Newsletter

Issued on Dec. 27, 2019 No. 27

IEEE Tokyo Section
Life Members Affinity Group

This issue reports a technical tour sponsored by LMAG-Tokyo, lecture meetings co-sponsored by LMAG-Tokyo (sponsored by Tokyo Section), other events supported by LMAG-Tokyo and a future event.

1. IEEE Tokyo SYWL Workshop 2019

IEEE Tokyo SYWL Workshop 2019 and IEEE Day Party 2019 were held at 10:00 to 20:00 on October 5, Friday at the 100th Anniversary Hall of College of Humanity and Science, Nihon University under co-sponsorship of IEEE Tokyo Section SAC, YP and LMAG and IEEE Japan Chapter WIE. This event was composed of (1) Lecture meeting, (2) Workshop, and (3) IEEE Day Party 2019, Banquet. The participants were 45 in number.

In the first part, each group of SYWL made a lecture on the theme of “IEEE and me.” Mr. Okada, SB Chair introduced the sessions of how to write a report and how to use LaTex that gathered many participants. Dr. Yoshida, Tokyo YP Chair explained real activities including his own experiences. Ms. Suzuki, JC WIE Chair presented her own history and the group activities, and expressed her welcome to anyone including men to WIE.

Lastly, Emeritus Prof. Takano, LMAG Chair talked about “To consider women’s development to society.” He introduced his experience as the Chair of a Technical Society of IEICE to have appointed a lady a session chair. Women at that time could not satisfy the criteria of a chair due to the lack of experience so that he lowered the criterion. The appointed lady made her job significantly and gathered many audiences to fill the session room. Later it has been usual to invite a session chair of a woman on such a criterion.

Fig.1 Dr. Takano, LMAG-Tokyo Chair, giving his talk

A new wave could be realized by changing criteria for women. The inhibiting factors for women to go into society are the lack of nurseries, work-off for baby-sitting, and man’s participation in family affairs. Moreover, he pointed women’s tendency to avoid the attitude as professionals.

He explained the relationship between W and L using a table with humor, and proposed for all affinity groups to collaborate in many events.

Fig.2 Group photo in SYWL Workshop

Fig.3 Cerebrating IEEE Day with a big Cake

2. 16th IEEE TOWERS Workshop

TOWERS (Transdisciplinary-Oriented Workshop for Emerging Researchers) is organized for young IEEE members, and is operated by student members. The papers submission is widely asked for students of junior high schools, high schools and universities, and young researchers. This workshop has continued for 16 years and this year it was held at 9:30 to 19:30 on October 19, Saturday at Empowerment Studio in University of Tsukuba with 105 participants. All papers were presented in

poster.

The workshop started with the opening session including sponsor introductions.

In the subsequent event, all attendants were divided into 6 groups to discuss the same topic “How to get rid of pseudoscience.” After the discussion, each group presented the summary. Examples of pseudoscience may be foods, supplements, and exercise equipment all for health. They stress only good aspects but not bad aspects of these goods. It is important to have scientific knowledge in order to recognize these facts.

The poster sessions were held twice to include 62 papers with a few cancellations. Excellent papers were selected for a variety of awards such as TOWERS Best Award, Outstanding Poster Presentation Award, and Undergraduate Student Award.

The presented papers covered information, communication, robots, food and biology. Every presentation evoked active discussions and comments. At the end of workshop, 8 winners of the awards were celebrated.

After the closing session, we had a party enjoying talks among attendants.

Fig.4 Group discussion at the workshop

Fig.5 Group photo of all participants

3. IEEE Events Associated with Foundation of LMAG-Sendai

LMAG-Sendai was founded in IEEE Sendai section on March 20, 2019. A commemorative symposium of the foundation and other related IEEE events were held in Sendai on October 24 and 25. LMAG-Tokyo supported and participated in the events.

3.1 Commemorative symposium of LMAG-Sendai foundation

The symposium was held at 13:00 to 17:20 on October 25, Friday at Aoba Memorial Hall in Engineering Faculty Campus of Tohoku University. The participants were 54 in number.

First, the estimated Chair of LMAG-Sendai, Emeritus Prof. Koji Mizuno of Tohoku University reported the foundation of the LMAG and explained the process before.

