Ground Station Network

Presentation Schedule - 18 July

18 July	Session		Paper Title	Name	Organization
14:00	Opening				
14:05	K1 / Key Note Lecture	01	A Report on Students' Ground Station Network Project in Japan	Yasuhisa Oda	The University of Tokyo, Japan
14:35		02	Using Cubesats to Create a Ground Station Network	Kyle Leveque	California Polytechnic State University, CA
14:55		03	A European Perspective on a Global Educational Ground Station Network	Neil Melville	European Space Agency
15:10	Break				
15:20	A1 / Network Technology of Ground Station for Satellites -I-	04	Component Based Ground Station Network using Modular and Distributed Systems	Rajesh Shankar Priya	University of Wurzburg, Germany
15:40		05	A report of GSN activities by Univ. of Tokyo ISSL -the efficient spacecraft operation system with domestic & international collaborators-	Mitsuhito Komatsu	University of Tokyo, Japan
16:00		06	Use of Internet by the Disaster Monitoring Constellation	Lance Gatling	Cisco Systems, Inc.
16:20		07	Spacecraft Management And Control System (SMACS) Overview	Yusuke Murata	SORUN Corporation
16:35	Break				
16:45	C / Proposal of New Technology and Collaboration	08	Towards the Development of Small Satellite Systems and Technologies for Applications and Research in the Philippines - the TriS-TAR Program	Jose Edgardo L. Aban	Republic of the Philippines
17:05		09	Implementation of Ground Station for Stratospheric Balloon Campaign BEXUS II	Muhammad Imran Majid	Space Generation Advisory Council
17:25	D1 / Discussion -I-	SP01	Short Presentations on Introduction of Various Ground Stations	Chiu-Teng Tsai	National Cheng Kung University, Taiwan
		SP02		Hideki Yoshihara	Kagawa University, Japan
		SP03		Kazuhiko Yotsumoto	Kyushu University, Japan
		SP04		Daichi Kumagai	Kyushu Institute of Technology, Japan
		SP05		Fumio Asai (JA3TDW)	Nara National College of Technology, Japan
		SP06		Haruki Shiroma	Soka University, Japan
		SP07		Bryan Klofas	California Polytechnic State University, CA
18:00	(Closing Day1)				

Ground Station Network

Presentation Schedule - 19 July

19 July	Session		Paper Title	Name	Organization
9:00	A2 / Network Technology of Ground Station for Satellites -II-	10	XML and IP Based Ground Station System for Distributed Operations of Small Satellites	Masaki Maeno	Tokyo Institute of Technology, Japan
9:20		11	The use of Distributed Ground Station System for very low power communication	Marcin Stolarski	Warsaw University of Technology, Poland
9:40		12	A mathematical programming approach to the Ground Station Network	Naonori Kakimura	University of Tokyo, Japan
10:00		13	Operation Scheduling of Multiple Small Satellites Using Ground Station Network	Yuya Nakamura	University of Tokyo, Japan
10:20	Break				
10:30	B / Facilities of Low-cost Ground Stations for Educational Satellites	14	Efforts toward networking ready ground station	Akira Yamaguchi	Nihon University, Japan
10:50		15	The SwissCube mission and associated ground station segment activities	Renato Krpoun	Ecole Polytechnique Federale de Lausanne, Switzerland
11:10		16	Cubesat Ground Station of the Technical University of Berlin	Dmitriy Bogdanov	Technische Universitat Berlin, Germany
11:30		17	Approach Concerning Hokkaido Institute of Technology Ground Station	Kazuhiko Takeoka	Hokkaido Institute of Technology, Japan
11:50		18	IRV Ground Station Status	C. Priya Fernando	Lulea Unisversity of Technology & Umea University, Sweden
12:10	Break				
12:20	D2 / Discussion -II-		TBD (60min)		
13:20	Closing				

Presentation Abstracts - 18 July

K1 / Key Note Lecture

14:05 (30min)

