



This issue reports the Lecture Meetings and Technical Tours sponsored or cosponsored by LMAG-Tokyo during 2016, the fourth LMAG-YPs-Student Branches-JC WIE Networking Workshop, and participating to the Kansai-Metro Area Workshop.

1. Lecture at 2016 Annual General Assembly of Tokyo Section

After the 2016 Annual General Assembly of Tokyo Section, the Lecture by Prof. Fumio Harashima was held in the Kikai Shinko Kaikan building at 15:10 with 42 participants. Prof. Harashima is President Emeritus of Tokyo Metropolitan University, recipient of "2015 IEEE Haraden Pratt Award".

The lecture was entitled "Diversity and Globalization of the IEEE Communities". At the first, he showed a photograph of IEEE Board of Directors of 1990, that reveals IEEE was society with a little variety. All the board members were Westerners other than Prof. Harashima. But, variety seemed to appear recently. Today, about 30% of its members are other than Westerners, and the women increased, too.

He laid emphasis on the study of the field of industrial robot in the IEEE, as well as the fields of Mechatronics, Robotics, Industrial Electronics. He said his idea seemed to be influenced by Astro Boy. At that time, Japan achieved big success in this field, and Japanese researchers led a society. In the IEEE, a lot of researchers of the mechanical engineering played an active part in this field.

It seems to be easy to organize new professional society in the IEEE. In Japan, when a certain professional group attempts to found a new society, it is often quarrelled with an existing society. As a result, the IEEE evolves, but the Japanese professional society declines. He made an effort for the foundation of two following societies in the IEEE.

Power Electronics Society

Robotics and Automation Society

In addition, he launched two transactions below, and both become the major articles in the IEEE.

IEEE Transaction on Mechatronics

IEEE Transaction on Industrial Informatics

Prof. Harashima was asked Governor Ishihara for and became the president of Tokyo Metropolitan University in 2009. He promoted here toward the number one in the world. As the ranking index, he led professor's attention to the number of quotations of papers from the university, and his promotion had achieved wonderfully.

Next, he looked back on his professional life from 20s to 70s as are follows; no students in 20s, no money in 30s, no time in 40s, no brain in 50s, no body in 60s, ? in 70s. Many attendants seem to be



Prof. Harashima giving his lecture

sympathized with this.

Presently, Prof. Harashima thinks about how a robot will develop in future. He pointed out the potential of robotics for health (safety) and robotics in justice. Finally, he pointed out that Astro Boy was a solid technology, but the recent technology of cloud and/or AI is not solid and holds the important issue of ethics.

2. Fourth LMAG - YPs - Student Branches - JC WIE Networking Workshop

Tokyo Section LMAG, YPs (Young Professionals), Student Branches and Japan Council WIE (Women In Engineering) hold the networking workshop at the Raiosha meeting room, Hiyoshi campus, Keio University, from 15:00 to 19:00 on April 23, 2016. The workshop participants were 58 in total. Each group provides the following talk, and participants had active discussions.

1. "Human centric antenna – relationship between human and antenna" by Prof. Koichi Ito (LMAG), Chiba University
2. "IEEE for Children in the World" by Dr. Jaeryoung Lee (YPs), Chubu University
3. "Robot study in Germany - actual feeling and advice" by Dr. Natsuki Yamanobe (WIE), AIST
4. "IEEE SB's Activity in Tokyo Section" by Mr. Kota Aoki (SB), Tokyo University of Science
5. "Remarks on the foundation of Student Branch at UEC" by Mr. Tomoya Yazu (SB), University of Electro-Communications

At the social gathering after above talks, the participants exchanged and enjoyed with an unique speech or a game from every group.



The participants to the 4th LMAG-YPs-Student Branches-JC WIE Networking Workshop

The outlines of the first talk given by Prof. Koichi Ito, LMAG member, were as follows.

Antennas came to be widely used for various wireless communications and broadcasting systems. Recently, antennas have played important roles in the fields of medicine, healthcare, and rehabilitation, and so on. In these fields, antennas used in and around the human body are called as “human-centric antennas.” This talk showed some examples of the relationship between humans and such antennas.