Then, congratulatory addresses were given by guests: Emeritus Prof. Tomonori Aoyama of the University of Tokyo who was 2019 LM Committee Member and Japan Council LMAG Coordinator, Prof. Akinori Nishihara of Tokyo Institute of Technology who is IEEE R10 Director, and Emeritus Prof. Tadashi Takano of ISAS, JAXA who is Chair of LMAG-Tokyo.

Next, the general assembly was held to select Prof. Mizuno, Prof. Michitaka Kameyama, and Prof. Kunio Sawaya as Chair, Vice Chair, and Secretary of LMAG-Sendai, respectively. Then, the activity rule and the activity plan of this year were determined.

As the first event of the LMAG, they held the Special Commemorative Lecture Meeting. The first speaker, Emeritus Prof. Shunji Iwasaki of Tohoku University made a talk entitled "For a rich society ~Through innovation of information technology." He explained the research history of vertical magnetic flux memory and contribution to industries and information society.

The second speaker, Prof. Aoyama made a talk entitled " ICT and Future Information Society." He covered from digital expression proposed by Leibnitz, 5G mobile phone, AI, IoT, media contents to VR. Further, the contents were from singularity problem, the 4th revolution, society 5.0 and hypothetical coins.

Fig.6 Relevant persons showing LMAG-Sendai banner (from left: Dr. Nishihara, Dr. Kameyama, Dr. Mizuno, Dr. Aoyama, Dr. Takano and Dr. Sawaya).

The last speaker, Emeritus Prof. Shojiro Kawakami of Tohoku University made a talk entitled "University-Based Hardware Startups -Case Study-." He had founded a company to design and

manufacture optical devices while being an active professor, and told of troubles and funs till the present time. He indicated three career paths of an engineer: a researcher, a company manager and an entrepreneur, and told that the last path is too rare in Japan.

From 17:30, the Foundation Commemorative Social was held. They were gratified with the foundation of LMAG-Sendai and hope for future activities. The party was enjoyable. However, as a storm warning was issued due to the 21st typhoon, the participants scattered being unwilling to leave.

3.2 IEEE Metro Area Workshop in Sendai

IEEE Metro Area Workshop 2019 in Sendai was held on October 24, at Sendai City Information & Industry Plaza with 91 participants. This workshop was one of the memorial events for the starting ceremony of LMAG Sendai.

The opening ceremony started by the congratulatory speeches of Prof. Kameyama, IEEE Sendai Section Chair, Prof. Nishihara, IEEE R10 Director and Prof. Takao Onoe, IEEE Japan Council Chair. Then, lecture meeting followed with 5 guest speakers.

The first speaker was Prof. Fumiyuki Adachi, Tohoku University. His talk was entitled “Development of 5G system and the future prospect,” according to his experience to investigate the physical layer of the system. Soon it would be important the cooperation of the radio wave communication with the optical fiber communication.

The next speaker was Prof. Masayoshi Esashi, CTO of MEMS Core Co. Ltd. His talk was entitled “Practical realization of sensors by semiconductor microfabrication (MEMS).” The fabrication process of MEMS (Micro Electro Mechanical Systems) and the sensor network systems including MEMS were introduced.

The third speaker was Dr. Iwao Waga, project leader of Tohoku Univ. COI (Center of Innovation). His talk was entitled “Important subjects of current health care and the possibility of ultra-smart technologies of information and communication.” The number of solitary living elders was increasing lately and their health state monitoring was required. Not only the public-assistance and the self-help, but the mutual-assistance became meaningful here after.

The fourth speaker was Prof. Takuo Suganuma, Tohoku University Cyber Science Center. His talk was entitled “Trial of progressive smart city at Tagonishi area, Sendai”. He selected the Tagonishi for the model area of smart city and introduced the state of art of the new city construction.

Last speaker was Dr. Kazuyuki Sakurai, NEC Biometrics Research Laboratories. His talk was entitled “Frontiers of face recognition and AI.” The biometric authentication became one of the important tools for future social security systems. The face recognition was the easy and sure technology and it was widely utilized in the airport terminals.

After the closing ceremony, we had reception party and enjoyed talking with speakers and participants.

Fig.7 Prof. Adachi giving his lecture

Fig.8 MAW2019 Speakers and relevant IEEE officers. Prof. Fukuda, IEEE President Elect stands at the second left in the front row.