A Report on Students' Ground Station Network Project in Japan

Authors:
Yasuhisa Oda*, Tatsuhiro Sato+, Nobuaki Kinoshita++, Yuya Nakamura*
*The University of Tokyo, +Hokkaido Institute of Technology, ++Nihon University

Abstract:
Recently many CubeSats are being developed in many countries. In Japan, two CubeSats, CUTE-1 and XI-IV were launched successfully in 2003. These CubeSats were launched into the low earth orbit and its operation time is limited less than 15 min per pass. To realize long operation time, the development of ground station network (GSN) is strongly required.

In 2004, 10 universities and colleges started the Ground Station Network Project Japan (GSNPJ). The project was organized as UNISON (UNISEC Student Organization) project, which was organized only by students. The remote ground station control system based on web services technology was developed by the University of Tokyo. In May 2005, the system was installed into the ground station of Hokkaido Institute of Technology (HIT), which could be remotely operated from the University of Tokyo. The remote ground station at HIT successfully worked as a sub-monitor station for XI-IV, and we continued this experiment for a month. This experiment has revealed the effectiveness of domestic GSN in that it enhances the amount of downlinked data. In 2006, the system was also installed at ground stations of Nihon University and Sugadaira Space Radio Observatory. The development of domestic network of ground station is still in progress.

In 2005, XI-V was launched. GSNPJ members formed collaborative receivers' network to track XI-V. 5 universities in Japan, from Hokkaido to Kyushu, joined together to cooperate in searching the satellite and had supported its operations for several days since the launch.

O

14:35 (20min)

Using Cubesats to Create a Ground Station Network

Authors:
Kyle Leveque
Masters Student of the Computer Science Dept., California Polytechnic State University, San Luis Obispo, USA
kleveque@calpoly.edu

Abstract:

Many universities all over the world are developing Cubesats. With 10 Cubesats currently in orbit and 14 going into orbit in late July, there are plenty of opportunities to test out the feasibility of a Ground Station Network. Because most Cubesats also use amateur radio frequencies, many people from the general public such as high school students or amateur radio enthusiasts could join such a network. By joining the network people could directly participate in scientific research and satellite missions in space. Recent work between the University of Tokyo, Japan, and the California Polytechnic State University, San Luis Obispo, USA has shown that such a Ground Station Network is very possible.

O

14:55 (15min)

European Perspective on a Global Educational Ground Station Network

Authors:

Neil Melville

Education Department of the European Space Agency

Abstract:

The European Space Agency's (ESA) Education Department is dedicated to improving the literacy and motivation of students in space science and technology, and ensuring a talented future workforce, by hands-on involvement in real space missions and space-related opportunities.

The ESA Education Department has proposed the concept of a Global Educational Ground Station Network to the International Space Education Board (ISEB), which consists of representatives from CSA, ESA, JAXA and NASA. The ISEB has given approval for the ESA Education Department to conduct an Assessment Study consisting of definition of network software requirements, investigation into other existing ground station networks, and organisation of a focused workshop including all relevant parties.

As a result of the ongoing Student Space Exploration and Technology Initiative (SSETI), ESA's student satellite programme, strong links exist between the ESA Education Department and a large number of educational and radio amateur ground stations throughout Europe. This provides an excellent development environment for a network software client, SatNet, which is currently being designed to facilitate improved access to all participating educational satellites by sharing ground station resources. Comparison, cooperation and collaboration with other similar projects, such as the UNISEC Ground Station Network, is sought in order to ensure an optimal final solution fulfilling the needs of end-users worldwide.

