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Greetings from the New President

Nobuyoshi Kikuma
 President, IEICE Communications Society
 Professor, Nagoya Institute of Technology



It is my great honor to serve as the President of the IEICE Communications Society (IEICE-CS), which has continuously fostered and innovated new communication technologies for the future advanced society. Notably, 2020 is a memorial year when the service of 5th generation mobile communication (5G) started in Japan. I expect that many researchers and engineers from academia and industry join the IEICE-CS activities towards the next-generation communication systems. I will do my best to improve the activities further and to increase their significance for IEICE-CS members.

I would like to look back on the last year 2019 first of all. We had two big events of cross-field national technical meetings: MIKA2019 (Multiple Innovative Kenkyu-kai Association for wireless communications) and RISING2019 (Cross-Field Research Association of Super-Intelligent Networking). They were supported by many technical committees of not only the IEICE-CS but also other IEICE Societies. In particular, RISING2019 held a topical session collaborating with the Japan Society of Machine Engineers. As a result, both meetings had 200 to 300 participants, respectively, and concluded quite successfully. As the next step, the IEICE-CS is planning the cross-field international conference that is the flagship of the IEICE-CS. I hope that the flagship international conference will make three massive pillars with MIKA and RISING in the IEICE-CS. This structure will get the IEICE-CS to be more exciting and enjoyable.

In MIKA2019, I provided a keynote address that was entitled “Optimization of Multi-Antenna Systems Bound with Rayleigh Quotient - Longitudinal Study towards Cross-Field Transverse Development.” What I wanted to say in the talk is that a reasonable and logical policy is necessary to develop things transversally over the walls between multiple technical fields. Just like the warp and weft of fabrics, the MIKA and RISING of transverse wefts are passed over and under the technical committees and IEICE societies of the longitudinal warps. For the artistic weaving, the IEICE-CS has to have a consistent policy and flexible sense for all activities. Then, MIKA and RISING can be in full bloom as if the wefts make up beautiful arts together with the tight warps. In this way, IEICE-CS will expand furthermore in all directions with the support of the cross-field activities. I understand that it is my role as the President of the IEICE-CS to weave with the right balance between warps and wefts in the IEICE-CS.

By the way, I had a chance to know SDGs [1] last year. SDGs stands for “Sustainable Development Goals.” Recently, I always put an SDGs badge on my jacket for self-enlightenment as shown in Fig. 1.



Fig. 1 SDGs badge.

As you know, SDGs are a collection of 17 global goals designed to be a “blueprint for achieving a better and more sustainable future for all.” So, I made my SDGs. One of my SDGs is “Continuous human-resource development to make a sustainable society.” Society cannot exist without the persons, and I would say that continuously bringing up young people who bear the next generation is the key to forming sustainable communities. I believe that person-making must be an essential infrastructure-making of society.

Unfortunately, because of new coronavirus, our activities are severely limited, and so the IEICE is in state of being unable to hold large-scale events. For example, the general conference of IEICE was held only online in March 2020. Many technical meetings have been canceled. I feel lonely since I cannot see the IEICE friends. On the other hand, there are many things we learned in such a situation. Realizing the online meetings and online conferences is one of the critical and urgent issues. On this occasion, we must construct and expand those online systems, including not only online discussions but also online parties, based on the 5G communication systems. It is time to push forward and practice things that we have hesitated to do or put off until now. When coronavirus is conquered and the current restrictions to us are removed, let us make the social distance quite small and join the IEICE-CS activities with enthusiastic hearts having younger people on in our communities.

I would like to conclude this greeting message by asking all of you for your kind support and contributions to IEICE-CS activities.

Reference

- [1] <https://www.un.org/sustainabledevelopment/sustainable-development-goals/>

Transmission System Design for 40G Link System through Global Collaboration

Akira Hirano
Tokyo Denki University



1. Introduction

Optical transmission systems have achieved large capacity of up to seven orders of magnitude through research and development of various breakthrough technologies such as optical amplifiers [1]. At the same time as the increase in capacity, the overwhelming reduction in communication costs has created an economical global network, making it possible to use various services anywhere in the world. In the research and development of these optical transmission systems, I realized for the first time a 40 Gbit system using the phase of light, from a 10 Gbit / second system that used IM-DD (Intensity Modulation-Direct Detection). Based on these researches and developments, the chromatic dispersion and polarization mode dispersion were mitigated. In this letter, a system design technique considering these kinds of impairments which was realized through global cooperation is described.

2. Chromatic Dispersion and Polarization Mode Dispersion

The chromatic dispersion and the polarization mode dispersion of an optical fiber are main factors that cause transmission deterioration of an optical transmission signal via ISI (Inter Symbol Interference). Figure 1 schematically shows ISI resulted from chromatic dispersion.

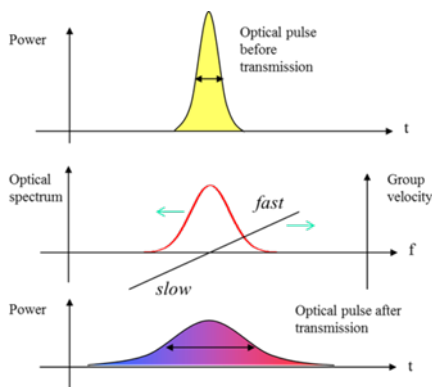


Fig. 1 ISI by chromatic dispersion.

An optical signal pulse has a certain bandwidth depending on its waveform and baud rate. In the chromatic dispersion, the signal component in the band advances at a different group velocity according to the optical frequency, and thus the waveform spreads as shown in the lower part of the figure. To compensate for such deterioration, whether optically or electrically,

it is necessary to accurately estimate the amount of chromatic dispersion.

As shown in Fig. 2, the polarization mode dispersion also causes deterioration in the quality of the optical signal through ISI, because the propagation speed varies depending on the polarization component of the optical signal due to the birefringence characteristic of the optical fiber.

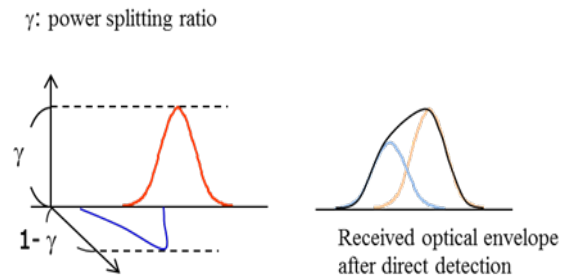


Fig. 2 ISI by polarization mode dispersion.

3. Optical Phase Control and Chromatic Dispersion Estimation

3.1 Evaluation of the Effect of Optical Phase

As one of the approaches beyond the limit of IM-DD, the possibility of improving the chromatic dispersion tolerance by actively controlling the optical phase was examined. Using the model shown in Fig. 3, simulation was used to evaluate how mutual phase states between adjacent symbols of an optical signal affect against chromatic dispersion.

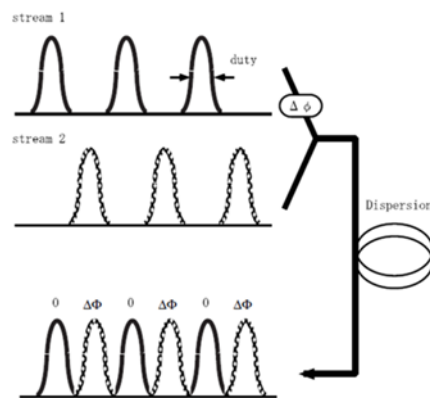


Fig. 3 Evaluation model.

As a result of the evaluation, a remarkable difference was observed in the waveform depending on the relative phase as shown in Fig. 4, and it was confirmed

that the ISI was suppressed between adjacent symbols when the relative phase was π . Therefore, to prove this, the device shown in Fig. 5 was developed and experimentally verified [2].

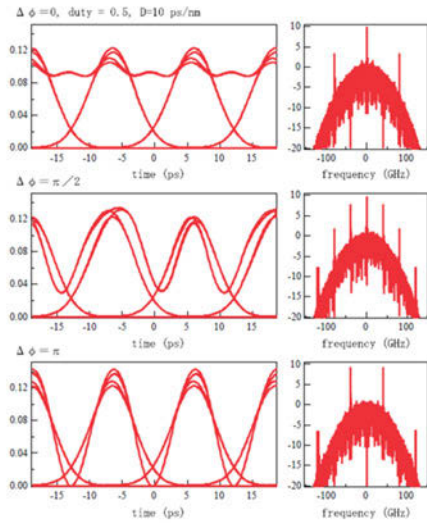


Fig. 4 Results of numerical simulations.

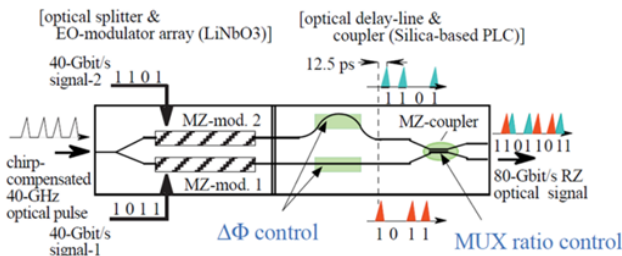


Fig. 5 Transmitter with optical phase control.

The results of experiments using this device are shown in Fig. 6. The waveforms and spectra were in good agreement with the simulation, and good results were obtained with respect to the chromatic dispersion tolerance when the phase difference was π as expected.

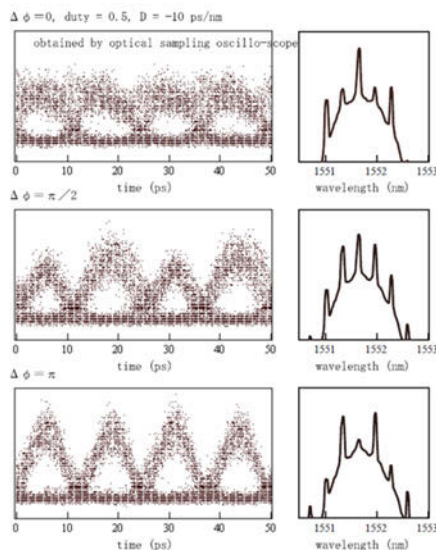


Fig. 6 Experimental results.

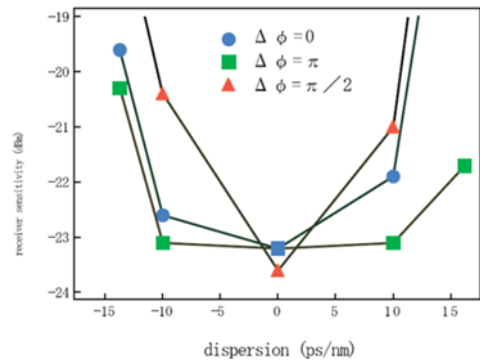


Fig. 7 Experimental results of dispersion tolerance.

3.2 Use of Spectral Structure of Optical Signal

A close look at the optical spectrum on the right side of Fig. 6 shows that the combinations of the carrier components are different from each other. When the optical phase difference is 0, the optical pulse is mainly generated by three carrier components, but as shown in the lowermost diagram of the optical phase difference π , the optical pulse is formed by two carrier components having almost the same intensity. Focusing on this structure, we confirmed that these two components can be separated during reception [3-5]. Figure 8 shows this state.

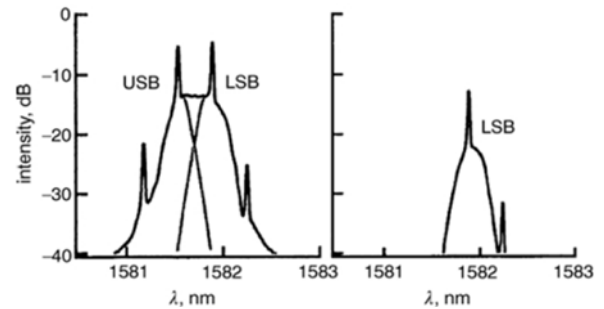


Fig. 8 Spectrum structure of phase difference π .

When these two carrier components propagate through the optical fiber, they should receive different chromatic dispersions by an amount corresponding to the difference between the two frequency components. That is, if the deviation is measured, it is expected that the amount of chromatic dispersion can be estimated as shown in Fig. 9 and Equation 1 [6, 7].

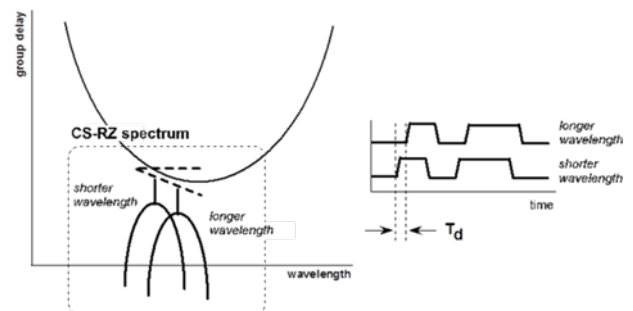


Fig. 9 Dispersion estimation by dual carrier comparison.

$$D = -\frac{T_d F_{carrier}^2}{c F_{separation}} \quad \text{Eq. 1}$$

D , T_d , $F_{carrier}$, $F_{separation}$, and c are the amount of chromatic dispersion, the delay difference between two carrier components, the carrier frequency, the carrier frequency difference, and the speed of light, respectively. As described above, by measuring the delay difference between different frequency components inside the optical signal, it is possible to estimate the amount of chromatic dispersion including its sign. If this method is used, compensation can be performed in-line and in real time without using a measuring instrument or the like. Figure 10 shows the experimental demonstration of this idea.