Before main topics, antennas for mobile phones were shown. In past, a rod-type antenna was installed generally onto the mobile terminal, however sophisticated tiny internal antennas are used for mobile phones today. Related to the topic of rod-type antenna, an interesting story was introduced. Right after the disaster of the Great East Japan Earthquake in 2011, a TV program showed that someone of a rescue team from overseas held a mobile satellite handset and received instructions for their specific operations.

Firstly, some antennas for medical applications were introduced. Many different types of antennas have been widely used for medical data transmission, diagnosis and treatment. As an example, antennas or applicators for hyperthermia were introduced which is one of the promising techniques for the treatments of cancer. In hyperthermia, it is essential to heat the whole tumor up to 42-45 degrees C. As for heating methods, there are external heating, intracavitary heating and interstitial heating. Different types of antennas have been developed such as planar antennas, helical antennas, and coaxial-slot antennas, and employed for particular treatment devices. As a practical example, a real treatment with coaxial-slot antennas was introduced.

Next, wearable antennas were introduced, which come to be used extensively for healthcare and rehabilitation today. A wearable antenna is the key technology for human body communications. As for basic characteristics of wearable antennas, Prof. Ito

introduced the simulation results of frequency dependence of electric-field distributions around a human body generated from a small antenna attached on the body. It was emphasized that the relationship between the wavelength in use and the length of an object (a human body for this case) is quite important.

Finally, human-body phantoms were introduced. When an antenna is used close to a human body, it is important to investigate how the human body affects antenna characteristics and to evaluate absorption of electromagnetic waves radiated from the antenna into the human body. For such purposes, human-body phantoms are indispensable and useful. And, he showed some of the human-body phantoms developed in his laboratory.

In conclusion, R&D of “human-centric antennas” will significantly contribute to medicine and our social life. Furthermore, it will open up the new vista. Particularly younger researchers and engineers as well as students are encouraged to challenge the this promising and interesting topics.

3. Memorial Lectures of new IEEE Milestone for “Emergency Warning Code Signal Broadcasting System” and “High Definition Television System”

The memorial lecture meeting took place from 13:00 after the presentation ceremony of the IEEE Milestone plaque for “Emergency Warning Code Signal Broadcasting System” and “High Definition Television System” at Hyatt Regency Tokyo with 110 participants on May 11, 2016.

Before the memorial lecture, Prof. Isao Shirakawa, Chair, History Committee, IEEE Japan Council overviewed the IEEE Milestone and its recognition achievements in Japan.

The first lecture entitled “R&D of Emergency Warning Code Signal Broadcasting System” was given by Dr. Kazuyoshi Shogen, B-SAT (Broadcasting Satellite System Corporation). This system is the

technique automatically switching on TV and/or the radio in the case of a large-scale earthquake or tsunami. NHK developed the system precedingly, and started its commercial service in 1985 for the first time in the world.

The second lecture entitled “Research and Development of High Definition Television System” was given by Mr. Taiji Nishizawa, ex Director of Science & Technology Research Laboratories, NHK. He presented the development process of the high definition television started in 1964, from the early study of basic technologies required for the high definition television toward the start of new television broadcasting in 1989 which is called Hi-vision today. And, he introduced the R&D topics regarding the apparatus including television receiver sets, video cameras and so on, and the hard luck story of the international standardization for this broadcasting system.

4. Lecture by IEEE Medal Recipient

The lecturer was Dr. Takuo Aoyagi, Senior Manager, Nihon Kohden Corporation, recipient of “2015 IEEE Medal for Innovations in Healthcare Technology”. The lecture meeting was held for from 15:00 to 16:30 on June 22, 2016, at Kikai Shinko Kaikan with 56 participants.

Dr. Aoyagi gave the lecture entitled “Discovery of the principle of the pulse oximetry, and its contribution on the medical care “. He introduced about the pulse oximetry researched and developed by him with a pioneer spirit, including the measurement principle, the related inventions and the development of the practical medical instrument. A pulse oximetry is based on the red and infrared light absorption characteristics of oxygenated and deoxygenated hemoglobin. The pulse oximetry is a technique to measure arterial blood oxygen density by a non-aggression, and the extremely useful medical device touching a probe on finger-tips. So, a pulse oximetry has become indispensable to prevent for anesthesia accident operated on, because this is able to detect immediately abnormal breathing and circulatory.