15:10 Break (10min)

A1 / Network Technology of Ground Station for Satellites -I-

15:20 (20min)

Component Based Ground Station Network using Modular and Distributed Systems

Authors:

Rajesh Shankar Priya, Klaus Schilling
Department of Robotics and Telematics, University of Würzburg, Germany.
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Abstract:

Interlinking several ground stations located all over the world to a federated single network and utilize the tracking data even during the eclipse of the satellite is a key software challenge for any satellite operation mission. The autonomy to choose different set of hardware and usage of independent software packages in a ground station for operations could sometimes be a hurdle for other Ground stations to network. In most cases, data synchronization can be done only after several technical adaptations are made which is required for connecting to a Network Ground station. The technical adaptations get more tedious if all ground stations use different methods for data exchange. The Department of Robotics is currently testing a specific Ground Station Network open source software Package which could be used by several other ground stations without any major technical adaptation from the operation team. This component based software is designed like a plug and play tool for any ground station. It is further designed to support different kind of communication protocols at all operation levels. This system provides an open framework to adapt itself to different software and hardware environments. It additionally features dynamic extensibility and a single packet solution for installing and running a complex ground station network. This component based open source software could generate potential interest for several ground stations to start up interlinking with minimum efforts and resources. This further extends the ground station community to spread its wings to different continents and serve the main purpose of providing more telemetry to the scientific community.

O

15:40 (20min)

A report of GSN activities by Univ of Tokyo ISSL - the efficient spacecraft operation system with domestic & international collaborators

Authors:

Mitsuhito Komatsu, Yuya Nakamura, Yasuhisa Oda, Yoshitaka Suzuki, Shinichi Nakasuka
ISSL, Univ. Of Tokyo, JAPAN

Abstract:

To acquire the telemetry data from a super-small satellite in the noisy environment, the Ground Station Network is one of the most efficient ways with extremely low development cost. The GSN project in Japan started in 2004, and our project team has established the very efficient and reliable GSN system with some domestic & international collaborators. In this presentation, we will introduce our GSN activities, showing the results & current status of it.

In light of returning the profits obtained by the CubeSat technology to the actual world, we also have prepared and developed the uplink service system of XI-IV for the general users. In order to realize this service, we had to consider some legal restrictions and settle some

problems which are mainly caused by the power & memory limitations of our satellite. In this presentation, we will explain the main purpose and ideas of this uplink service system, and will show the concrete instance to operate a small satellite safely & efficiently by the ground station network.

O

16:00 (20min)

Use of the Internet by the Disaster Monitoring Constellation

Authors:
Lance Gatling
Representing Cisco Systems Global Defense, Space and Security
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http://www.cisco.com/go/space

Abstract:
When ground stations use the Internet to communicate and collaborate, a large satellite operations network can be built quickly and cheaply. The Disaster Monitoring Constellation (DMC), designed and built by Surrey Satellite Technology Ltd at the University of Surrey, now consists of five countries connecting their ground stations of similar design across the Internet in a Virtual Private Network to communicate and share operations of five small remote-sensing satellites. The DMC satellites, which share common payloads and communication links, become more responsive, can be commanded more often, and can download more imaging data to the ground stations. The DMC satellites also use the Internet Protocol to communicate with their ground stations, simplifying their design and operations. We outline how this DMC network is set up and operated. We also discuss how the Internet has been extended into space by the DMC satellites, both for mission-critical imaging purposes, delivering data through Cisco Internet routers in the ground stations, and experimentally, where a Cisco Systems mobile access router has been tested in space onboard the UK-DMC satellite.

O

16:20 (15min)

Spacecraft Management And Control System (SMACS) Overview

Authors:
Yusuke Murata, Katsuyoshi Yamamoto, Masaaki Sugino
SORUN Corporation
3-11-24 Minato-ku, Tokyo, 108-8368, Japan

Abstract:
More than 20 years have already past since the first utility spacecraft was launched in Japan, and the third generation spacecraft control system at JAXA, which monitors the remote-control status from the earth, has been developed. The system has already been applied in the control of the ALOS (Advanced Land Observing Satellite) launched in Jan

2006.

Currently artificial spacecrafts are becoming larger or smaller depending on the mission request and have become more diversified than ever. In addition, large spacecraft accidents of the ADEOS series, which led to the inevitable suspension of operations, may encourage the launching of smaller spacecraft series.