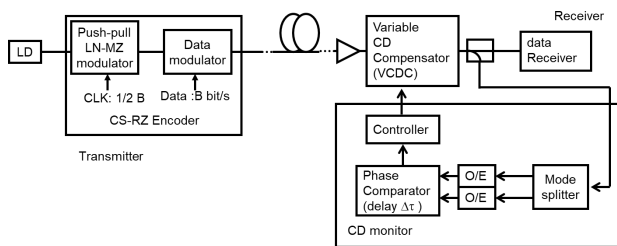


Fig. 10 In-line and real-time compensation method.

Although an optical compensator is used in this experiment, the same configuration can be applied to electrical signal processing. Even in current digital coherent systems, the amount of chromatic dispersion is estimated by a method equivalent to this, and the value is used to compensate by digital signal processing.

4. Polarization Mode Dispersion Evaluation by Global Cooperation

4.1 Status of Installed Fibers

In order to quantitatively evaluate the polarization mode dispersion and to evaluate the effect on the transmission characteristics, it is necessary to use installed fibers having a certain amount of polarization mode dispersion. At that time, the fiber installed in Japan had a relatively small amount of polarization mode dispersion, making it difficult to accurately quantify the effects of polarization mode dispersion having statistical properties. However, in the case of Deutsche Telekom's installed fiber, more than 35% of the fibers in the backbone segment had a value of 5 ps or more, which was optimal for such evaluation. For this reason, the 40G prototype system developed by NTT was brought to Deutsche Telekom's office and coordinated for experiments to evaluate. Finally, the configuration shown in Fig. 11 was implemented in Berlin in the summer of 2003.

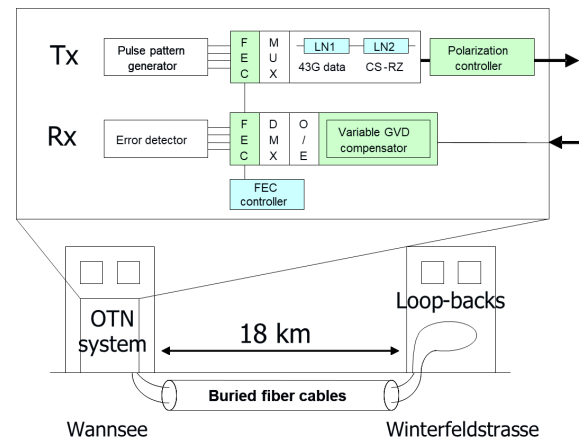


Fig. 11 Field experiment configuration in Berlin.

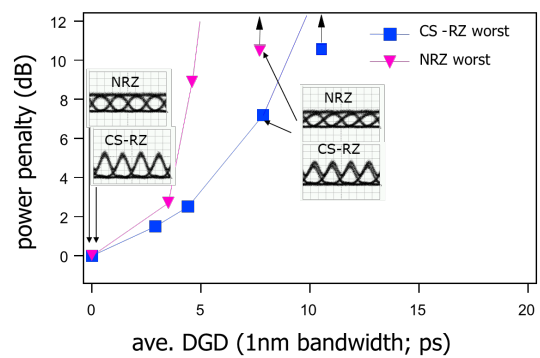


Fig. 12 Results of field experiments ($\gamma=0.5$).

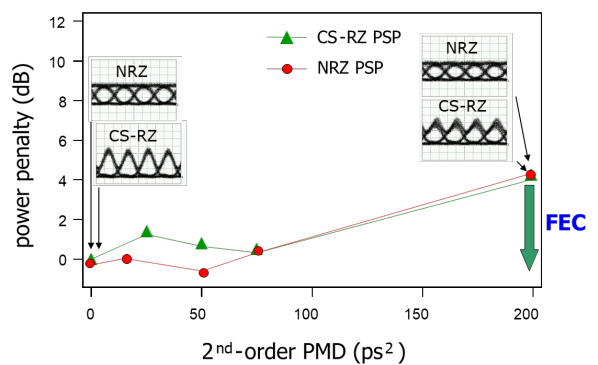


Fig. 13 Results of field experiments ($\gamma=0$).

4.2 Field Evaluation Experiment

Figure 12, 13 shows the results of the evaluation experiment. The superiority of RZ over NRZ and the effectiveness of Reed-Solomon FEC were confirmed [8-10]. Through this evaluation experiment, the world's first effective tolerance of a 40G high-speed optical signal in an installed fiber was evaluated. Based on these results, a margin design was performed, and the 40G-WDM system using the RZ-DQPSK method, which can achieve the required proof stress, was put to practical use.

Based on these results, a proposal for standardization contribution was made to ITU-T under the joint name of Deutsche Telekom, and the recommended duty ratio of RZ for polarization mode dispersion was agreed [11].

5. Acknowledgments

This research was supported by the NTT Transmission Systems Laboratories (now NTT Network Innovations Laboratories, NTT Network Systems Laboratories), affiliates, and university professors. I am deeply grateful to all of the above.

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My Research Experience on Switching Power Supply Control for Electronics, Information and Communications System

Fujio Kurokawa
Nagasaki Institute of Applied Science



1. Introduction

It is a great honor for me to have been awarded the IEICE Fellow for my contribution to research and development on Switching Power Supply Control for Electronics, Information and Communications System. I express my deepest thanks for many colleagues of my research field. I think I have contributed with my colleagues to develop not only the analog control techniques but also digital control techniques for the switching power supply in the information and communications System [1, 2]. These results applied to develop the control method of PWM, resonant and soft-switching dc-dc converters for switching power supply in electronics, information and communications systems. Moreover, I think these excellent fruits produced great advantages to research and invent a new digital control method for switching power supply.

2. Outline of My Work

In the development of the digital control techniques, I designed and developed the parallel processing digital control circuit already in 1989. Although the switching frequency of the digitally controlled dc-dc buck converter was 20 kHz, it was useful that I made clear up the design criterion of digital control circuit parameters first. Therefore, it is revealed that my outstanding realized digital control circuit technique blazed a trail in the digital power field. The power supplies are usually controlled by analog ICs because the controllability of the analog ICs is satisfactory, and the cost of the digital ICs is higher than that of analog ones. Recently, the power supply system requires the high-performance characteristics, the high reliability, and the small size. In this case, it has been recognized that the digital control techniques are useful for these switching power supplies. However, it was well known that the digitally controlled dc-dc converter is not operated in the high frequency switching band. To solve this problem, I designed and developed a new high-speed 1 MHz digital control circuit for dc-dc converter in 2004 [3]. My results in [3] provided a strong impact for engineers in the world.

Further, I considered the design criterion and published the simple design procedure for digital control of dc-dc converter. These results were presented by many invited papers in the international conferences and journals. They were also applied to develop a unique digital control method of many power supply systems. From 2009, since the Japanese government evaluates my

research, my digital control techniques were chosen for higher voltage direct-current (HVDC) power-feeding supply system in data center buildings as one of main subject of New Energy and Industrial Technology Development Organization (NEDO) “Green IT Project.” In this big national project, new technologies are invented to decrease the power consumption of 30% in the data center and the router, respectively, in Japan [4, 5]. Figure 1 shows the next generation module type data center, where my new technology is implemented.

The most popular digital control method is a digital PID feedback control. In a conventional PID control, its gain parameters are optimally determined to control the dynamic input–output conditions. Due to the fixed control parameters, it has difficulties under unexpected conditions. The digital filter method, which is also widely used as a digital control, has the same problem.

To address such a problem, the function is needed to change control parameters or add additional control term adaptively. In this study, I adopt a neural network (NN) to realize such an adaptive control [6-11]. The most significant point of my approach compared to previous works is that the NN is adopted in the combination with the conventional PID control. In the presented method, the NN control modifies the reference or bias value in the conventional PID control to improve the transient response of the output voltage.

To modify the reference, the NN is repeatedly trained to precisely predict the output voltage using former predicted data. After the training, the reference in the PID control is modified by the predictor. Therefore, the



Fig. 1 Next generation module type data center.

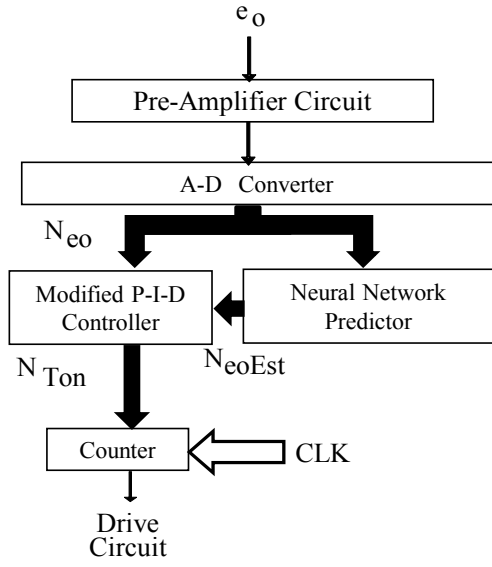
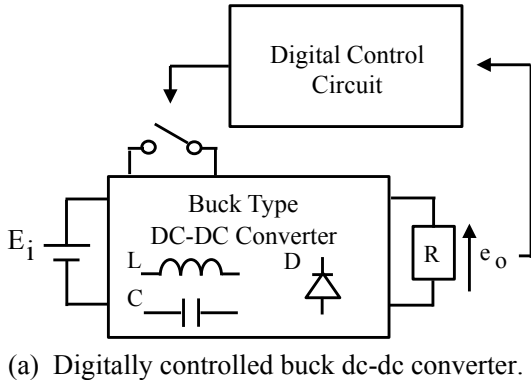


Fig. 2 Digitally controlled dc-dc converter and its control diagram.

NN control improves the transient response of output voltage in the transient state [10]. The conventional PID works to keep the regulation characteristics in the steady state.

The digitally controlled buck converter is shown in Fig. 2(a). Symbols in Fig. 2(a) represent circuit parameters as follows. E_i is an input voltage. e_o is an output voltage. R is a load resistance. L is a reactor. D is a diode. C is an output smoothing capacitor. In the digital control circuit shown in Fig. 2(a), e_o is detected as a feedback. As shown in Fig. 2(b), the digital controller consists of the conventional PID controller and the NN controller. It is noted that the suffix n denotes the n -th period of the switching period T_s . In the digital controller, e_o is sent to the A-D converter through the pre-amplifier circuit, and it is converted into its digital value $N_{e_o,n}$, which is sent to both the PID controller and the NN controller.

Figure 3 shows the time duration and start-end timing of NN control term for suppression of k -th over or undershoot in the case of $k = 1, 2, 3$ to explain the effect for repetitive training. The time duration after the first and second training are shown. $T_{j,k}$ ($k = 1, 2, 3$) are the time duration of the NN control term before the timing control is adopted, which are determined from obtained

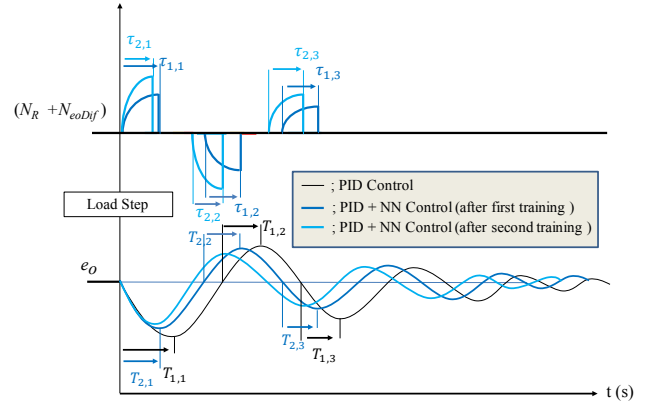


Fig. 3 Time duration and start-end timing of NN control term.

data in look-up tables (LUTs) preliminarily. The index j represents the j -th training of the NN (LUT). It is explained that $T_{1,k}$ in the first LUT (first NN) are not suitable when the second neural network ($j = 2$) is adopted. Therefore, it is needed to control the time duration of the NN control term. Fig. 3 also shows the effective time duration $\tau_{j,k}$ which represents suitable ones after the timing control is adopted. During $\tau_{j,k}$ for each over or undershoot in Fig. 3, the NN control term is performed.

As mentioned before, the reference in the PID control term is modified by the NN control. The NN adopted here is the standard three-layered feed forward NN and trained with the standard back propagation algorithm. Figure 4 shows the training procedure and adaptation of NN control in this study. In the training process of the NN controller, firstly, the NN is trained to predict $e_{o,n}$ from its former three data $e_{o,n-3}$, $e_{o,n-2}$, $e_{o,n-1}$ when only the conventional PID control is adopted. It is noted that whole e_o data in the transient state are used in this training process. The predicted values are stacked into the memory as the first LUT. Secondly, the reference in the PID control is modified with the first LUT. Using the PID control and the first NN control (first LUT) simultaneously, the on-time duration $N_{Ton,n}$ is calculated by (1).

$$N_{Ton,n} = N_B - K_P \{ N_{e_o,n-1} - (N_R + N_{e_oDif,n}) \} - K_I \sum \{ N_{e_o,n-1} - (N_R + N_{e_oDif,n}) \} - K_D (N_{e_o,n-1} - N_{e_o,n-2}) \quad (1)$$

N_B is the bias term. K_P , K_I and K_D are the proportional, integral and differential coefficients of the PID control, respectively. N_R is the original constant reference in the PID control. Compared to the conventional PID control, the reference in the PID control terms are modified using $N_{e_oDif,n}$ which is represented as (2).

$$N_{e_oDif,n} = N_R - N_{e_oEst,n}^{(1)} \quad (2)$$

$N_{e_oEst,n}^{(1)}$ is the predicted value of $e_{o,n}$ with the first LUT. The NN control term is performed from the time when the step change in the load occurs. It is effective for compensation of subsequent outputs to suppress the first few under and overshoots.