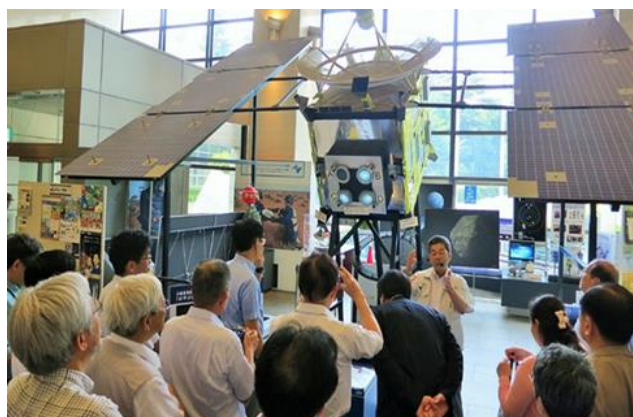
The participants of the lecture were able to understand this technique developed by Dr. Aoyagi is spreading worldwide.



Dr. Aoyagi giving the lecture

5. Technical Tour and Lectures at ISAS, JAXA

LMAG Tokyo held the 3rd technical tour and the lectures at ISAS (Institute of Space and Astronautical Science), JAXA, from 14:00 to 19:00 on July 14, 2016. The tour gathered 63 participants. They enjoyed seeing rockets and scientific satellites in the display room, rockets in the outdoor exhibition, and a satellite assembly environment and test facilities with explanations. Especially, Hayabusa is a full-scale model, and attracted the members with much interest and many questions.



Technical Tour at ISAS/JAXA

Then, the lecture meeting was held with 82 participants. Two speakers talked about the recent and most fascinating topics in ISAS. The summaries are described below.

Lecture 1: "Venus Probe, Akatsuki - Recovery and Present Situation" by Prof. Masato Nakamura, Project Manager of Akatsuki, ISAS/JAXA

It first began when I was called by ISAS in 1999 and asked to help with a Venus exploration project. At first we discussed the development of infrared devices, then worked on the design of a probe. I organized the science and engineering investigation team into the “Proposal for Venus Exploration Plans” and presented the plans to the public at the first Space Science Symposium in January 2001. And the mission is recognized as Scientific Research Satellite No. 24.

The explorations of the planet up until now have primarily revealed static parameters like the composition of the terrain and atmosphere, temperature, and wind speed. Instead, we have decided to investigate the conditions of the dynamically changing climate. For this purpose, we have equipped the probe with 5 cameras that take pictures continuously, from which we will search for a wind speed vector. By statistically analyzing this, we plan to find out the cause of Venus’s four-day atmospheric rotation cycle.

For light sources, we will capture the reflection from infrared radiation coming from Venus itself as well as infrared and UV radiation from the sun. With the 5 cameras we will acquire information about wind

speed from each differing altitude. By putting these together, we will have 3D information.

The probe was launched on May 21, 2010, and arrived at Venus on December 7 of the same year. Due to damage to propulsion systems, the probe couldn't sufficiently decelerate, and ended up orbiting the sun a second time. Akatsuki spent five years orbiting around the sun with the perihelion at 0.6 AU.

While the temperature of the probe climbed to the brink of its endurance, it somehow weathered nine passages through the perihelion. Furthermore, the main propulsion system was completely broke down so that a thruster of the attitude control system was diverted for the orbit maneuver operation. On December 7, 2015, the probe braked for 20 minutes, and this time entered orbit around Venus without incident. It has been exactly five years since the initial failure to enter Venus's orbit.

Since this time Akatsuki has continuously sent back to us the images resulting from the cloud of sulfuric acid that exists in Venus's atmosphere and the terrain of the planet itself, as well as valuable data on the temperature distribution at the clouds' top, etc. All of us on this project would be thrilled if, from this success, the people of the world would hear about Akatsuki and become energized, and keep alive the feeling of never giving up whatever happens.