In consideration of these circumstances, improvement in reliability and reduction in both maintenance and operation costs are being sought for the spacecraft control system. The SMACS (Spacecraft Management And Control System) was developed through the accumulated know-how from past spacecraft management and control systems.

For recent spacecrafts, AOS, as recommended by CCSDS, and space packet transfer with tele-command have been mainly used in space link protocol. SMACS has a database for telemetry commands regarding the space packet unit in its structure and executes processing according to this space packet unit. This system can be applied for all kinds of telemetry command processing systems using space packets.

16:35 Break (10min)

C / Proposal of New Technology and Collaboration

16:45 (20min)

Towards the Development of Small Satellite Systems and Technologies for Applications and Research in the Philippines - the TriS-TAR Program

Authors:

Jose Edgardo L. Aban, Ph.D.*, Nestor Tiglao+, Enrico Paringit, Ph.D.+

*Science and Technology Coordinating - Committee on Space Technology Applications, Department of Science and Technology, Republic of the Philippines

+ College of Engineering, University of the Philippines-Diliman

Abstract:

Following the conduct of the monumental first National Congress on Space Technology Applications and Research (NC-STAR) last 15 November 2005, one of the plans of action that have been identified is the development of expert manpower needs, curriculum and educational materials at all levels. Among the strategies formulated to realize this plan is the deployment of hardcore trainees for graduate research degree/non-degree programs in small satellite and information, communications technology (ICT) design, data reception, maintenance and management.

To date, the Philippines may be one of the very few countries in the ASEAN region which still does not have local manpower capability in satellite design and development. Parallel activities on local small satellite development are now underway in Indonesia and Malaysia.

The series of workshops towards the Development of Small Satellite Systems and ICT Technologies for Applications and Research in the Philippines (the TriS-TAR Program) are meetings of the minds among various stakeholders of satellite-based technologies in the Philippines. The workshops are envisaged to be participated in by researchers, scientists, engineers, policy and regulatory entities of satellite and ICT, communications, and satellite

communications and broadcasting industry players in the Philippines. It hopes to identify problems and issues relative to local satellite design and ICT development, and propose strategic alternative mechanisms, concrete approaches and possible solutions to address the gaps. The TriS-TAR workshops hope to come up with concrete steps and chart out major milestones, activities, with the end in view of achieving local competence and know-how in small satellite design and ICT development in the region.

Foreign counterparts involved in the research and development of small satellite technologies and ICT will be networked with local researchers and engineers to draft specific strategies and target collaborative projects/programs within a workable timeframe, for technology/knowledge diffusion/transfer from foreign counterparts, on specific programs of satellite and ICT research and development, experts exchange, and human resource training, among others.

The TriS-TAR program seeks to pursue the following objectives:

1. To consult with local satellite stakeholders, particularly with researchers, scientists, engineers, policy and regulatory entities of satellite communications, and satellite communications and broadcasting industry players in the Philippines, in order to identify the current needs, status of utilization of satellite technologies;
2. To put into fore all issues, problems and assess the needs of the ICT and satellite technology research and applications sector in the Philippines, and to be able to resolve such issues, problems through the formulation of a cohesive strategy on small satellite development in the Philippines;
3. To forge and enhance networking activities between local (future) satellite and ICT technology developers/engineers with foreign expertise and research and development institutes;.4. To draft specific strategies and target collaborative projects/programs within a workable timeframe, for technology/knowledge diffusion/transfer from foreign counterparts, on specific programs of ICT and satellite research and development, experts exchange, and human resource training, among others.

O

17:05 (20min)

Implementation of Ground Station for Stratospheric Balloon Campaign BEXUS II

Authors:

Muhammad Imran Majid

Regional Coordinator, Asia Pacific, Space Generation Advisory Council

Abstract:

Every year, students from Space Engineering programmes at Umeå University, Luleå University (Kiruna Space Campus) and technical high school in Sweden are given the opportunity by Esrange(North European Space Range) to design and build experiments which are then launched on stratospheric balloon flights and rockets.