3.3 Japan SYWL Workshop in Sendai

The SYWL workshop in Sendai was held at 9:30 to 12:20 on October 25, Friday in Aobayama Commons of Tohoku University, Engineering Faculty Campus. The workshop was sponsored by the workshop organizing committee and cosponsored by IEEE Sendai Section, Sendai/Tokyo LMAGs, Sendai/Tokyo YPs, Sendai/Kansai/JC WIEs, JC SAC, Aizu SB, and Tohoku SB. The participants were 41 in number.

This workshop is aimed to provide an opportunity for a wide range of students, engineers and researchers to interact with each other, and for young people who would lead the future society to be active globally through the IEEE activity.

First, Ms. Takako Hashimoto, a vice president of Chiba University of Commerce, also known as a woman researcher and who is active as Secretary of IEEE Region 10, gave a lecture “Fly to the World in Information and Communication Field.“ She talked about how to develop professional carriers as woman researchers with her actual experience, and suggested that they should continue their efforts even with slow steps.

Next, a group discussion was held in the field of STEM (Science, Technology, Engineering and Mathematics). The participants were divided into groups consisting of several people from a wide

range of generations. Each group had a free discussion on the topic “Exciting Future” and presented what they discussed. Although the allocated time was short, discussions were active from a variety of aspects and resulted in some proposals such as creating dramas that convey the attractiveness of STEM, and establishing a university for elderly people.

Fig. 9 Japan SYWL Workshop 2019 Participants

4. Lecture Meeting "Semiconductor Heterojunction Diode and its Applications to Terahertz Wave"

The lecture meeting was held sponsored by TPC and cosponsored by LMAG, both of IEEE Tokyo Section from 15:30 to 17:00 on October 29, Tuesday in the training room 1 of Kikai-shinko Kaikan. The participants were 20 in number. The lecturer was Prof. Hiroshi Ito of Kitazato University who was awarded an IEEE Fellow in 2019 on the related topic.

First, Dr. Ito explained how the research on uni-travelling-carrier photodiode (UTC-PD) started. As a key device in optical communication systems, photodiodes (PDs) have been required to achieve higher output. Conventional pin-PD, however, had a difficulty to achieve higher output due to power saturation caused by spatial electrical charges in the device. In order to solve this problem, a new configuration consisting of an optical amplifier of EDFA and a PD was proposed. UTC-PD was invented as the high-power PD that achieved high-speed electron transfer efficiently in the device so that output power hardly saturates. UTC-PD is an excellent device that can drive the cascaded electric circuits directly at a speed of 100Gbit/s. High-speed optical communication systems, however, have widely adopted coherent systems nowadays.

On the other hand, utilizing its characteristics of wideband, narrow linewidth, and frequency stability, UTC-PD is eventually used for generation of terahertz wave which can penetrate a variety of materials and is used for wide applications such as security check and non-destructive inspections. UTC-PD is also expected to be used in radio astronomy observations, especially for contributions to the next generation ALMA project as a photonic reference signal generator.

Additionally, Dr. Ito introduced an application of UTC-PD to remote spectral sensing by millimeter/submillimeter wave irradiation, and an advancement of terahertz radio transmission technology, known as fiber optic radio.

Finally, Dr. Ito introduced the development of Fermi-level control barrier diode which is high-performance element for terahertz-wave detection and its application to imaging. After his talk, there were eager technical questions about the fabrication process.

Fig.10 Prof. Ito giving his lecture

5. Lecture Meeting “Edge Computing in IoT/AI Era and the Role of MCU Embedded Systems “

The lecture meeting was held sponsored by TPC and cosponsored by LMAG, both of IEEE Tokyo Section from 15:30 to 17:00 on November 7, Thursday in the training room 1 of Kikai-shinko Kaikan. The participants were 53 in number. The lecturer was Dr. Hideto Hidaka, Fellow of Renesas Electronics Corp., and he was awarded an IEEE Fellow in 2019 on the related topic.

Dr. Hidaka first referred to a broad direction of IoT. IoT revolves the structure of industry with a system where cyber and real matters are merged, and resolves social problems.

