The project was split in three areas and each student was assigned for it: electronics, software and structure.

In this multidisciplinary scenario they learned how to work in teams and exchange information on their part.

Professional and management experience was gotten as they had short deadlines and budget constraints.

During the project they had contact with aerospace professionals from national institutes. Two technical project reviews were done and those showed them the benefits of external high skilled views.

They learned on how to work on critical mission behavior and to design redundant systems.

International experience was gotten. They had to be in contact with the DLR teams as there were many interfaces with the X1 platform.

Working in a practical project made them put in practice their background knowledge and fix the concepts.

One of the students used the project as a theme for his final graduation project.

Although the fight did not reached the microgravity level, the system worked as planned giving good information on the flight events.

Name: Stephan Stoltz
Affiliation: Astro- und Feinwerktechnik Adlershof GmbH
Title: COTS based reaction wheels in Orbit experiences from TET-1 and BIROS

Abstract:

The TET-1 satellite is in orbit since 22nd July 2012. Since 22nd June 2016 it is accompanied by the BIROS satellite to form DLR's scientific; FireBird" mission. The main task is the monitoring of high temperature events on the Earth such as wildfires.

Both satellites base on the TET satellite platform and are using Astrofein's COTS based reaction Wheel RW 90. The presentation will show experiences and lessons learned gained within both missions.

Name: Naomi Kurahara

Affiliation: Infostellar, Inc.

Title: TBD

Abstract:

Name: Jyh-Ching Juang
Affiliation: National Cheng Kung University
Title: On IoT-enabled Lean Satellites
Abstract:

Lean satellites were conceived by adopting mass production practices into the design and production of small/micro satellites. The life cycle of a typical space program encompasses the design, manufacturing, test, launch, and operation phases. When the manufacturing and test campaigns are significantly enhanced by the lean satellites practices, the number of satellites in space is likely to increase drastically. The operation of the satellites and the dissemination of data then becomes an important issue. It is thus highly desired to adopt mobile phone and internet techniques in the operation of lean satellites. In the presentation, Internet of things (IoT)-enabled techniques to realize an internet protocol network of satellites are discussed. A scheme that is based on software defined radio and international mobile subscriber identity is described.

Name: Takashi Yamauchi
Affiliation: Kyushu Institute of Technology
Title: Safety design and verification for lean satellite II
Abstract:
Most of piggy-back satellites released from ISS are characterized as a lean satellite that utilizes untraditional risk-taking development approaches to achieve low-cost and fast-delivery with a small number of team members. Meeting safety requirements is critical for the satellite development and often a big hurdle for lean satellites. It can be a major factor to delay the satellite development. In the piggy-back satellite, the concern of launcher is focused on the harmlessness of the satellite to the main satellite and the launcher. In the case of the CubeSats released from ISS, the concern of the launcher is the harmlessness to ISS and its crews. Especially, strong requirements are imposed on the power system (circuit and battery), the communication system and the deployment system. There is different in the idea of the safety requirements by whether the satellite launched by the rocket or released from ISS. For example, when deployment unintentionally expansions, there is a possibility of damaging other satellites in POD. And there is also the possibility that the satellite is caught by the POD and disturbing the release of other satellites. In the case of a rocket launch, the direction of satellite releasing further changes due to unintended deployment, and is worried about damage to the rocket.
We will deliver Irazú and BIRD2 to be released from ISS. And we are currently working on AOBA VELOX-IV to be launched by an Epsilon rocket. Those satellites need to meet various safety requirements,

which are sometimes dependent on the launcher and sometimes common in all the launchers. In this workshop, we will share our experience of how to meet the safety requirements.