The first international student batch at Kiruna Space Campus collaborated with Swedish Space Corporation, Universities and private parties for the design and implementation of

second balloon flight campaign (BEXUS II). Ground station for Bexus II was implemented using serial interfacing which was controlled via code developed for Java and later on Graphical Programming (Lab View). The experiments involved robust testing of hardware prototypes, software modules and integrating the same. Data from 7 experiments on board was seamlessly transferred to Ground station terminal via RS232 and Lab View for 5+ hours.

The experimentation with coding for serial interfacing with the two programming languages of Java and Lab View is discussed in detail. The VIs used in Lab View can be re run on different systems around the world; a network interface could be provided and hence forth the balloon can be remotely monitored and thus efficiency can be further improved to enhancing future missions (rocket campaigns, student satellites e.t.c.).

D1 / Discussion -I-

17:25 (35min)

Short Presentations on Introduction of Various Ground Stations

Speakers (scheduled):

Chiu-Teng Tsai, National Cheng Kung University, Taiwan
Hideki Yoshihara, Kagawa University, Japan
Kazuhiko Yotsumoto, Kyushu University, Japan
Hideyuki Igawa, Kyushu Institute of Technology, Japan
Fumio Asai (JA3TDW), Nara National College of Technology, Japan
Haruki Shiroma, Soka University, Japan

18:00 Closing 1st Day Presentation

Presentation Abstracts - 19 July

A2 / Network Technology of Ground Station for Satellites -II-

9:00 (20min)

XML and IP Based Ground Station System for Distributed Operations of Small Satellites

Authors:
Naoki Miyashita, Masaki Maeno (speaker) and Saburo Matunaga
Tokyo Institute of Technology

Abstract:

In recent years, many universities and space agencies have much interest in small satellite development, launch and operation on-orbit in low-cost and short term. Simultaneously, ground station systems for operation of the corresponding small satellites have also been developed. However, most of them were designed for specific corresponding satellite operation, and the systems didn't have extensibility for other small satellite operations. Generally speaking, small satellites have not enough power and space, and the communication speed is very limited and the receiving signal is frequently jammed and lost in amateur radio bands used for many small satellites. Furthermore, reception data accesses are usually limited to the authorities, and public persons can not easily access the data.

In order to deal with the above shortcomings and limitations, LSS (Lab. for Space Systems) led by Prof. Matunaga at Tokyo Institute of Technology has proposed, developed an architecture of extensible ground station system for many types of small satellites. This ground system has 1) a new remote operation function module, 2) a new automatic operation function module, 3) a new distribution protocol for distributed tele-operation of the multiple ground stations, and 4) a new real time satellite data broadcast function module.

In order to realize the above functions, leading-edge technologies of XML and Internet are fully used in the development of the ground system, and the system layers are classified into: 1) Device Control Layer, 2) Business Logic Layer, 3) Data Store Layer, and 4) User Layer. The system has been confirmed by operating CUTE-I (CUbical Tokyo Tech Engineering satellite-1) over 2 years, LSS executes daily house keeping check, and a weblog is updated automatically at the time of FM packet reception from CUTE-I.

In this paper, the developed ground system architecture is described in detail and the results of many kinds of evaluation experiments are shown to validate effectiveness and feasibility of the system.