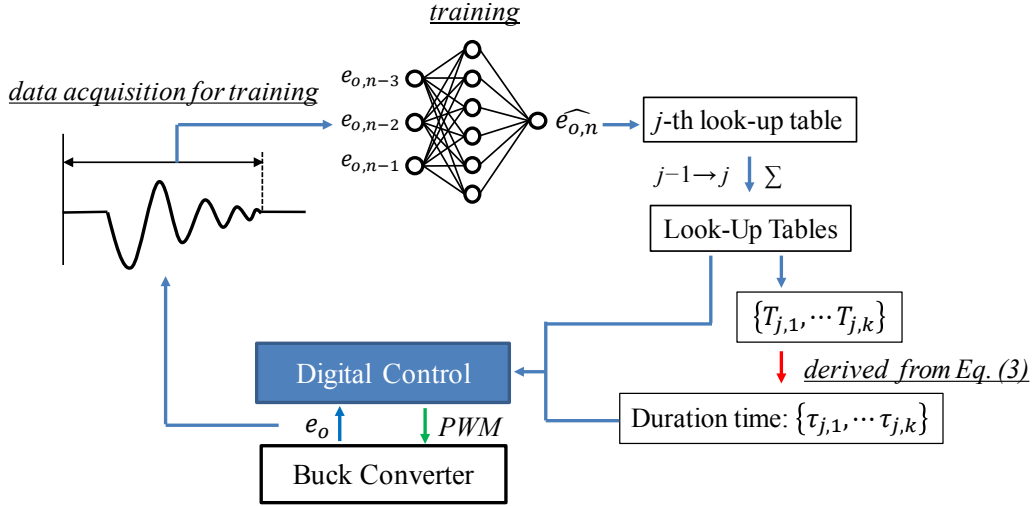
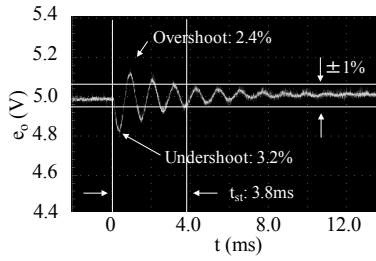
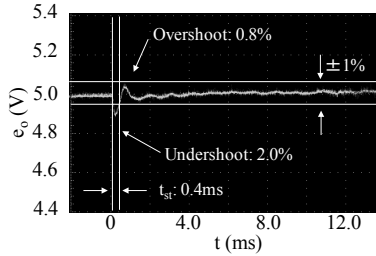


Fig. 4 Training procedure and adaptation of neural network control.



(a) Conventional PID control: $K_P = 4$, $K_I = 0.015$, and $K_D = 4$.



(b) Proposed method after third training of NN: K_P , K_I , and K_D are same with conventional PID control.

Fig. 5 Transient response of e_o in experiment.

The simple criterion is suggested to obtain suitable $\tau_{j,k}$. The suitable $\tau_{j,k}$ are calculated from $\tau_{j,k} = \alpha_{j,k} T_{j,k}$, where $T_{j,k}$ is the duration time obtained from LUTs and $\alpha_{j,k}$ is the ratio of time durations. Each $\alpha_{j,k}$ is simply set to the same value; $\alpha_{j,k} = 0.75$. That is, $\tau_{j,k} = 0.75 \times T_{j,k}$ for each j and k . This criterion makes us easy to design the NN duration time. We also add one more criterion which limits the length of duration time to be too short. When $\tau_{j,k}$ becomes too short, the effect of the NN control term is decreased too much, and it does not work well in the control process. Therefore, the criterion is needed to ensure the effect of the NN control and realized by limiting the change of duration time

depending on its length. This criterion is represented as (3), which is combined with the first criterion described above:

$$\tau_{j,k} = \begin{cases} \alpha_{j,k} T_{j,k} & (T_{j,k} > T_H) \\ T_{j,k} & (else) \end{cases} \quad (3)$$

where T_H is the common threshold value to limit the change of the time duration. From (3), the length of $\tau_{j,k}$ for each LUT is determined.

The training steps of the NN described above repeatedly proceeds using former predicted data (LUTs) until the enough suppression of e_o in transient state is obtained. When the new LUTs are obtained and added for each training step, $T_{j,k}$ and $\tau_{j,k}$, the duration time for the j -th training step, is also obtained. The values of LUTs are summed up and adopted to modify the reference in the PID control terms in (1). Therefore, $N_{e_oDif,n}$ in (1) is replaced by (4) after j -th training.

$$N_{e_oDif,n} = \sum_{i=1}^j (N_R - N_{e_oEst,n}^{(i)}) \quad (4)$$

$N_{e_oEst,n}^{(i)}$ is the predicted value of $e_{o,n}$ with the i -th LUT. For all LUTs, the suitable time duration $\tau_{j,k}$ is also determined from (3). It is noted that the training of the NN proceeds repeatedly three times ($j = 3$) in this study. As shown in Fig. 5, the experimental results show that the proposed method can improve the overshoot and the convergence time t_{st} of e_o simultaneously effectively and provide stable transient response compared to the conventional ones. The over and undershoots are suppressed to be about 1/3 and 2/3 of the conventional PID control, respectively. t_{st} also becomes about 1/9.

3. Future Work

The reduction of CO₂ is a hot topic to protect the environment of the earth in nowadays. The renewable energy has been shown to be an effective means of reducing CO₂ and electricity consumption during the peak hour. Also, it can be implemented as the non-

interruptible power source in the times of disasters. To this end, it is widely implemented in the fields of information communication, transportation, public welfare, etc.

Nowadays, the energy flow in the power supply system becomes complex due to the implementation of renewable energy sources. In order to control the energy flow with the high-performance, the artificial intelligence (AI) technologies are expected to be implemented to control the complex power conversion system in the future [12]. The AI technologies are expected to improve the energy management performance of the individual control power supply system [13, 14]. For example, in the renewable energy system, various energy sources with different characteristics input uncertainly power to the power line through the power supplies. In the individual control power supply systems, since the power converter units take no communication with each other, the optimal operation points for each unit should be predicted to regulate the balance of the shared power for power supplies. In this case, the AI technologies can be considered as the most effective way to predict the optimal operation points. The high-speed processing is required for the AI technologies to predict the optimal operation point in real-time because the power supplies are operated under the high switching frequency. Thus, it is difficult to implement AI technologies to the high switching frequency power supply units directly by the present technology level. Currently, I am trying to use simple AI model control approaches instead of standard AI technologies as the predictive control method for predicting the optimal operation points to realize maximum performance of power supplies. I hope to continue my contribution for switching power supply control for future electronics, information and communications systems with not only senior but also young researchers. Also, I expect many researchers will win the IEICE CS Fellows.

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Application of AI to Network Operation*

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1. Introduction

In recent years, attention has been focused on technologies to detect network anomalies (such as failures) by analyzing various data collected on networks and to enhance and automate network control by utilizing network virtualization technologies. In particular, expectations for the application of artificial intelligence (AI) are increasing. Through the first and second AI booms, it is currently the third AI boom where machine learning and deep learning are attracting attention [1, 2]. Machine learning makes it possible to obtain patterns hidden in the data, and consists of techniques such as identification, regression/prediction, clustering, and rule-extraction. In deep learning, the number of hidden layers in a conventional neural network is increased, and it is applied to image recognition etc. In conventional machine learning, features (points to pay attention to for identification) need to be designed by someone with specialized knowledge. In contrast, the features are extracted automatically in deep learning.

Research and development on the enhancement of network operation by applying AI such as machine learning and deep learning to various data collected on the networks are being developed. One of the research difficulties is owing to factors of performance degradation risk, such as failure and congestion owing to traffic concentration, becoming diverse and complex, along with providing various network services.

Especially, as network virtualization such as Software Defined Networking (SDN) and Network Functions Virtualization (NFV) (details are described in Section 5.1) advances, the performance degradation risk detection/identification becomes difficult owing to multiplexing of functions and/or frequent changes in network configuration by the virtualization. For example, the root cause analysis needs to be enhanced because the correspondence between physical and virtual resources can change [3]. Furthermore, in a virtualized network, we need to manage/control not only physical resources, but virtual resources as well, which may increase the number of such resources. Therefore, the control needs to be automated [4]. If the control is automated, we can expect that a part of the manual operations by the network operators is also

automated, or complicated controls can be immediately and frequently applied.

In this study, we describe research and development trends on the application of AI toward advanced network operation and automated control. First, we divide the network operation flow for performance degradation risk such as failure and congestion into three phases: 1) detection of the performance degradation risk, 2) root cause analysis, and 3) control and recovery. Next, we describe the research and technology trends in each phase. We also introduce the content of our research efforts.

2. Network Operation Flow

As shown in Fig. 1, we divided the network operation flow for performance degradation risk such as failure and congestion into three phases: 1) detection, 2) analysis, and 3) control/recovery [5]. The following are the procedures utilized in each phase:

- (1) Anomaly detection: detects the change in network state that causes performance degradation
- (2) Root cause analysis: identifies the location/factor of the cause of performance degradation
- (3) Control/recovery: controls to avoid the performance degradation; recovers immediately from failure

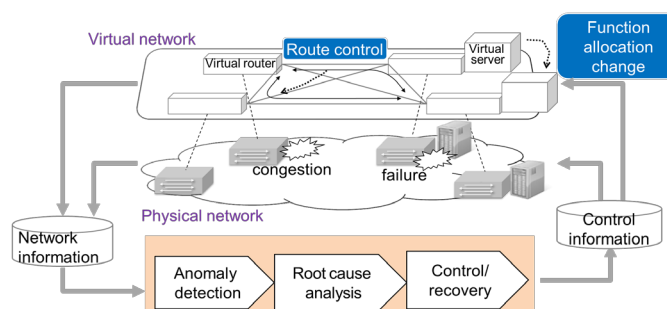


Fig. 1 Network operation flow.
(based on Fig. 1 in [5])

Subsequently, research and technology trends for the techniques used in each phase are introduced. Specifically, Section 3 describes anomaly detection techniques, whereas Section 4 describes root cause

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analysis techniques, and Section 5 describes control/fast recovery techniques. Section 5 also introduces efforts to automate the entire network operation flow. (To be precise, in Sections 3, 4, and 5, we describe the techniques corresponding to each of the phases, but, for example, the studies introduced as anomaly detection techniques in Section 3, may include not only anomaly detection techniques, but also root cause analysis techniques.)

3. Anomaly Detection Technology

We first describe technical challenges for anomaly detection. As the network system becomes large and provides various network services, we consider that factors causing performance degradation risk also become diverse. Thus, we need to monitor various and huge data to detect anomalies early. However, it may be difficult to manually set the rules (thresholds) for individual monitoring items appropriately. In addition, failures hard to detect by such predetermined rules (such as silent failures) may occur. To solve these problems, various anomaly detection techniques have been proposed. In the following, we classify the anomaly detection techniques (including rule-based anomaly detection), and then describe the characteristics of each technique.

We classify the anomaly detection techniques as follows, based on [6, 7]. First, from the viewpoint of data for learning, we classified them into unsupervised and supervised methods. For example, we assume that the data for each monitoring item is collected periodically, and we use such data as input. In addition, we consider the case when the actual response to failure is recorded (i.e., trouble ticket), and such information is used as teacher data, or not. i.e., the former is a supervised case and the latter is an unsupervised case.

In the unsupervised case, only the normal state is specified, and an anomaly is detected as the deviation of observed event from normal state (outlier). i.e., the normal state is learned using data collected only during normal times, and an anomaly is detected when the current data deviates from the normal state (Fig. 2).

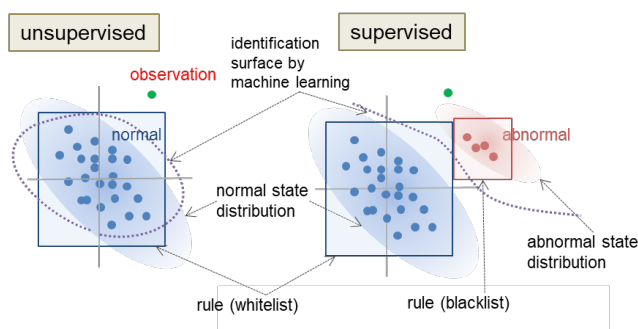


Fig. 2 Unsupervised vs. supervised methods.

In the supervised case, both normal and abnormal states are specified, and an anomaly is detected as the

deviation of observed event from normal state and/or the similarity to the abnormal state. At this juncture, we need to label the input data used for learning as the data when abnormal, which is conducted using the teacher data.