Name: Sangkyunn Kim
Affiliation: Kyushu Institute of Technology
Title: Evolution of BIRDS, 1U CubeSat Standard BUS
Abstract:

BIRDS projects are educational projects of 1U CubeSat for the capacity building. It has been developed with many generations from Bird-1, and the second generation of Bird-2 is under final assembly work now for the deployment on the orbit. Both generations did many accomplishments by the members of projects, but gave us many lessons for the improvements at the same time. Members start the project without any experience of space engineering, and they have to build and operate the satellite within two years. Standard BUS of simple structure becomes essential part for the reason. At this study, one standard BUS is introduced for the future BIRDS projects. It takes many heritages from Bird-1 and Bird-2, but modified its design with two key ideas, simplification and unification. This standard BUS will be tested on the ground with all environmental tests, and will be used from Bird-3 project.

Name: Turtogtokh Tumernjargal
Affiliation: Kyushu Institute of Technology
Title: Development status of Software-Configurable Interface Board for 1U CubeSat
Abstract:
Using a standardized or common interface for different CubeSat missions is one of the key methods to reduce cost, and delivery time. Backplane interface approach for a 1U CubeSat, proposed by University of Wurzburg in Germany as UWE-3, were implemented in BIRDS-1 Project at Kyushu Institute of Technology (Kyutech) to shorten development and assembly times and costs. The backplane approach also help reducing the risk of the workmanship errors associated with harness. The second-generation satellites, BIRDS-2 and SPATIUM, are implementing the backplane approach based on the BIRDS-1 design. However, the proposed standard interface board needed changes in every CubeSat project to comply with their mission requirements. In fact, the electrical connections on the backplane board strongly depend on the mission payload requirements. If the electrical connections have to be changed every time, we lose the advantage of repeatability. To benefit from the backplane interface board, we need a high flexibility especially for data connection, which is one of the lessons we learned through BIRDS-1, BIRDS-2 and SPATIUM projects at Kyutech. This work introduces a new idea to solve this problem by making a software configurable bus interface with the backplane board. A Complex Programmable Logic Device (CPLD) utilized as replacement of a hardware routing on the board, which allows us reconfiguring the bus

interface by reprogramming CPLD. The work will discuss the validation of this idea and further implementation for BIRDS-3 CubeSat project.

Name: Evelyn Honore-Livermore
Affiliation: Norwegian University of Science and Technology
Title: Survey of Lean Satellite Development Management Software
Abstract:

The Norwegian University of Science and Technology has a history of space technology subjects and projects, and have now started a project to develop a pipeline of low-cost small satellites for oceanographic research projects. The overall goal is to have a network of small satellites and unmanned autonomous vehicles (airborne, seaborne and underwater) that communicate and together investigate certain geographic areas of interest. The first mission is a hyperspectral imager, which will look at algal blooms and analyze these to enable autonomous vehicles to do in-situ measurements if necessary. The second mission will have a software defined radio payload, to facilitate a flexible and reconfigurable communication platform between the vehicles.

Development of small satellites in academia and startups have both high technical and managerial risks associated with it. To stay lean the traditional big bodies of standards are discarded and instead use of COTS is encouraged as well as focusing on a shorter development schedule. Additionally in university projects there is typically a high turnover of team members which increases the risk of knowledge loss and delays. The research will be looking at methodologies to increase the success rate of small satellite projects and to decrease the time between concept to launch. The first part of the research is looking into software that support product development and evaluate these using the hyperspectral imager as a test case in spring/fall of 2018.

Name: Kiran Kumar Pradhan
Affiliation: Kyushu Institute of Technology
Title: Shortening of Development time of Lean satellites
Abstract:

The introduction of CubeSats has brought a massive impact on the development of smallsats/leansats. As opposed to traditional satellites, leansats are being developed in shorter time and at cheaper cost. This has lead to an increase in the number of satellites being launched. But, this concept is far from matured and that gives the opportunity for further advancements in the development process. The leansats could be developed much faster to address the changing needs of the users. Thus, the current research aims to study the development methodology in practice, analyze the challenges faced by the satellite developers and then frame a new/improved approach for faster development and delivery of lean satellites.

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