O

9:20 (20min)

The use of Distributed Ground Station System for very low power communication

Authors:

Marcin Stolarski

Warsaw University of Technology, Faculty of Electronics and Information Technology, Institute of Radioelectronics, Nowowiejska Street 15/17, 00-665 Warsaw, POLAND

M.Stolarski@elka.pw.edu.pl

Abstract:

The Paper concerns radio amateur satellites that are built by international student teams. In order to contact a satellite, a single ground station is usually used. In this configuration and with the satellite on the Low Earth Orbit, teams have contact only for about 40 minutes per day. If the satellite has service for radio amateurs, they use it for 20 hours per day. A lot of them have connection to Internet as well. This generates new opportunities of connecting all of them, and building a big communication system. This paper shows how they can use the radio amateur transceivers and antenna systems in order to build ground stations network named Distributed Ground Station System. Frequencies, types of modulations, calculation of power budge, the ways to control amateur stations through the Internet, and a proposal of implementing dedicated DGSS system for radio amateurs with and without use of APRS network are also shown. These are essential procedures, because radio amateurs have their standards and habits. Finally, a proposal to use DGSS for receiving very low power signal from satellite is put forward. Some mathematical calculations (implemented in author's "DGSS Calculator" software [Fig. 1]) of power request for creating stable radio channel with bit error rate lower then 1E-4 and receiving standard signals (Power=5W) with bit error rate lower then 1E-32000 are also shown.

Distributed Ground Station is one of the experiments on “PW-Sat” satellite, which is being build on the Warsaw University of Technology.

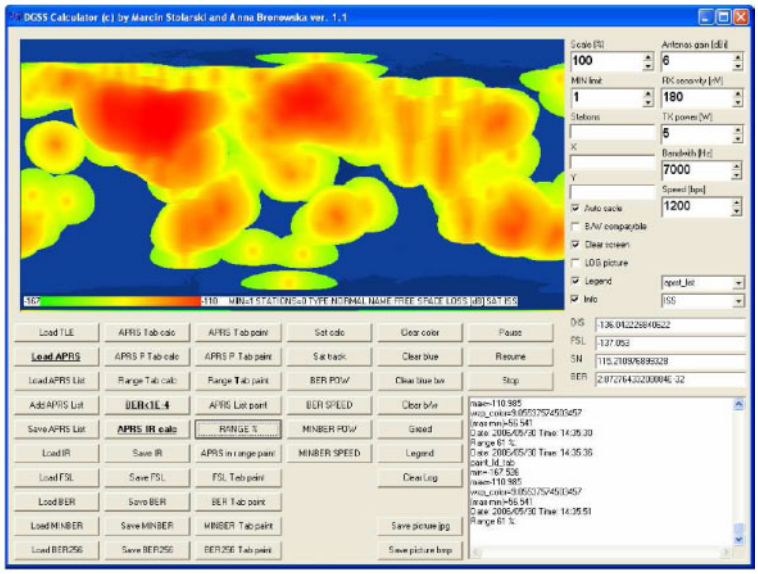

Figure1. "Distributed Ground Station System Calculator" software.

O

9:40 (20min)

A mathematical programming approach to the Ground Station Network

Authors:
Naonori Kakimura and Yasuhisa Oda
University of Tokyo, Japan

Abstract:

Collaboration of the sub-monitor stations in the domestic GSN enables the amount of downlink data to increase. In fact, we experienced that XI-IV operation team in collaboration with HAMs obtains about 1.25 times the amount of packets that the team alone does. In this study, we aim at investigating the effectiveness of the collaboration in terms of mathematical programming.

A ground station can receive the data from a cubesat if its antenna is pointing to the satellite and the antenna polarization matches the satellite's one. Obviously, for one satellite, we can receive the maximum amount of the data if all the stations are assigned to the satellite. However, what if many satellites exist? In general, several cubesats are launched at the same time. For few days or weeks after the launch, several satellites form a cluster on the orbit, and they all pass over a ground station at the almost same time. Therefore, each ground station has to choose a satellite to maximize the amount of the datum from all the satellites in total.

In this talk, we formulate a simple communication model as a 0-1 integer programming problem. We then experient with the past data of XI-IV operation team in collaboration with HAMs.