We further classify into rule-based and statistical/machine learning-based methods, from the viewpoint of the method of judging deviation from normal state/similarity to abnormal state.

In the following, we explain each technique in detail based on Fig. 3.

As rule-based and unsupervised methods, for example, there is a method of detection by comparing some numerical data with threshold. In rule-based and supervised methods, we blacklist (abnormal) and whitelist (normal) for the observed data, and evaluate them by matching the data with the lists. Specifically, we detect anomalies if some parts of the text log are matched with specific keywords. OS native commands for text log monitoring are usually used for this purpose. Integrated monitoring software also usually have this kind of function. Here, a text log refers to a text log (for example, syslog, etc.) about changes in the states of devices output from network devices.

There have been many research reports on statistical/machine learning-based anomaly detection methods. In these methods, instead of setting rules and/or thresholds in advance, normal states are learned and modeled from monitoring data to detect anomalies. We classify them into time-series model based and relationship model based, and explain typical methods hereafter.

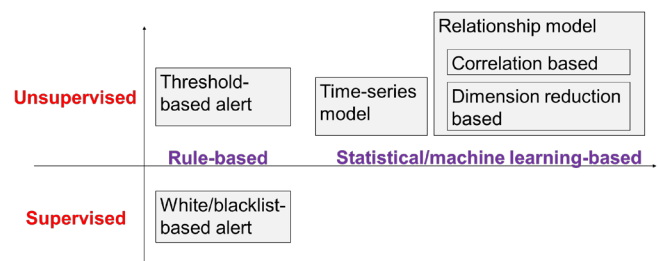


Fig. 3 Anomaly detection technology map.

In time-series model-based methods, for certain monitoring item such as traffic volume on a link, a prediction model is constructed from the past time-series data and an anomaly is detected when the current observed value deviates from the predicted value (Fig. 4-(a)).

For example, we proposed an anomaly detection method by predicting traffic using periodicity of observation data (traffic data) [8]. In ChangeFinder [9], an AR (Auto Regression) model is used to construct a time-series model, and an SDAR (Sequential Discounting AR) learning algorithm is applied to handle non-stationary time-series data. Based on this model, change points are detected by two-stage learning. In the first stage, the degree of change at each time point is determined as a score, and outliers are detected. The second stage of learning is performed

after smoothing the score, and only essential fluctuations are detected by removing noise. Note that ChangeFinder [9] can be applied not only to a single traffic volume time-series but also time-series of multidimensional vectors.

With the relationship model based anomaly detection method, a normal relationship model between multiple monitoring items is constructed by learning, and an anomaly is detected based on whether the current observation value deviates from the model (Fig. 4-(b)). In this study, we further classify the methods into two types, based on how the relationship model is given. One is the method that models the correlations between multiple monitoring items and detects an anomaly by the deviation of the observed value from the model. We call this type of method correlation based anomaly detection. The other is based on dimension reduction. Assuming that multiple dimensional data of multiple monitoring items are generated from low-dimensional factors, the relationship of the original data is modeled by dimension-reduction to detect an anomaly by judging whether the observed value deviates from the model. We call this type of method dimension reduction based anomaly detection.

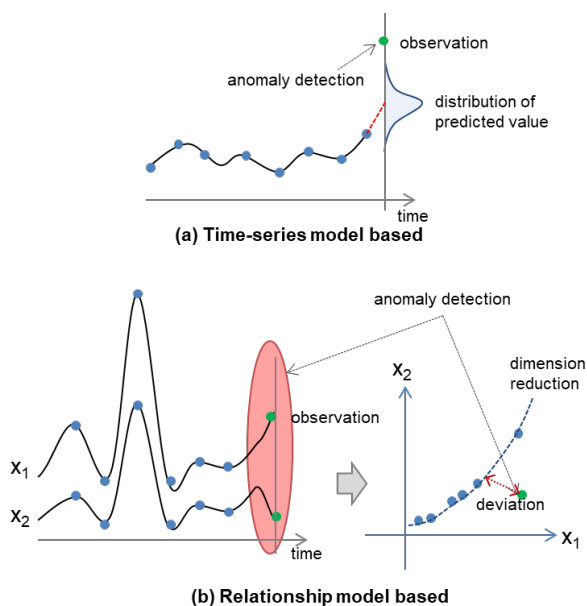


Fig. 4 Time-series model and relationship model based methods.

As correlation based anomaly detection, there are methods in [10] and [11] etc. For example, in [10], if the prediction error is reduced by pairwise regression using ARX model (AutoRegressive models with eXogenous inputs) for multiple monitoring item data observed during normal time, the model is learned as the invariant between the two observations (invariant relationship in normal state), and the anomaly is detected from the collapse of the invariant. In [11], a sparse graph is constructed with each variable as a node based on the relationship between individual variables, and the degree of anomaly of each variable is

calculated by comparing the graph of the test data with the graph of the reference data. There is also an integrated log analysis technology [12] that detects anomalies compoundly by relative analysis of various performance values.

As an example of dimension reduction based anomaly detection method, there is an approach that uses principal component analysis (PCA) [13]. In [13], the traffic volume on each link in a network is used as input. Lakhina et al. [13] showed that their proposed method can detect anomaly, identify the underlying origin-destination (OD) flow, which is the source of the anomaly, and estimate the amount of traffic involved in the anomalous OD flow. Moreover, there is an anomaly detection method using auto encoder (AE) (e.g., [14, 15], which we have studied).

AE is a kind of deep learning that can ascertain the complicated structure inherent in data, and anomaly detection by AE has been attracting attention in various fields. In AE, the dimension of the hidden layer is reduced by setting the dimension of the hidden layer to be smaller than that of the input/output layer, and learning is performed to reproduce the data of the input layer in the output layer. i.e., the dimension reduction is conducted at the hidden layer. It is assumed that normal data can be represented in a low-dimensional manner, and an anomaly is detected by inputting the current data to the AE, and regarding the distance between the vectors of the input and output layers as the degree of anomaly.

Besides, there are many reports on network anomaly detection. For example, there is a study [16] that proposes an anomaly detection method for traffic data. Please refer to [7] for various anomaly detection techniques for traffic data. To study various network data, there are NICE [17] that analyzes the relationship between data, and SYNERGY [18], an extended version of NICE.

At the end of this section, we describe the preprocessing when inputting network data to each of the methods described above. For numerical data such as time-series of traffic volume, appropriate measurement interval setting is crucial. For text log, it is considered that rule-based methods are mainly used. If we apply time-series model based or relationship model based to text log, we need to convert the text log into some numerical vector that summarizes useful information for anomaly detection. As input to the anomaly detection method using AE [14], we converted text log into IDs and quantified them using the number of occurrences of each ID, where we used automatic classification technology for text log [19]. The integrated log analysis technology [12] extracts characteristic log patterns from a large amount of text log and analyzes them, together with numerical log, to detect anomalies and analyze the causes.

4. Root Cause Analysis Technology

After detecting anomaly, we need to identify its cause. Here, we first explain the research challenge. As

described in Section 3, we consider that factors of the anomalies become diverse and it therefore becomes difficult to identify the root cause as the network system becomes large and provides various network services. For example, when anomaly occurs in a device and its influence is propagated so that alerts in various devices occur, it may be difficult to identify the anomalous device.

In this study, we classify root cause analysis techniques into two types, according to the following concept: We treat the root cause estimation as the problem of estimating anomaly factor X from the observation Y in the network. To solve this, there are two types of approaches. The first is the method that estimates/identifies X directly from Y , and the other is the method that models the influence of X on Y , and then estimates X taking into account the process of Y being generated. We call the former identification model based, and the latter generation model based.

Rule-based is a typical identification model based method. Many of products on the market are rule-based, and the items to be detected (observed values) and the corresponding factors at that time are determined as rules (for example, rule can be described as if-then; if an alert A occurs, the factor is B). Moreover, a method for automatically generating such rules has been announced [20]. With this method, from observations such as alerts issued from network devices when an anomaly such as a failure occurs, the rule between the anomaly factor and the observations is derived by extracting combinations of observations specific to the anomaly. In addition, this method improves the accuracy of rules by learning rules in the daily operation of maintenance personnel.

In addition, for root cause analysis/incident diagnosis, a method of analyzing the relationship between time-series data such as CPU utilization and events of system tasks (such as disk-intensive tasks or CPU-intensive tasks) [21], and a method of analyzing the lag (time dependency) between events [22] etc., have been proposed.

As a generation model-based method, there is Shrink [23], which constructs a causal graph such as that in Fig. 5 based on network configuration information, etc. Here, X_i represents the state of network device i (normal or abnormal), and Y_j represents the value of observation data j (e.g., 1 if alert occurs, 0 otherwise). When there is a causal relationship between X_i and Y_j , they are connected with an arrow. The degree of causal relationship is represented by probability. For example, based on the network configuration information, the device (node in this figure) to be analyzed is connected to the observation data j in the network element (link in this figure) with an arrow, when the node and the link are connected. Under the model where Y is generated according to this causal graph, the problem is estimating X_i when Y_j is observed (calculating X_i that maximizes the probability under the condition that Y_j is observed).

In a model such as Shrink, that expresses the causal relationship with probabilities, Gestalt [24] reduces the computational complexity to speed up, by fixing some probabilities of the causal graph to 1 or 0 for simplification. CauseInfer [25] estimates the causal graph between network performance indices from data and identifies events that cause anomalies. In [26], we proposed a method of root cause diagnosis for rare failures having two features: observation errors (e.g., no alerts occur even in case of failure) and unexpected causal relations. Specifically, an extended model that can cope with the two rare-failure features as described above was proposed by extending the causal graph shown in Fig. 5.

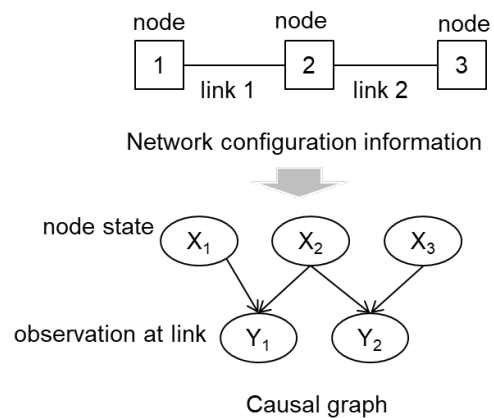


Fig. 5 Causal graph.

5. Control/Recovery Technology

In Section 5.1, we describe trends in virtualization technologies that are important in automating the entire operation flow as shown in Fig. 1. In Section 5.2, we describe control algorithms used in the control phase of Fig. 1. In Section 5.3, we describe the techniques in the recovery phase of Fig. 1. Finally, in Section 5.4, we describe research trends toward automation of operation flows.

5.1 Virtualization Technology

Similar to server virtualization that makes multiple virtual machines available on a physical server, the concept of virtualization in communication networks such as SDN and NFV is being realized.

SDN is a concept of controlling individual devices integrally over the entire network as a unit by software, instead of conventionally performing configuration settings individually for network devices. OpenFlow is a key technology for realizing SDN. Its standardization and efforts towards its popularization is being promoted by mainly ONF (Open Networking Foundation) [27], which was established in 2011.

NFV is a concept that separates software and hardware of a network device that has been conventionally provided as a dedicated appliance, and realizes network functions on a virtualization platform built with general-purpose servers. The NFV standard architecture and specifications are being promoted by the NFV Industry Specification Group (ISG) [28],

which was established in 2012 under the European Telecommunications Standards Institute (ETSI). In addition, the concept of MANO (Management and Orchestration) that virtualizes computers, storage devices, and network devices, and controls the virtualized devices was presented by the ISG in 2013 [29]. The NFV architecture proposed by the ISG consists mainly of VNF (Virtual Network Function), NFVI (NFV Infrastructure) and NFV MANO. MANO plays an important role in building and executing network services quickly and flexibly, by providing management function for physical and virtual resources (Virtualized Infrastructure Manager), VNF management function (VNF Manager), and orchestration function (NFV Orchestrator) (Fig. 6).

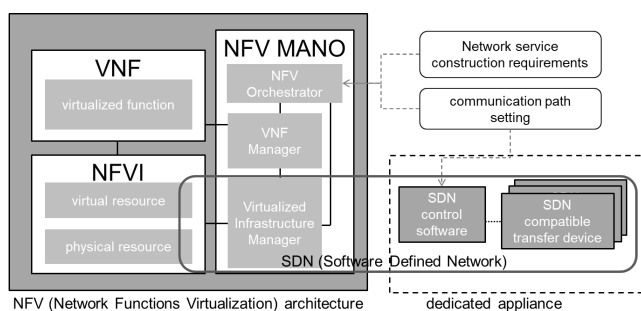


Fig. 6 Network virtualization technology by SDN/NFV.

Owing to the spread of products supporting network virtualization technology and the performance improvement, communication carriers are also studying for efficient and flexible utilization of network resources. In addition, discussions on NFV infrastructure construction using white box switch (bare metal switch) and OSS (Open Source Software) such as OpenStack [30] are actively conducted.