Next he talked about IoT’s fundamental factors: Big Data, CPS (Cyber Physical System), Nomadic and Autonomous, and explained the process to achieve these functions using a pyramid of IT (Information Technology) and OT (Operational Technology). He also explained that MCU (Micro Control Unit) embedded systems has been developed realize high-speed and wide range processing required for IoT edges. An embedded flash memory, a greatest feature of the system, was used to store CPU codes formerly, now additionally stores codes for edge security functions and for accelerators to achieve high-speed edge computing.

Then, Dr. Hidaka introduced the latest development trend of embedded systems such as in-vehicle GPS and e-AI (end-point AI) applications. He pointed out that AI processing in edge systems had become playing more important roles. AI

processing, in general, requires 32-bit computation for accuracy, but an approximate 4-bit calculation works well for e-AI computation.

Finally, as a future challenge of the embedded systems in IoT/AI era, Dr. Hidaka mentioned the importance of making a balance between edge computing and communication. He showed some future views and concluded his lecture.

After the lecture, many questions were raised that showed keen interest in this field: the future of MCU embedded systems and the semiconductor industry in Japan.

Fig.11 Dr. Hidaka giving his lecture

6. Technical Tour to KDDI Research and Lecture Meetings

IEEE LMAG-Tokyo held a technical tour to KDDI Research, Inc. and lecture meetings at 14:30 to 19:00 on November 29, Friday. The number of participants was 45.

(1) Lecture Meeting

Dr. Yasuyuki Nakajima, President, CEO of KDDI Research, Inc. talked about “Introduction of KDDI Research” and “Benefit and possibility of 5G.”

KDDI Research, Inc. started in 1953 as the research division of KDD Co. Ltd. Then in 2016 the present Research, Inc. was settled. The locations are in Fujimino, YRP, and Ildabashi. ‘Challenge For Future’ is the slogan to motivate the Research and Development.

In Fujimino once, there were many short wave antennas. The developments of the satellite TV, the undersea cable systems and the G3 facsimile were recognized as an IEEE Milestone. Currently the soliton communication, the big data, IoT, the post 5G, the free viewpoint video, and the cryptography are main R&D items. To recover a communication network in disasters, the use of helicopters, drones and ocean ships are developed. To discover the deep ocean, robotics is investigated.

About 5G, the rich life is going to be realized relating to Society 5.0. The beam forming technology to prevent radio wave interruption and automatic driving technology are under the investigation.

Fig.12 Dr. Nakajima giving his talk

(2) Technical Tour

Free viewpoint VR (Virtual Reality) was introduced. The video movies taken by multi-cameras were edited to be seen from any directions. This technology was also applied to the sound. By synchronizing the video and the sound, the voice of a specific person could be extracted, and the difference due to the location was recognized.

(3) Lecture Meeting

Dr. Masatoshi Suzuki Principal Research Engineer gave a talk entitled “Trend of Spatial Multiplexing Optical Fiber Transmission technologies.” First he introduced the history of the important devices of laser diodes and optical fibers. After that, the nonlinear dispersion effect of the optical fiber, EDFA (Erbium Doped Fiber Amplifier), and QAM accompanying with the digital coherent technology were introduced. About the spatial multiplexing, the multi-core fiber was introduced. Recently the optical fiber embedded with 100 cores was reported. His comment was that the reasonable number of embedded cores might be 5.

Fig.13 Dr. Suzuki giving his talk

Fig.14 Group photo of all the participants

He pointed out that the R&Ds were promoted and the number of patents remarkably increased in Chinese companies such as Huawei. In the near future, the devices venders might be in China and the service development would be in Japan.

We had a reception party with members of KDDI and participants. All members enjoyed talking and drinking.

7. Lecture Meeting "The New Generation Signal Processing Algorism Generated by Consolidation of Optimization Mathematics and Fixed-Point Theorem"

The meeting hosted by Prof. Isao Yamada, Tokyo Institute of Technology was held at 15:30 to 17:00 on December 16 at the 1st Training Room of Kikai-shinko Kaikan sponsored by IEEE Tokyo Section TPC and co-sponsored by its LMAG. The number of participants was 40. He started this research work in Tsukuba University and now continues it in Tokyo Institute of Technology, and awarded IEEE Fellow.