O

10:00 (20min)

Operation Scheduling of Multiple Small Satellites Using Ground Station Network

Authors:
Yuya Nakamura
Intelligent Space Systems Laboratory, University of Tokyo, Japan

Abstract:

This paper will describe how we manage and solve an operation scheduling problem of multiple small satellites, using many ground stations connected one another with the Internet.

As discussed in this workshop, GSN will make operations of small satellites much more efficient. However, for all participants to enjoy the merit of GSN, we must deal with a complicated scheduling problem. For example, different two operators may want to use the same ground station at the same time. We have many things to be considered. A certain ground station may be under maintenance over a period of time. An operator may change his/her operation plan suddenly. In case of an awful natural disaster, a top-priority mission like image acquisition should be conducted by a remote-sensing satellite. The circumstances are changing every minute, and we have to take them into consideration when allocating an operation request given by a user (GSN participant) to a certain ground station. To solve this scheduling problem, we propose a new type of optimization method.

We advance Lagrangian decomposition method, so that each task of a given mission (e.g. image acquisition, downlink) can, by itself, select the satellite to take a picture and the ground station to perform a downlink, considering imposed constraints and its priority. What is important here in this method is that selfish actions by each task agent eventually lead to a minimization of an evaluation function, that is, a total optimization. This means that if we can use a fast parallel computer (each task corresponds to a single computer node), we may obtain an optimized result in a very short period. This characteristic is advantageous to our GSN application, where the rescheduling is frequently required.

10:20 Break (10min)

B / Facilities of Low-cost Ground Stations for Educational Satellites

10:30 (20min)

Efforts toward networking ready ground station

Authors:
Akira YAMAGUCHI
Nakamura & Miyazaki Laboratory, Department of Aerospace Engineering, College of Science and Technology, Nihon University, Chiba, Japan

Abstract:
This presentation reports our activities related to remote networking of a ground station in Nihon University.

Nihon University had finished setup of the ground station in 2004 to track and control our 1st CubeSat named SEEDS. The satellite will be launched from Baikonur Space Center on June 28, 2006 with a delay of 2 years. Thanks to this delay, we had enough time to elaborate optional functions and could receive telemetry data of other universities' satellites in collaboration.

Major instances are

1. Establishment of remote networking system which enables to access amateur radio receiving system in the ground station via the Internet,
2. Cooperation with other universities in receiving data from their satellites (XI-V, CUTE-1.7, UWE-1 etc.)
3. Developing analysis software for CubeSat UWE-1,
4. Provision of a remote controllable power unit for ground station network service point in Sugadaira Space Radio Observatory.

On the other hand, it is very important to establish contact with other ground stations as mutual human relationships. This presentation refers to human networks not only technical topics of networks with devices.

O

10:50 (20min)

The SwissCube mission and associated ground station segment activities

Authors:
Renato Krpoun*, Muriel Noca+, Herbert Shea*, Maurice Borgeaud+

*Microsystems for Space Technologies Laboratory, Ecole Polytechnique Fédérale de Lausanne, EPFL, Switzerland
+Space Center EPFL, Ecole Polytechnique Fédérale de Lausanne, EPFL, Switzerland
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Abstract:

SwissCube is a CubeSat mission having as one of its primary goals the development of an educational framework capable to provide engineering students, without a specific aerospace background, an industry like 'hands-on' experience of a distributed and multidisciplinary work environment. The educational objective is to introduce them to the field of space engineering and in parallel enhance their flexibility, work autonomy and teamwork skills.

The Ecole Polytechnique Fédérale de Lausanne (EPFL) has increased its space related activities in recent years by creating a Space Center federating space related activities between EPFL, other universities, industry and Space Agencies. It is further active in teaching activities which include the SwissCube project and a minor in space engineering.

As introduction this paper will present the SwissCube satellite project goals and structure by briefly presenting the results of the feasibility study, carried out in 13 different labs in 5 different Swiss universities. It will emphasize on the technical details of the planned Ground Station infrastructure at EPFL.