By the introduction of network virtualization technology, it is expected that it is possible to automate (with software operation) operations such as device settings that have been conventionally conducted manually by network operators. Specifically, SDN control software makes it possible to conduct the settings of the IP address for each device and communication paths etc. integrally. Furthermore, it is possible to construct equipment and change the amount of equipment according to the demand, by preparing network functions as VNFs on a virtualization platform built with general-purpose servers. In addition, it is expected to provide network services on demand by constructing a virtual network (SFC: Service Function Chaining) by combining VNFs with communication routes flexibly. In future, by combining with network state information collection/analysis, it is expected to achieve an advanced autonomous control that conducts a specific control when some conditions are satisfied, or automatically calculates/applies communication routes that satisfy the prespecified objective such as efficient utilization of network resource and load balancing. During the Open Networking Summit held

once a year by ONF [31], carriers, cloud service providers, and OSS communities have reported on network virtualization using OSS, and in recent years, ONAP (Open Network Automation Platform) [32] that supports network operation through network data collection, analysis, and feedback control has been attracting attention.

5.2 Control Algorithm

To accomplish an autonomous network control as described in Section 5.1, it is important to develop an algorithm to achieve a prespecified objective by software control. In research on network virtualization technologies, allocating/reallocating a virtual network on a virtualization platform so that a prespecified objective is satisfied is called Virtual Network Embedding (VNE), and the formulated problem to derive an algorithm for the control objective and constraints on resources on the virtualization platform is called VNE problem.

The research challenge here is that we need to take into account a huge number of combinations of objectives, constraints and resources if various services can be provided as virtualization progresses. Many studies on the VNE problems have been reported [33], and finding the optimal solution of VNE problem is known to be NP-hard [34].

In [35], a VNE problem for providing SFC that transits multiple VNFs is formulated as an integer linear programming problem, and solved by commercial mathematical optimization solver in a relatively small topology. A heuristic method is also proposed. Ref. [36] proposed that a joint optimization of VNF allocation and route between VNFs is formulated as a mixed integer linear programming problem, and solved using a commercial mathematical optimization solver. In [37], a heuristic method is proposed for joint optimization problem taking into account VNF allocation, route, and reallocation cost. In [38], a tabu search based method is proposed for dynamic VNE problem, taking into account server resource scheduling for VNF allocation. In [39], a method by reinforcement learning is proposed for solving VNE problem taking into account dynamic traffic fluctuation. Ref. [40] proposed a framework that can cope with the change of objective function for VNE problem with multiple objective functions, and a method of calculating Pareto solutions at high speed by applying genetic algorithm.

In the VNE problem, the viewpoints that communication carriers attach importance to are the efficiency of equipment utilization and service performance degradation avoidance, and continuity. As the studies on realization of autonomous control with network virtualization technology by the research group of the second and third authors in this study, there are a heuristic algorithm that presents an efficient allocation in the future (maximizes the number of virtual networks that can be accommodated) for time-varying demands for virtual networks [41], an

extendable NFV-integrated control method using reinforcement learning for determining VNF placements and routes between VNFs under various requirements [42], predictive routing algorithm for avoiding network congestion [43, 44] etc.

5.3 Technology for Fast Recovery

Research and development are also progressing toward speeding up and automating recovery work. Generally, when a failure occurs, in addition to the log been automatically recorded by the system, a trouble ticket is created in which the operator records the status of the failure and the history of recovery work. When a new failure occurs, the operator refers to the system log to understand the status of the system, searches for the trouble ticket related to the failure, and refers to the past response procedures to conduct the recovery work.

In order to accomplish fast recovery work, we need to efficiently search for necessary information from system logs and trouble tickets, creating a technical challenge. There are various research reports on studies for efficient search. For example, there are machine learning based methods such as hierarchical clustering [45] as method of understanding trends on system failures by clustering trouble tickets, rule-based word-matching [46], topic model based [47] etc. As methods of grasping recovery work corresponding to the occurred event to shorten the recovery work time, there are methods of presenting the related trouble ticket by topic model [48] or deep learning [49], and of searching for contact information [50].

To help operators read and understand a large amount of text promptly, we have proposed a method of workflow extraction for service operation using multiple unstructured trouble tickets [51]. The method of extracting useful information such as business process by analyzing logs is called process mining [52]. Ref. [53] proposed a process mining for system logs.

There is a tool called Run Book Automation (RBA) for automation of workflow execution. As typical tool, there are StackStorm [54], an open source platform, and other tools provided by network equipment vendors. In the future, it is expected that the automation of recovery work will be progressed by such methods.

5.4 Automation of Operation Flow

Research to automate the entire flow from detection to control is being advanced. For example, toward control automation, there is a research on automatic generation of control procedure and automatic acquisition of the necessary expertise [55]. As NFV automated failure recovery, there is a report on the development of anomaly sign detection function and that of automatic recovery procedure generation function using deep learning, and experimental proof obtained in a test environment [56]. Besides, a completely autonomous network vision [57] has been announced. Research on automation of network operation/control is expected to continue in the future.

6. Conclusion

In this study, as research/technology trends for advanced network operations using AI, we described techniques of network anomaly detection/analysis using various network data, those of enhancing/automating network control using network virtualization technology etc. and of speeding up/automating recovery work. We also introduced our research efforts.

As a future challenge, we consider that discussion on the degree to which network operation can be automated is required. Another challenge is the interpretability to output of deep learning. For example, we used auto encoder (a kind of deep learning) for anomaly detection [14, 15], but this method only outputs a determination as to whether or not it is an anomaly. However, operators cannot do the next actions if they do not know the reason why it is judged that anomaly occurs. Hence, we have also studied on a method of inferring causal parameters of the detected anomalies [58]. This is just an example, but we consider that, as the application of deep learning progresses, we need to distinguish which parts of network operation can be automated and which parts requires interpretation/judgement for the output, and also need some mechanism for the interpretability in the latter case.

7. Acknowledgments

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This study is an English version of our previous study presented in IEICE Communications Society Magazine [59]. Some parts are slightly modified, or omitted owing to space limitation. All the figures in this study are reused from [59] with the permission of the IEICE.

2019 IEICE Fellow Conferred on 9 IEICE-CS Members

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1. Introduction

IEICE Fellow is conferred on IEICE members who are recognized as having made a significant contribution to the institute in academic, technical or related fields. This article introduces the 2019 IEICE Fellow winners.

2. Conferment

Fellow Conferment Ceremony is usually held in March every year during IEICE General Conference, and the president of IEICE handed a fellow badge and a certification plate to each new Fellow. However, in this year, the IEICE General Conference was cancelled, thus the conferment ceremony was not held.

In 2019, IEICE Fellow is conferred on 24 IEICE members including 9 from Communications Society (CS) who are listed in Table 1. The past Fellow members can be viewed at IEICE Web site below:

https://www.ieice.org/jpn_r/awards/fellow/index.html
(in Japanese)

We have great respect and deep gratitude for their contributions.

3. Next Fellow Conferment Ceremony

The 2020 ceremony is going to be held in Tokyo Institute of Technology, March, 2021.

Table 1 New IEICE Fellows from Communications Society.

Name	Contribution contents
Masaki AIDA	Innovative Research on Hierarchical Distributed Control and Online Social Networks
Ryoichi SHINKUMA	Cross-disciplinary Research on Cooperation in Heterogeneous Networks
Sachio SEMMOTO	Realization of Digital Society by Serial Entrepreneurship Applying New Access Technologies
Makoto TAROMARU	Editing Activities of IEICE Transactions and Founding Letter Journal ComEX
Hiroyuki TSUJI	Research and Development of Wireless Communication Systems and Array Signal Processing for Aircraft
Hideki TODE	Research on Advanced Infrastructure Technologies for Content Retrieval, Acquisition and Distribution
Kazuhiko FUKAWA	Study on Adaptive Equalization and Adaptive Interference Suppression Techniques for Digital Mobile Communications
Itsuro MORITA	Research on Transoceanic-class Ultra-long-haul Transmission Technologies for High-speed Optical Signals
Tetsuya YOKOTANI	Traffic Control Technologies in High Speed Communication Systems and Their Promotion by International Standardization

Annual Report of Technical Committee on Information Networks (IN)

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1. Introduction

The technical committee on Information Networks (IN) is one of technical committees of the Communications Society of the IEICE [1]. The IN addresses a broad spectrum of issues associated with information networks and provides a forum for researchers and engineers to discuss various research and development topics. The chairman is Mr. Takuji Kishida of NTT Advanced Technology Corporation. The vice chairman is Prof. Kenji Ishida of Hiroshima City University. The secretaries are Mr. Shingo Kashima of NTT Communications, Mr. Seiichiro Mochida of NTT Corporation, Dr. Hiroyasu Obata of Hiroshima City University and Mr. Shuntaro Kashiara of KDDI Research, Inc. This document presents the IN's annual report for activities from April 2019 to March 2020.

2. IN Activities

The IN is one of the most active technical committees of the IEICE Communications Society. The IN held seven technical meetings from April 2019 to March 2020, some of which are co-organized with another institute (IEE) or other technical committees in IEICE (RCS, NV, CCS, CS, NS, ICTSSL, IA, and ICN). Many researchers participated in the meetings and reported their latest technical research and development results. The venues and the main topics of each meeting are shown in Table 1.

Each technical report is submitted in a paper or slide format and published as a Technical Report of the IEICE. Authors of selected papers have received the 26th Information Networks Research Awards, and the young first authors (32 years old or less) of selected papers have received the 5th Young Researcher Awards of Information Networks in March 2020.

This year, the following three excellent papers were selected from 116 papers for the 26th Information Networks Research Awards.

- Yoshiki Miura, Hiroyasu Obata, Chisa Takano, and Kenji Ishida, “A Media Access Control using Capture Effect Improving Throughput Fairness among WLAN Systems.”
- Masaki Aida, Chisa Takano, and Masaki Ogura, “On the Fundamental Equation of User Dynamics and the Structure of Online Social Networks.”

- Yuka Komai, Tatsuaki Kimura, Masahiro Kobayashi, and Shigeaki Harada, “Traffic Prediction by Extracting Users' Access Patterns.”

In addition, three young authors won the 5th Young Researcher Awards of Information Networks. The selected papers are as follows.

- Hinano Uegata, and Haruhisa Hasegawa, “On Simulation Evaluation for Support System of Watching Over Children with Proximity Sensing.”
- Yoshitaka Koitabashi, Yuki Inoue, Syota Uchiyama, and Osamu Mizuno, “Transmission controlling Method based on Remaining Battery for Delay Tolerant Networking.”
- Akito Suzuki, and Shigeaki Harada, “Dynamic Virtual Resource Allocation Method Using Multi-agent Deep Reinforcement Learning.”

IN has commended those who have contributed to revitalizing IN since last year. The 2nd Distinguished Contributions Award of Information Network are Mr. Yuta Kobayashi and Mr. Takeshi Suehiro with their great support on the IN/NS research workshops for three years, co-awarded by the technical committee on Network Systems (NS) and IN.

3. Reference

- [1] Technical Committee on Information Networks <http://www.ieice.org/cs/in/eng/>, accessed April 5, 2020.

Table 1. Technical meeting schedule.

Date	Venue	Main topics	Num. of reports	Num. of participants each day
May. 16-17 2019	Keio Univ. (Yokohama)	Ad-Hoc/Sensor Networks/MANET, Mobile Networks, M2M/IoT Communications, Wi-Fi, IEEE802.15 (ZigBee) and others	13	67, 56
Aug. 1-2	Kiki Shiretoko Natural Resort (Shari)	Network Science, Future Networks, Cloud/SDN/Virtualization, Contents Distribution, etc.	9	34, 31
Sep. 5-6	Research Institute of Electrical Communication, Tohoku Univ. (Sendai)	Session Management (SIP/IMS), Interoperability/Standardization, NGN/NwGN/Future Networks, Cloud/Data Center Networks, SDN (OpenFlow, etc.)/NFV, IPv6, Machine Learning, etc.	7	72, 72
Oct. 17-18	Beppu International Convention Center (Beppu)	Anti-Cyber Attack, Anti-Disaster/Failure, BCP/Resilience, Smart Grid, Energy Saving, Data Analyzing, etc.	15	45, 38
Dec. 19-20	Satellite Campus Hiroshima (Hiroshima)	Performance Analysis and Simulation, Robustness, Traffic and Throughput Measurement, Quality of Service (QoS) Control, Congestion Control, Overlay Network/P2P, IPv6, Multicast, Routing, DDoS, etc.	20	40, 57
Jan. 23-24 2020	WINC AICHI (Nagoya)	Contents Distribution, Social Networking Services, Data Analytics and Processing Platform, Big Data, etc.	11	26, 13
Mar. 5-6	Royal Hotel Okinawa Zanpa Misaki (Yomitan)	General Topics and Workshop	73	Canceled due to COVID-19 (coronavirus disease 2019) effect

Report on the Sixth ENRI International Workshop on ATM/CNS (EIWAC2019)

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1. Introduction

The Sixth ENRI International Workshop on ATM/CNS (EIWAC2019) was held on October 29-31, 2019 at the Nakano Central Park Conference, Tokyo, Japan. It was organized by the Electronic Navigation Research Institute (ENRI), National Institute of Maritime, Port and Aviation Technology (MPAT), Japan, in cooperation with the IEICE and other organizations. The theme of EIWAC2019 was “Exploring Ideas for World Aviation Challenges.”