First, he talked about what is optimization, and defined it as obtaining a fixed point that does not move by the projection effect to a vector. Using graphs, general interpretation was explained. During his talk, we heard the names of great mathematicians such as Banach, von Neumann and Hilbert, which had been studied in our student lives.

Fig.15 Prof. Yamada giving his lecture

Next, he introduced the following 3 fields that consolidate optimization mathematics and fixed-point theorem: (1) From a closed partial space to a closed convex set, (2) A fixed point for contraction mapping and non-expansive fixed point, (3) Convex analysis. As a result, it is possible to exploit a new signal processing algorism implemented with function that was esteemed impossible. This work was awarded Best Paper Award by IEEE.

Lastly, as "a hint to research activity in the AI age," he talked about the inspiration obtained while sleeping in night that had been pointed by Noguchi and Poincare. He suggested the information processing when consciousness is latent and obvious as optimization for a double layer structure.

After his talk, 3 questions were raised. The discussion continued even after the closing time.

8. IEEE Milestone Award Ceremony and Lecture Meeting

HEMT (High Electron Mobility Transistor) invented at Fujitsu Laboratories, Ltd. was recognized as an IEEE Milestone. At 11:00 to 15:00 on December 18th, a commemorative ceremony was held at Hikari room of Imperial Hotel Tokyo with 88 participants.

(1) IEEE Milestone Award Ceremony

After the sponsor address, Prof. Toshio Fukuda, IEEE president elect presented the milestone plaque to Mr. Yuki Hara, president, Fujitsu Laboratories Ltd. Mr. Hara addressed the gratitude speech.

(2) Commemorative Lecture Meeting

After the ceremony and a cerebration party, Prof. Isao Shirakawa, the chair of IEEE Japan Council, explained the outline of IEEE Milestones. Then, four commemorative lectures were delivered.

Dr. Takashi Mimura, Honorary Fellow of Fujitsu Laboratories Ltd. who was an inventor of HEMT gave a lecture entitled “The Invention of HEMT and its earlier stage of R&D.” During the R&D of high-speed GaAs Metal Semiconductor FET, HEMT was born by merging Metal Oxide Semiconductor FET and Modulation doped superlattice. The molecular beam epitaxial growth was very effective to realize this idea. By using the heterostructure of compound semiconductors with the high electron mobility, the 2-dimension electron gas contributed the higher electron mobility. By using HEMT, the low noise amplifier was realized to contribute the decrease in the diameter of a parabolic antenna and the applications in the many fields were made.

Prof. Hiroyuki Sakaki, president, Toyota Technological Institute talked on “Physics of Semiconductor Heterostructure and Impact of HEMT to Physics.” He introduced series of inventions such as p-n-p transistors, tunnel diodes, IC’s, Si-MOSFET, Heterostructure, and HEMT. Then the quantum structures were followed so that quantum well, quantum wire, and quantum dot were proposed to expand the characteristics of semiconductor devices.

Dr. Iwao Hosako, National Institute of Information and Communications Technology gave a talk entitled “The role of HEMT in the future society.” The 5G service will start next year. By considering the progress in mobile phones, the new service of Beyond 5G: called 6G, over 1 THz would be expected. The frequency range of 0.1-10 THz is already assigned. Semiconductor devices operating in this frequency range would depend on HEMT.

Dr. Keiji Watanabe, Fujitsu Laboratories Ltd. talked on “Practical use of HEMT and Its Contribution to the Expansion of ICT Society.” Considering the breakdown voltage and high frequency response, the promising semiconductor materials are GaN and InP, respectively. HEMT would widely be used in many fields of automatic driving, base stations for mobile phone services, and

security applications.

Fig.16 IEEE milestone award ceremony and relevant persons.

Fig.17 Dr. Mimura giving his talk

9. LMAG-Tokyo Future Event

LMAG-Tokyo General Assembly (2020)

- Date & Time: April 3, 2020 (Fri) 14:00～14:25
- Venue: Room 66, 6F, Kikai-Shinko-Kaikan.

For further information, contact IEEE Tokyo Section tokyosec@ieee-jp.org.

IEEE Tokyo Section LMAG Newsletter, No. 27, Issued on Dec. 27, 2019

Issued by IEEE Tokyo Section Life Members Affinity Group

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