Prof. Nakamura giving his talk

Lecture 2: "Hayabusa 2 - From Design to Operation" by Associate Prof. Yuichi Tsuda, Project Manager of Hayabusa 2, ISAS/JAXA

The deep space explorer Hayabusa 2 was developed by JAXA and launched in 2014. Its mission is a sample-return which includes going to an asteroid, collecting sample soil of the asteroid, and returning it the Earth. The target asteroid is "Ryugu", for which three samplings and one crater forming are planned during 1.5 years of stay in the proximity of the asteroid. The Earth return is scheduled in 2020.

The spacecraft successfully conducted an Earth swing-by on December 3, 2015, and is now flying toward the asteroid with the assist of ion engine propulsion.

Hayabusa2 weighs 609kg, which is heavier than the forerunner, Hayabusa, by about 100kg. A half of the increased mass is used for higher reliability based on the operation experience of Hayabusa, and the rest half is used for new technology and science payloads, which includes Small Carry-on Impactor, Ka-band communication system, Delta-Differential One-way ranging equipment and the asteroid lander developed by German and French partners.

He introduced the development process and latest operation status as well as efforts to make a operation plan against the unexplored celestial body and interdisciplinary collaborative work between scientists and engineers.



Prof. Tsuda giving his talk

6. Kansai Metro Area Workshop

IEEE Metro Area Workshop (MAW) in Kansai 2016 was held on August 4 and 5, 2016, at Imadegawa campus of Doshisha University, Kyoto. Prof. Tetsuya Miki, Vice Chair and Prof. Tadashi Takano, Secretary of LMAG-Tokyo participated to the MAW. In association, IEEE JAPAN SYWL WORKSHOP 2016 was held on August 5 to 6, at the same place.

The objectives of MAW are to notify the academic and standardization information of IEEE, and to raise persons who bear the future of many industrial fields. Students are free to participate, and non-member of IEEE may attend.

On 4th, Prof. Hironori Yamauchi of Ritsumeikan University opened in the events with WELCOME ADDRESS. Then, OPENING SPEECH was made by Prof. Tomonori Aoyama of Keio University and Prof. Ryuichi Yokogawa, Vice President of Doshisha University. They held SESSION1: SENSORS & DEVICES with 5 lectures, INVITED SPEECH with one lecture, and SPECIAL SESSION: HEALTHCARE with five lectures. In the evening, Authorship Workshop was held for those to submit papers to IEEE journals.

On 5th, in the morning, SESSION2: ROBOTICS & AI was held with the theme of Business Innovation that IoT, AI and Big data draw - Regional Co-creation of the IoT era and the future of Kansai. It was a panel discussion, and the presentation of each panelist and smart chairing were excellent. The following KEYNOTE SPEECH was held with the theme of "Interactive robots and the fundamental issues".

In the afternoon, there was POSTER SESSION where they made many research reports and also activity introductions of Affinity Groups in poster presentations. We both tried to collect much information, and met and talked with the officers of IEEE Kansai-branch and LMAG Kansai



Poster session scenery



In front of the poster of Tokyo LMAG

In the afternoon of 5th after the poster session, SPEECH FROM GOVERNMENT was made first by Mr. Akio Ikemori (Director-General, Kansai Bureau, Ministry of Economy, Trade and Industry) with the title of "Outlook of the Kansai economy". Then, Dr. Kazuo



Dr. Kyuma delivering his talk.

Kyuma (Executive member, Council for Science, Technology and Innovation, Cabinet Office) presented "Science, Technology and Innovation Policy of Japan". CLOSING REMARK was delivered by Prof. Howard E. Michel of IEEE Past President.



Prof. Michel delivering his talk.

On 6th, IEEE JAPAN SYWL WORKSHOP Kansai 2016 was held. Representative of many Student Branch (SB), Young Professionals (YP), Women in Engineering (WE), Life Member Affinity Group (LMAG) in Japan gathered together in a room, and presented about the activities of each Affinity Group. Next, Career Development Workshop was held as an ideathon. The objectives are career skill-up and activation of each Affinity Group. We both could not attend the events on 6th, but exchanged information in RECEPTION on 5th.