2. EIWAC History and Overview

EIWAC is a biennial event which started in 2009 [1]. It has focused on the research and development of operational improvement in Air Traffic Management (ATM) and its enabling technologies in Communication, Navigation and Surveillance (CNS). It has contributed to the global harmonization of research and development with the participation of a wide range of speakers from international organizations, regulators, service providers, industries, research organizations, universities, and airspace users etc.

On the first day, we had seven keynote presentations and a panel discussion by opinion leaders, and on the second and third day, three special presentations and 18 technical sessions were held. In total, 63 oral presentations and 9 poster presentations were presented at three parallel technical sessions. All the presentations were categorized into Academic Track of research activities and Interchange Track of latest technical information exchange. The total number of participants was 861 from 19 countries. Four exhibitions of SWIM (System Wide Information Management), Foreign Object Debris Detection System, SBAS (Satellite-Based Augmentation System) and CARATS (Collaborative Actions for Renovation of Air Traffic Systems) Open data took place in the foyer. The welcome reception was held on the first day evening in the foyer.

3. Keynote Speech

EIWAC2019 was commenced with the opening address by Prof. Hiroyuki Yamato, the President of MPAT.

The plenary session was organized with keynote speeches and a panel discussion.

At first, Mr. Stephen P. Creamer (Director, Air Navigation Bureau, International Civil Aviation Organization (ICAO)) began with an introduction to



Fig. 1 Keynote Speech by Mr. Stephen Creamer
Director, ICAO ANB.

the Global Air Navigation Plan (GANP) and the Global Aviation Safety Plan (GASP), and discussed about the latest initiatives such as the digital aviation ecosystem, expanding new users and new needs in the aviation, cyber security, trust frameworks, and digital certification.

Mr. Florian Guillermet (Executive Director, SESAR Joint Undertaking) focused on Digital Transformation (DX) in the aviation and activities to build infrastructure suitable for future air traffic expansion in his presentation.

Mr. Christopher Loring (Manager, NextGen International Office, FAA) spoke on NextGen's progress and achievements, international initiatives, the path to TBO (Trajectory Based Operations), prospects for the next 20 years (high altitude operations, UAM (Urban Air Mobility)), UTM (Unmanned Aircraft Systems Traffic Management), and activities for the future.

Mr. Tohru Kawaharabata (Director, Air Navigation Services Department, Japan Civil Aviation Bureau) stated on the progress of CARATS, such as SWIM as well as challenges for PBN (Performance Based Navigation), data communications, international harmonization and international digitization.

Mr. Naoki Tanaka (Director of Corporate Strategy Department, Corporate Strategy & Planning Division, JAL) mentioned on the outlook of the aviation market, activities of the Innovation Lab for AI, robotics, maintenance applications, VR training, and corporate strategy, including efforts to achieve the SDGs.

Mr. Yoshiaki Tsuda (Vice President, ANA Digital Design Lab & Avatar Division, ANA), Mr. Akira Fukabori, and Mr. Kevin Kajitani (Co-Directors Avatar Division, ANA) introduced drone and space businesses as innovation initiatives, and presented about its avatar activities (ANA AVATAR XPRIZE with the X Prize

Foundation, Avatar X Program with JAXA, platform avatar-in).

Mr. Shigeru Ozeki (Director General, ENRI) introduced the accumulation of aviation knowledge and the digitization of ATM/CNS for that purpose, the relationship between innovation and standardization, and the use of EIWAC.

4. Panel Discussion

The panel discussion was focused on the “Digitalization in Aviation: A Standardization Perspective,” which was the final item of the plenary session. Digital transformation in aviation was an emerging topic and was referred to as a pivotal element in terms of future technological proliferation. Moderators were Mr. William C. Johnson (NASA), who is one of the EIWAC TPC (Technical Program Committee) external committee members and Mr. Hajime Yoshimura (JCAB), who is a former President of the ICAO Air Navigation Commission. Panelists were Mr. Creamer (ICAO), Mr. Terry McVenes (President and CEO, RTCA), and Mr. Christian Schleifer (Secretary General, EUROCAE).

Initially, the topics were provided by the Standards Developing Organizations EUROCAE and RTCA, followed by discussions by moderators and questions from the audience. Discussions were held on the need for faster standardizations and regulations to ensure safety while responding to new users in the aviation field, and the effectiveness of gathering and discussing stakeholders from the early stage of standardization.

5. Invited Talks

Mr. Christian Schleifer (EUROCAE) delivered a presentation on current and future aviation standardization activities in EUROCAE. Mr. Akbar Sultan (Director, Airspace Operations and Safety Program, NASA) presented recent activities on NASA Aeronautics Research Mission Directorate. Mr. Patrick Souchu (Program Director, DSN) expressed on sharing trajectory information for TBO.

6. Technical Sessions

In total, 18 technical sessions were divided into 14 categories such as ATM Performance / ATM Modelling / Airport Management / AI for ATM / Aviation Weather / Trajectory Management / UTM / Traffic Capacity & Congestion Management / SWIM / Surveillance / Aviation Safety / Global Tracking & Related Technologies / GNSS / Space Weather.

7. Student Awards and Selected Papers

Since the 4th EIWAC (2015), TPC has selected excellent student presenters and awarded the “Best Student Paper Award” with the aim of encouraging young ATM/CNS researchers. Mr. Philippe Monmousseau (ENAC, France Civil Aviation Univ.) was the winner of the EIWAC2019 Best Student Award for the paper titled “Passengers on social media: A real-time estimator of the state of the US air transportation system”. This study is about estimating the number of delayed flights at major airports in the United States using social media Twitter data.



Fig. 2 EIWAC2019 Keynote Speakers, TPC members and guests.

Since EIWAC2013, papers with innovative research ideas and outstanding quality are reviewed and selected for the publication in the “Air Traffic Management and Systems” [2-4] series in collaboration with Springer. The fourth book in the series, “Selected Papers of EIWAC2019” is under process for publication.

8. Conclusion

At EIWAC2019, we learned about international initiatives to address new aviation users, the use of ICT-related technologies such as digital transformation and trust frameworks in the aviation field.

A post survey conducted showed that 87% of the respondents marked a good rating while 88% expressed their interest in participating in the next EIWAC.

The next EIWAC is scheduled to be held in autumn 2021 in Tokyo. Call-for-Papers for EIWAC2021 will be released in autumn 2020. Please visit our EIWAC site for further information at the following URL. We welcome your submission to EIWAC.

http://www.enri.go.jp/eiwac/index_e.html

9. Acknowledgment

ENRI thanks international organizations, national administrative agencies, service providers, operators, manufacturers, research organizations, universities, and academic societies for their support in making EIWAC2019 a great success.

ENRI also thanks the external committee members of TPC who made great contributions to review and assign papers for technical sessions.

10. References

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Annual Report of Technical Committee on Information and Communication Management (ICM)

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1. Introduction

The technical committee on Information and Communication Management (ICM) is a technical committee of the Communications Society of the IEICE [1]. This article briefly reports the last year's activities of ICM, and introduces the upcoming English session.

2. Activities

The ICM held two-day technical meetings 4 times from May 2019 to January 2020. The venues and the main topics of each meeting are shown in Table 1. In addition, 3 special sessions were sponsored by ICM as shown in Table 2.

Of particular note, in the English session in 2019 IEICE Society Conference at Osaka University, the number of papers reached 30 in total. This session was hosted and presented entirely in English. The purpose of this session is to promote the globalization of IEICE by providing the participants staying in Japan or

joining from overseas with more opportunities for presentations and discussions in English.

Unfortunately, the last meeting and ICM workshop, which were scheduled during March, were cancelled because of the coronavirus (COVID-19) outbreak. In the ICM workshop, the panel session was planned, and the four invited speakers would have presented and would discussed the theme with the attendees (the approximately 60 researchers had applied to this workshop). ICM committee is re-planning the similar session to hold in one of the meetings in 2020.

3. Awards and Upcoming Event

The winners are shown in Table 3. The English Session Encouragement Award is given to the authors of the best papers of the English session every year (Fig. 1). ICM committee is now calling for submission for the upcoming English session. The deadline is early in July.

4. Reference

[1] ICM, <http://www.ieice.org/~icm/eng/>

Table 1. ICM Technical Meetings in FY 2019.

No.	Date	Venue	Main Topics	Joint
1	May 23-24	Osaka University (Osaka)	Service Management, Operation/Administration, Security Management, etc.	IPJS-IOT IPJS-CSEC
2	Jul. 11-12	Asahikawa City International Conference Hall (Hokkaido)	Management Function, Management Theory, etc.	-
3	Nov. 21-22	Kobe University (Hyogo)	Network Quality, Network Management and Measurement, Network Virtualization	CQ NS NV
4	Jan. 9-10	Arkas SASEBO (Nagasaki)	Applications and Research Opportunities of Life Log, Office Information System and Business Management	LOIS
5†	Mar. 2-3	Nobumoto Ohama Memorial Hall (Okinawa)	Element Management, Management Functionalities, Operations and Management Technologies, etc.	-

† No.5 technical meeting was cancelled because of the coronavirus outbreak.

Table 2. Special Sessions by ICM in FY 2019.

Title	Date	Remarks	Theme
English Session	Sep. 10	As one of the symposium sessions in IEICE Society Conference	Network and Service Design, Control and Management
APNOMS 2019	Sep. 18-20	The premier conference in the Asia Pacific region sponsored by ICM	Management in a Cyber-Physical World
ICM Workshop†	Mar. 2	In conjunction with ICM Technical Committee Meeting	The future of mobile communications with a view to democratizing information communications

†ICM Workshop was cancelled because of the coronavirus outbreak.

Table 3. Winners of ICM Awards in 2019.

Award	Winners	Title
Research Award	Jumpei Yamashita, Hidetaka Koya, Hajime Nakajima, Kohji Tsuji	Deep Neural Network-based Gaze Estimation using Interaction-informed Electrooculography
	Akari Tsuji, Yuki Miyazaki, Shinsaku Numata, Kazukuni Koyama, Masakatsu Sawada	Implementation and Evaluation of Zero-Touch Operation System for Recovery Operation of a Large-Scale Cloud Services
English Session Encouragement Award	Badr Mochizuki, Takuji Tachibana	Online Lightpath Establishment with Expanded/Contracted Service Provisioning in Elastic Optical Networks



Fig. 1 ICM Annual Award (English Session Encouragement award).

Report on NS English Session at 2020 IEICE General Conference –BS-1 In-Network Intelligence for Design, Management, and Control of Future Networks and Services–



Tatsuaki Kimura^{*}, Yosuke Tanigawa^{**}, Shinya Kawano^{***},
Shiro Mizuno^{***}, Akihiro Nakao^{****}, and Yoshikatsu Okazaki^{***}

^{*}Osaka Univ., ^{**}Osaka Pref. Univ.,
^{***}NTT Corp., ^{****}The Univ. of Tokyo

1. Introduction

The 2020 IEICE General Conference was to be held at Hiroshima University in Hiroshima, Japan, on March 17-20, 2020. In the general conference, the IEICE Technical Committee on Network Systems (NS) [1] organized the full English symposium session entitled “In-Network Intelligence for Design, Management, and Control of Future Networks and Services” as one of the symposium sessions hosted by IEICE Communications Society. The technical committee on NS has been organizing the full English session since 2005 in order to promote the globalization of IEICE. The English session offers a good opportunity for the researchers in Japan and those from overseas to make presentations and discuss in English. Although the general conference was canceled due to concerns about COVID-19, the English session this year was held online via Zoom [2] on March 17.

2. Topics and Statistics

Table 1 and Fig. 1 show the recent themes in the past three years and the number of submissions from 2006 to 2020 of the English session. Although the number of submissions tends to decrease in recent years, we believe that it will increase in the near future because many academic organizations in Japan have put an enormous effort into their globalization in recent years.

In this year, 23 papers were submitted to the English session, among which 6 papers were presented at the online conference. The submitted papers include a variety of interesting research topics related to “in-network intelligence”, such as security/privacy, network virtualization technologies, Internet of Things (IoT) networks, wired/wireless networking, and machine learning.

This year’s English session was held online for the first time. All the speakers gave presentations by screen sharing, and question and answer sessions were also held online. Many attendees connected to the online session (more than 20 accounts), and the discussions among attendees and the speakers were very active similar to an ordinal offline session in the past conferences.

Table 1. NS English Session in the Past Three Years.

Year	Theme
2018	Innovative Information Communication Technologies for Future Network System Supporting Information-oriented Industry
2019	Compositive Information Communication Technologies and Applications for Future Network Systems
2020	In-Network Intelligence for Design, Management, and Control of Future Networks and Services

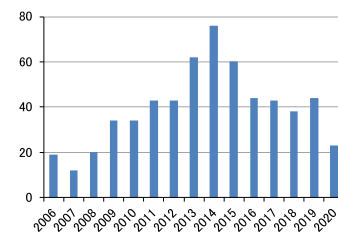


Fig. 1 Number of submissions.

3. Conclusion

The online NS English Session was very successful thanks to many excellent papers, active discussions, and helpful technical support of the executive committee of the IEICE General Conference. We believe that this activity was fruitful for all participants and contributed to the globalization of IEICE.