The second part will focus on functionalities of a GSN compatible "advanced" Mission Control System performing automatic operation during a satellite pass. Elements composing such a system should include a man in-the-loop environment to schedule the spacecraft operations and autonomous TC/TM operations during a pass. An acknowledge scheme and standardised TC/TM services will be discussed allowing semi-autonomous operations and a common Mission Operations framework.

O

11:10 (20min)

Cubesat Ground Station of the Technical University of Berlin

Authors:

Mr. Dmitriy Bogdanov

Technische Universität Berlin, 10587 Berlin, Marchstr. 12, Germany
dmitriy.bogdanov@ilr.tu-berlin.de Tel: ++493031425611

Abstract:

The TU Berlin operates a ground station and antennas for many years for the control of satellites of the TUBSAT family, a TU own micro and nano satellite fleet. Recently the ground station was extended for the reception of other satellite classes, for example radio amateur satellites with AX.25 protocol.

The ground station uses a 100 watt VHF/UHF transceiver and crossed yagi antennas with preamplifier who provides a gain up to 30dB.

The ground station can either work manually, autonomous or remotely controlled. It is optimally applicable for a ground station network and it is ready for integrating in a ground

station network.

Presently experimental satellites of the CUBESAT standard are developed at the TU Berlin. The so called BeeSat (Berlin Educational and Experimental Satellite) should be launched in 2007. Its main mission objective is the space verification of a new developed reaction wheel for pico satellites.

O

11:30 (20min)

Approach Concerning Hokkaido Institute of Technology Ground Station

Authors:

Kazuhiko Takeoka, Tatsuhiro Sato, Kyohei Takenami, Sinya Nisizato, Tosiki Kato, Ryuichi Mitsuhashi

Hokkaido Institute of Technology

Abstract:

1. Introduction - Up to now, the Hokkaido Institute of Technology ground station has been playing some roles from comparatively the reception environment of the electric wave good as GSN member. Moreover, micro space satellite "HITSAT" is a developed launch schedule to Hokkaido Institute of Technology center in the autumn of this year. The approach of the ground station for the launch becomes active, too. Here, the main content is described.

2. Approach of GSN - The ground station server stood up, and the first network connection became possible as GSN Hokkaido Institute of Technology in The University of Tokyo initiation of last year in June. There is details from which this is used, and CubeSat of The University of Tokyo is operated remotely. Moreover, each university in Japan cooperated in October of the same year, and it succeeded in the CW first reception of "XI-V".

3. Approach of university - Micro space satellite "HITSAT" that is called CubeSat is developed centering on Hokkaido Institute of Technology. This satellite is installed as a sub-payload by the M-V rocket of JAXA, and is a launch schedule in the autumn of this year. The frequency uses the amateur radio belt of CW:437.275MHz and FM:437.425MHz. The real operation of the Hokkaido Institute of Technology ground station is begun on the launch of this satellite. Maintenance for the operation of the establishment of the communication system with HITSAT etc. is advanced in the ground station.

4. Schedule for the future - It aims at the beginning of mission of HITSAT, and the ground station environment is maintained continuously. Moreover, it is scheduled to act positively as GSN of the reception cooperation etc. of the space satellite that will launch it at each university in the future.

O

11:50 (20min)

IRV Ground Station Status

Authors:

C. Priya Fernando

Luleå University of Technology & Umeå University, Department of Space Science

Box 812, SE-981 28, Kiruna, Sweden

Abstract:

The new ground station at the department of space science is under construction to meet broader area of applications. The current status of ground station and available hardware from antennas to transceiver are discussed here. The remaining problem for operation is the tracking software and the limitation in the available transceiver frequency range. The ground station is planned keeping in mind tracking scenarios from satellite launch to operations. The objective is to increase the students' career prospective by exposing them to more realistic space projects.

12:10 Break (10min)

D2 / Discussion -II-

12:20 (60min)

TBD

13:20 Closing 2nd Day Presentation