7. Lecture by IEEE Award Recipient

The lecturer was Dr. Takehiro Moriya, NTT Communication Science Laboratories, recipient of "2016 IEEE James L. Flanagan Speech and Audio Processing Award". He provided the lecture entitled "Enhancement of sound quality for telephone and broadcasting by speech and audio coding technologies" The lecture meeting was held from 15:00 to 16:30 on August 29, 2016, at Kikai Shinko Kaikan with 38 participants.



Dr. Moriya giving the lecture

Dr. Moriya was consistently engaged in the study of the encoding technology of a sound since 1980 he entered the NTT Laboratories. He made a lot of achievements particularly in the field of high-quality

sound which deserve to receiving the award. In his lecture, he introduced to the research progress of the high-quality coding technologies for speech and audio as well as the international standardizations contributed by his research results.

When he started a study, the main study theme in the field of the speech encoding was bandwidth compression. The research group he belonged to had already given the superior study result such as the Line Spectrum Pair (LSP) technique which was recognized as IEEE Milestone in 2014. But, he tackled the high-quality encoding oppositely from the bandwidth compression encoding. As for high-quality sound, object signals come to apply to not only the speech but also the music. In the case of speech, the main problem is the time-based prediction accuracy to minimize the distortion of waveforms. But, in the case of music, the main problem is the frequency spectrum fidelity.

Dr. Moriya contributed also to the international standardization based on his study. Recently, EVS (Enhanced Voice Services) was standardized for the speech encoding of mobile phones, and ALS (Audio Lossless Coding) was standardized for the high-resolution audio encoding of TV broadcastings.

Dr. Moriya concluded his lecture in expectation of spreading his longtime research results about the high-quality sound with future trend of a IPTV and a high-resolution audio.

8. Lecture Meeting and Technical Tour in connection with IEEE Milestone

As the first trial of LMAG-Tokyo, a lecture meeting and a technical tour in connection with IEEE Milestone was carried out at Science and Technical Research Laboratories, NHK (see Section 3 in this issue). This event took place from 14:00 to 18:30 on Dec. 8, 2016 with 46 participants.

Lecture 1: The History of Hi-vision

Lecturer was Dr. Takehisa Ishida, Journalist of television, ex NHK, who has been engaged in many of related works to Hi-vision in NHK. He gave the details from the early research on high-definition television technologies to the development and commercialization of Hi-vision broadcasting including its historical standardization as well as its application to the film industry.

Lecture 2: The R&D on Super Hi-vision

Lecturer was Dr. Kensuke Hisatomi, Science and Technical Research Laboratories, NHK. He explained the development situation of 4K and 8K Super Hi-vision broadcasting systems. Because 4K and 8K expresses the number of the lateral pixels of the TV screen, the number of all pixels of 4K and 8K Super Hi-vision is equivalent to 4 times and 16 times for current Hi-vision to 2K Hi-vision respectively. The dynamic range of brightness and the color space of Super Hi-vision are expanded as well as the number of pixels. Furthermore, its sound system provides

superior reality. He explained also about various apparatus required for broadcast, the situation of international standardization, and its test broadcasts in Japan through the BS satellite channels begun recently.



Dr. Ishida (left) and Dr. Hisatomi (right) giving their lectures

Technical Tour

After above lectures, participants experienced 8K Super Hi-vision with very large screen full of force in the auditorium. Then they observed the 8K living theater, a video comparison between, 60Hz and 120Hz framerate, an 8K sheet type display, and an integral 3D vision.



Technical tour at Science and Technology Research Laboratories, NHK

9. New Officers of LMAG-Tokyo

New Officers of LMAG-Tokyo for 2017 were appointed as following.

Chair	Tetsuya Miki, Emeritus Prof., University of Electro-Communications
Vice Chair	Tadashi Takano, Emeritus Prof. of JAXA
Secretary	Hajime Imai, Emeritus Prof., Japan Women's Univ.

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