Although the main objective of the English session is to provide a valuable place where the researchers can spend the whole conference with only English, this becomes difficult if the number of submissions continues to decrease. Hence, the technical committee on NS continues to encourage submissions from Japanese and overseas students as their first steps to international conferences. In addition, NS English session awards are given to some selected papers in each year to encourage their continuous activities [3].

Finally, we would like to give special thanks to Prof. Yoshiaki Tanaka, for great contributions.

4. References

- [1] IEICE Technical Committee on Network Systems web site, <http://www.ieice.org/~ns/eng/>
- [2] Zoom, <http://zoom.us/>
- [3] Y. Okazaki, et al., “Report on the 2019 NS English Session Awards and Award Ceremony,” *IEICE Global NewsLetter*, vol. 44, no. 1, pp. 4–5, March 2020.

Report on the 1st Philippines-Japan Workshop on Wireless, Radio and Antenna Technologies

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1. Introduction

The 1st Philippines-Japan Workshop on Wireless, Radio and Antenna Technologies was held at the Monet Ballroom, Novotel Manila Araneta City, General Aguinaldo Avenue, Quezon City, Philippines on December 4-5, 2019. This conference was sponsored and organized by the Technical Committee on Antennas and Propagation of the Institute of Electronics, Information and Communication Engineers (IEICE), the Department of Science and Technology - Advanced Science and Technology Institute (DOST-ASTI) along with the Wireless Communications Engineering Laboratory (WCEL) of University of the Philippines Diliman - Electrical and Electronics Engineering Institute (UP EEI).

2. Brief History of PJWWRAT

Before the main event for Dec. 4-5, representatives from Japan and Philippines formed the organizing committee and organized an event called “PJWWRAT-mini” which was held at the Department of Science and Technology- Advanced Science and Technology Institute (DOST-ASTI), Quezon City, Philippines (Fig. 2) with over 80 participants. There were 24 paper presentations – 12 from Japan and 12 from the



Fig. 1 PJWWRAT-mini Organizing Committee and Presenters.



Fig. 2 Technical Session during PJWWRAT mini.

Philippines. The event served as a guide for the organizers for PJWWRAT 2019.

Prof. Joel Joseph Marciano Jr. of the Electrical and Electronics Engineering Institute, University of the Philippines, Advanced Science and Technology Institute (DOST-ASTI) and Prof. Jiro Hirokawa of Tokyo Institute of Technology served as the General Chairs while Prof. Lawrence Materum of De La Salle University and Prof. Satoru Kurokawa of the National Institute of Advanced Industrial Science and Technology were delegated as Vice Co-Chairs.

PJWWRAT 2019 is the first joint technical workshop between the Philippines and Japan for exchanging information on the progress of research and development in antennas, propagation, RF/microwave and wireless communication systems. The PJWWRAT Committee is planning and looking forward to having this workshop as a biennial event for the Philippines and Japan.

3. Technical Sessions

The program for PJWWRAT 2019 consisted of 26 oral paper presentations and 15 poster presentations with 130 participants (Fig. 8). The presentation topics include but not limited to:

- Antenna Technology for 5G
- Massive MIMO
- 5G Standards and Radio technologies
- Radio Spectrum Monitoring or Spectrum management
- 5G Radio propagation measurements and models
- Array antenna systems for space technology

The first day of the program included messages from Clarinda Reyes of the Emerging Technology Development Division under the Philippine Council for Industry, Energy and Emerging Technology Research and Development (DOST-PCIEERD), Mr. Tomoyuki Honda, the Second Secretary of the Japan Information and Culture Center, Embassy of Japan in the Philippines and Prof. Joel Joseph S. Marciano, Jr., one of the PJWWRAT General Chairs.

The technical sessions for the first day included 14 paper presentations (Fig. 3) and the exhibit of the posters (Fig. 4). After each oral presentation, audience queries were entertained for an allotted period. The presenters consisted of professors, researchers and students from different universities and institutions from the partnering countries.



Fig. 3 Participants of PJWWRAT 2019 during the Paper Presentations.

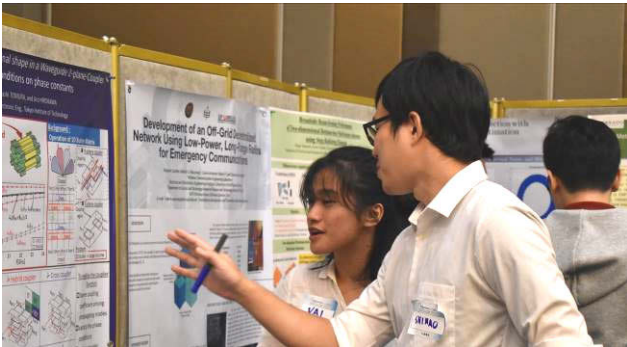


Fig. 4 PJWWRAT Day 1 Poster Exhibition.

The second day of the program included 12 oral paper presentations, 15 poster presentations and 2 keynote speeches from Hiroyuki Tsuji, Ph.D. Research Manager of the National Institute of Information and Communications Technology (NICT) with the presentation entitled “*Activities of R&D in Japan for Future High Throughput Satellite Communications*” (Fig. 5) and Gregory L. Tangonan, Ph.D, the Research Director of Ateneo Innovation Center with the presentation entitled “*International Collaboration for the New V-Hub Standard for V-X*” (Fig. 6).



Fig. 5 During the Keynote Speech of Hiroyuki Tsuji, Ph.D.



Fig. 6 During the Keynote Speech of Gregory L. Tangonan, Ph.D.

Poster presentations ensued after the paper presentations. There were 8 posters from Japan and 6 from the Philippines (Fig. 7).

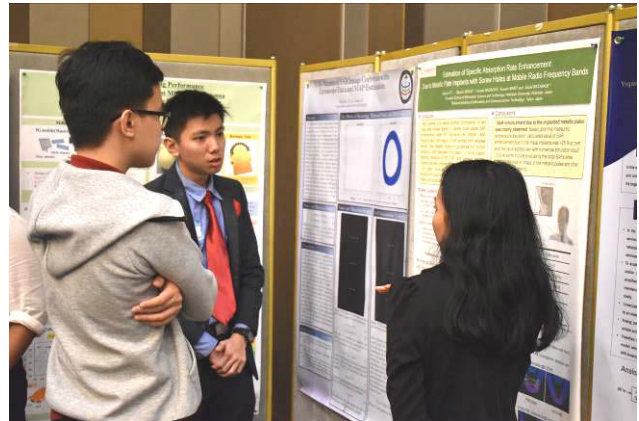


Fig. 7 PJWWRAT Day 2 Poster Exhibition.

4. Awards

The technical program committee chairs awarded 2 participants (1-Philippines, 1-Japan) for best paper presentations and 3 participants (2-Philippines, 1-Japan) for best poster presentations.

Paper presentation awardees:

“*Coarse Sampling for Near Field Co-Planar Phaseless Measurement*” by Kusunose Kyosuke and Arai Hiroyuki (Electrical and Computer Engineering, Graduate School of Engineering, Yokohama National University, Yokohama, Japan)

“*TV White Space Availability in the Western Philippine Nautical Highway*” by Rizza T. Loquias (Electrical and Electronics Engineering Institute, UP Diliman) Calvin Artemies G. Hilario, Mar Francis D De Guzman, Joel Joseph S. Marciano, Jr. (Electrical and Electronics Engineering Institute, UP Diliman & Department of Science and Technology - Advanced Science and Technology Institute)

Poster presentation awardees:

“*Development of an Off-Grid Decentralized Network using Low Power, Long Range Radios for Emergency Communications*” by Khazmir Camille Valerie G. Macaraeg (Wireless Communications Engineering Laboratory, Electrical and Electronics Engineering Institute, University of the Philippines, Diliman, Quezon City, Philippines) Calvin Artemies G. Hilario Charleston Dale Ambatali (Wireless Communications Engineering Laboratory, Electrical and Electronics Engineering Institute, University of the Philippines, Diliman, Quezon City, Philippines and Department of Science and Technology - Advanced Science and Technology Institute)

“*UAV-Mounted SAR Image Correction with Gyroscope Data and MAP Estimation*” by Ryan Joshua A. Maliwat (Wireless Communication Engineering Laboratory, Electrical and Electronics Engineering

Institute, University of the Philippines, Diliman, Quezon City).

“*Estimation on Human Body Blockage Characteristics at 5G Frequency bands for Epidemiologic Research on RF Exposure and Adolescent Health*” by Ryunosuke Ozaki and Takashi Hikage (Graduate School of Information Science and Technology, Hokkaido University, Japan) Manabu Omiya and Masahiko Mizuta (Information Initiative Center, Hokkaido University, Japan) Keiko Yamazaki, Atsuko Araki, Yuri Teraoka and Reiko Kishi (Center for Environmental and Health Sciences, Hokkaido University, Japan)

5. Banquet and Social Program

After the awarding ceremony, a group photo session commenced (Fig. 8) and a banquet followed right after. The participants were given a taste of the Filipino culture (Fig. 9) where they were served different and unique Filipino delicacies while being entertained with some Filipino songs. The banquet was an opportunity for the students, researchers and professors to interact with each other in the spirit of knowledge and network promulgation.



Fig. 8 Group Photo before Banquet.



Fig. 9 Banquet and Social Program.

6. Facility Tour and Technical Discussion

On the third day after the technical discussions, the organizing committee and some of the Japanese students had a chance to visit some of the facilities housed in the Department of Science and Technology-Advanced Science and Technology Institute (DOST-ASTI) (Fig. 10) and University of the Philippines Diliman (Fig. 11).



Fig. 10 Visit in DOST-ASTI.

They also had a chance to meet with the University of the Philippines President, Danilo L. Concepcion (Fig. 11). Japanese visitors were toured around the University Laboratory for Small Satellite and Space Engineering Systems (ULyS³ES) located at the Electrical and Electronics Engineering Institute of UP Diliman. ULyS³ES houses a Full Anechoic Chamber (Fig. 12) and a research laboratory.



Fig. 11 Meeting with University of the Philippines President.



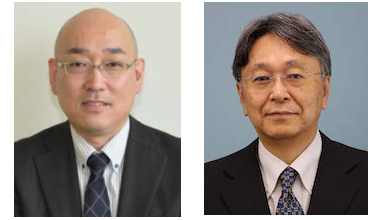
Fig. 12 Full Anechoic Chamber.

7. Reference

<https://asti.dost.gov.ph/events/pjwwrat-2019-manila/>

Report on the 7th International Conference on Smart Grid (icSmartGrid2019)

Nobumasa Matsui and Fujio Kurokawa
Nagasaki Institute of Applied Science



1. Introduction

The 7th International Conference on Smart Grid (icSmartGrid) 2019 was held on 9-11 December, 2019 at Rdyges Newcastle Hotel, Newcastle/Australia.

The purpose of icSmartGrid2019 is to bring together researchers, engineers, manufacturers, practitioners and customers from all over the world to share and discuss advances and developments in Smart Grids research and applications. After the successes of the previous editions of Smart Grid Workshops at Antalya in 2013 and 2014, and in Feb. and Apr. 2015 with technical co-sponsorship of IEEE Industrial Electronics Society (IES) at Istanbul. Then they organized 6th icSmartGrid2018 at Nagasaki with IEEE-IES and Industry Applications Society (IAS).

icSmartGrid2019 is organized the International Journal of Renewable Energy Research (IJRER) and International Journal of Smart Grid (ijSmartGrid). The General Chair of icSmartGrid2019 is Prof. Yousef IBRAHIM, Co-Chairs are Prof. Ilhami COLAK and Prof. Fujio Kurokawa. The diamond sponsor is Toshiba Mitsubishi-Electric Industrial Systems Corporation (TMEIC), Lanzhou Jiaotong University is bronze sponsor. IEEE-IAS and IEEE-IES have joined as technical co-sponsors, the Institute of Electrical Engineers of Japan (IEEJ) and the Institute of Electronics, Information and Communication Engineers (IEICE) support the conference in cooperation. It is also supported by Federation University and Newcastle University, Australia, Nagasaki Institute of Applied Science and Nagasaki University, Japan, moreover, Gazi University and Nisantasi University, Turkey.

The city of Newcastle is located north of Sydney, and passengers take about 3 hours here by train of Intercity from Sydney. Another transportation is domestic flights. Newcastle was a port city pioneered to transport coal. The first official shipment of coal begun from Newcastle to Sydney in 1801. In 1997, the Port entrance is 17 meters deep and able to accommodate such large ships regularly, making coal export a major contributor to the wealth of the region and nation.

In today's Newcastle downtown area, trams are the main means of transportation for citizens, as shown in Fig. 1. The electric power of the tram is charged at some place such as the Intercity Station, and the electric power from the battery is used during traveling. Therefore, there is no overhead power line on the tram line, and attention is paid to the cityscape.

2. Opening Ceremony and Keynote Speeches

On Monday morning, the first day of the conference, the opening ceremony was held by General Chair, Prof. Yousef Ibrahim, General co-Chairs, Prof. Ilhami Colak and Prof. Fujio Kurokawa, as shown in Fig. 2.

After the opening ceremony, Prof. Terrence Summers, Newcastle University as first keynote speaker in Fig. 3 has presented about a scenario whereby the bulk of a system's energy is generated locally by small distributed generators and he discussed various scenarios as to how the problem of controlling.

In secondary keynote speech, Dr. Shinzo Tamai (TMEIC) has presented the trend of UPS circuits are introduced as an application of several hundreds of kVA two-level and three-level converters, as shown in Fig. 4. On the first evening, a welcome reception was held at the venue with cocktails and snacks in Fig. 5.



Fig. 1 City of Newcastle.



Fig. 2 Opening ceremony.



Fig. 3 1st Keynote speech, Prof. Terrence Summers.

On Wednesday morning, the second day of the conference, there were two keynote speech. At first, Prof. Brayima Dakyo, University of Havre, France has focused on some key theoretical and practical developments that concern energy flux better transfer strategies, multi objective power converters design and real time control of storage units.

Next, Prof. Xinghuo Yu, Royal Melbourne Institute of Technology has presented some recent developments in both Artificial Intelligence and Smart Grid. And he discussed about potential issues associated with interplay and integration between them to bring out the best of both fields.

3. Technical Program

There were 39 submissions papers are given an alternative energy, sustainable and clean energy issues, new trends and technologies and so on for smart grid. 27 presentations papers from 14 countries were accepted for oral presentation by careful peer review process, as shown in Fig. 6.

The technical program was scheduled through Monday afternoon and Wednesday morning. The conference program consisted of 6 technical sessions in Fig. 7. Each session was kept the schedule, and attendances discussed about the interesting subjects, advances and developments in smart grid technologies and their applications. One best paper [1] and two excellent papers are selected as award on the conference.

4. Conclusions

icSmartGrid2019 was held at Newcastle/Australia on 9-11 December 2019 to continue promoting and disseminating the knowledge concerning several topics and technologies related to smart energy systems and sources.

icSmartGrid2020 will be held in Paris, France on 17-19 June 2020. <<https://www.icsmartgrid.org>>

5. Reference

[1] C. Karunanayake, J. Ravishankar and Z. Y. Dong, “A Novel Torsional Vibration Mitigation Strategy for DFIG Based Wind Turbines,” in Proc. icSmartGrid2019, pp. 27-32, Dec. 2019.



Fig. 4 2nd Keynote speech, Dr. Shinzo Tamai.



Fig. 5 Welcome reception at venue.

#	Flag	Country	Total Submission	#	Flag	Country	Total Submission
1		Algeria	4	2		Austria	3
3		China	2	4		Ecuador	2
5		Estonia	2	6		Indonesia	1
7		Japan	4	8		Norway	1
9		South Africa	3	10		South Korea	1
11		Sweden	1	12		Tanzania	1
13		Tunisia	1	14		Turkey	1
			Total 14 Countries				Total 27

Fig. 6 Presentation papers.



Fig. 7 Technical Program.

Report on Japan–Africa Conference on Electronics, Communications, and Computations 2019 (JAC-ECC2019)

Osamu Muta, Kyushu University



1. Introduction

The Japan–Africa Conference on Electronics, Communications, and Computations 2019 (JAC-ECC2019) was held during December 15–16, 2019 at Egypt–Japan University of Science and Technology (E-JUST), Alexandria, Egypt. The conference was organized through international collaboration between Kyushu University in Japan and E-JUST in Egypt [1], and also technically co-sponsored by the Technical Committee of Communication Systems in IEICE Communications Society [2] (IEICE-CS), and IEEE Egypt Section [3].

As an international conference addressing the fields of electronics, communications, and computer engineering, JAC-ECC stands out among other conferences in the engineering field, offering its unique value. The conference features formulation of academic and human network among international researchers from academia and industry in Japan, the Middle East, and Sub-Saharan Africa.

This report briefly provides historical background and an overview of JAC-ECC2019 while introducing its special invited sessions related to information communications technologies (ICT) in Japan, co-organized by IEICE-CS and JAC-ECC committee.

2. JAC-ECC History and Overview

In 2012, Kyushu University and E-JUST co-organized an international conference called the international Japan–Egypt Conference on Electronics, Communications and Computers (JEC-ECC). Since then, it has been held four times: once in Japan (Fukuoka in 2015) and the rest in Egypt (2012, 2013, and 2016). Most articles presented at JEC-ECC have been published in the IEEE Xplore online library of the Institute of Electrical and Electronics Engineers (IEEE).

As an advanced edition of JEC-ECC, a renewed international conference, JAC-ECC was organized in 2017. Unlike the previous four conferences, JAC-ECC (with “A” for Africa in place of “E” for Egypt) was organized as a platform for extending collaboration among international researchers in Japan and Middle-Eastern/African countries. The third edition of JAC-ECC (i.e., the Seventh Edition Conference in total) was held at E-JUST campus in 2019 as shown in Fig.1. For this conference, the Technical Committee of Radio Communication Systems and that of Communication Systems in the IEICE Communications Society also cooperated.



Fig. 1 JAC-ECC2019 Conference venue.

JAC-ECC2019 includes eight main technical tracks:

- Artificial Intelligence
- Big Data Analytics and Cloud Computing
- Communications
- Circuits and Systems
- Signal, Image, and Video Processing
- Microwave and Antennas
- The Internet of Things (IoT)
- Biomedical Engineering and Applications

The JAC-ECC technical program committee (TPC) peer-reviewed all submitted articles. Contributing to the peer-review process, the TPC was supported by experts in the fields of electronics, communications, and computers from Australia, Canada, China, Egypt, Japan, India, Kuwait, Malaysia, New Zealand, South Africa, South Korea, Sweden and the United States. They collectively conducted a total of 272 reviews.

In JAC-ECC2019, the technical program committee received 85 submissions. Among the submissions, 54 papers were accepted with a 63% acceptance ratio in the final program. The accepted papers were presented in oral sessions similarly to other international conferences in the same research field.



Fig. 2 (a) Poster session (b) Oral session.



Fig. 3 Organizing committee members and participants.

In the technical program of JAC-ECC, we had 11 regular technical sessions. In addition, we organized the IEICE invited session for three invited speakers. Furthermore, we had keynote sessions for four invited speakers, all of whom were leading researchers in engineering fields. In the conference, poster presentation was held on the first day of the conference in parallel with technical regular sessions. Figures 2(a) and 2(b) respectively show oral presentations and poster presentations in technical sessions of the conference. Figure 3 depicts our organizing committee members, IEICE invited presenters, and conference participants.

3. IEICE Special Invited Session

In JAC-ECC2019, we organized a special invited session on ICT technologies in Japan in cooperation with Technical Committee of Communication Systems and that of Radio Communication Systems in IEICE Communications Society. To this session, we invited three outstanding Japanese researchers who are members of IEICE and experts in ICT. Impressive invited talks presented topics such as internet-of-things (IoT) technologies, research activities on communication quality, and radio transceiver antenna systems [4–6] as well as a brief introduction of IEICE activities. Each presentation had 35 min for a presentation and 5 min for questions. Invited presenters for the special session were the following (Fig. 4).

- Prof. Tetsuya Yokotani (Kanazawa Inst. of Tech.)
- Dr. Hideyuki Shimonishi (NEC Corporation)
- Prof. Makoto Taromaru (Fukuoka University)

During the conference, we had an IEICE booth for advertising our activities, as depicted in Fig. 5. In this booth, we provided some brochures as handouts for participants, such as “IEICE Oversea Membership Application Form” and “Introduction to IEICE”.

We received many queries from participants related to IEICE activities and ways to join IEICE. We also discussed possible future activities with JAC-ECC committee members for cooperation with IEICE Communications Society.



(a)Prof. Yokotani (b)Dr. Shimonishi (c)Prof. Taromaru

Fig. 4 Presenters in IEICE special invited session.



Fig. 5 IEICE booth and participants.

4. Conclusion

JAC-ECC2019 was the seventh edition of the conference including the past four editions of JEC-ECC organized by international collaboration of Kyushu University and E-JUST in cooperation with IEICE Communications Society. Details and venues of the next edition of the conference, JAC-ECC, have not been determined yet. For additional information, please visit our conference site [1]. We welcome your submission to the conference. Finally, we would like to express our gratitude to all speakers, participants, and committee members for their contributions to the conference.

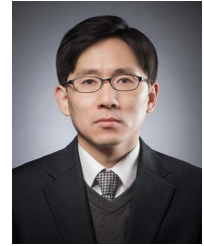
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- [2] IEICE Communications Society website:
<http://www.ieice.org/cs/>
- [3] IEEE Egypt Section website:
<http://www.ieee.org/eg/>
- [4] T.Yokotani, “A proposal of IoT DEP as a platform for efficient IoT service deployment on wide area networks,” Invited presentation at JAC-ECC2019, Dec. 2019.
- [5] H. Shimonishi, “Review of recent research activities on communication quality,” Invited presentation at JAC-ECC2019, Dec. 2019.
- [6] M. Taromaru, “Utility and Problem by Using Switching in Radio TRX and Antenna Systems,” Invited presentation at JAC-ECC2019, Dec. 2019.

Report on the 34th International Conference on Information Networking (ICOIN) 2020

*Kihyung Kim, **Sangheon Pack

*General Co-Chair of ICOIN 2020, **TPC Chair of ICOIN 2020



1. Introduction

The 34th International Conference on Information Networking (ICOIN) 2020 was held at Barcelona, Spain, from January 7 to 10, 2020. This conference was organized by Korea Institute of Information Scientists and Engineers (KIISE), and technically cosponsored by the IEEE Computer Society and IEICE Communication Society.

2. Organization

The organizing committee of ICOIN 2020 was formed with the General Co-Chairs, Choong Seon Hong (Kyung Hee University, Korea), Ki-Hyung Kim (Ajou University, Korea), Hiroyuki Ohsaki (Kwansei Gakuin University, Japan), and Nen-Fu (Fred) Huang (National Tsing Hua University, Taiwan). The technical program was organized by Technical Program Committee Co-Chairs, Sangheon Pack (Korea University, Korea), Takeo Fujii (The University of Electro-Communications, Japan), Yulei Wu (University of Exeter, UK). More than 300 technical program committee (TPC) members were involved in the review process.

3. Conference Program

In ICOIN 2020, 167 papers were submitted from 37 countries. After the reviews and discussions, 65 papers have been accepted for oral presentations and 58 papers for poster ones. In addition, four workshops on intelligent computing, B5G, AI for healthcare, AI/mobility collected 30 oral papers and 9 poster papers. The 65 oral papers are organized into 14 technical sessions, which will be held in 2 parallel tracks. The 67 poster papers (including 9 workshop posters) are organized into 2 poster sessions. The program covers a variety of topics on recent topics in computer communication and networking including IoT, 5G, network security, blockchain, SDN, cloud, and AI for networking.

ICOIN 2020 also invited world-class leading researchers for keynote speeches: Lajos Hanzo (University of Southampton, UK), Song Chong (KAIST, Korea), M  rouane Debbah (Huawei France Research Center, France), and Akihiro Nakao (University of Tokyo, Japan). They gave wonderful talks on quantum computing, AI/machine learning, 5G, and SDN. Two exciting tutorials on machine learning and SDN were provided by Walid Saad (Virginia Tech., USA) and Kate Ching-Ju Lin (National Chiao Tung University, Taiwan).

The three papers were selected as the best paper awards and the award ceremony was held simultaneously during the banquet session.

● Best Paper Awards

- “Cross-domain Network Traffic Classification Using Unsupervised Domain Adaptation,” Dongpu Li, Qifeng Yuan (University of Science and Technology of China, China), Tan Li (City University of Hong Kong, Hong Kong), Shuangwu Chen, and Jian Yang (University of Science and Technology of China, China)
- “Designing Content Placement of CDN for Improving Aggregation Effect of ICN FIBs Adaptation,” Yu Sasaki, Noriaki Kamiyama (Fukuoka University, Japan), and Yusheng Ji (National Institute of Informatics, Japan)
- “Cooperative Content Downloading Protocol Based on the Mobility Information of Vehicles in Intermittently Connected Vehicular Networks,” Jaejeong Bang, Youngju Nam, Hyunseok Choi (Chungbuk National University, Korea), Seungmin Oh (Kongju National University, Korea), and Euisin Lee (Chungbuk National University, Korea)



Fig. 1 Best Paper Award.

4. Conclusion

We believe that ICOIN 2020 was a truly successful conference in the area of communication and networking. On behalf of the organizing committee, we would like to thank our sponsors, IEEE Computer Society, and IEICE-CS for their kind support to this successful event. In addition, it is our pleasure to announce that ICOIN 2021 will be held in January 2021. (for more details, please visit <http://icoin.org/>.)

Report on the 2nd International Conference on Artificial Intelligence in Information and Communication (ICAIC) 2020

*Yeong Min Jang, *Takeo Fujii, *Dong Seog Han, **Seokjoo Shin
*Organizing Chairs of ICAIC 2020, **TPC Chair of ICAIC 2020



1. Introduction

The 2nd International Conference on Artificial Intelligence in Information and Communication (ICAIC) 2020 was held in Fukuoka, Japan, from February 19 to 21, 2020. This conference was supported by Korean Institute of Communications and Information Sciences (KICS) and technically cosponsored by the IEEE Communication Society and IEICE Communication Society.

2. Organization

The organizing committee of ICAIC 2020 was formed with the Pascal Lorenz (Univ. of Haute Alsace, France), Ilyoung Chong (HUFS, Korea), Rami Langar (UPEM, France), Hsi-Pin Ma (National Tsing Hua Univ., Taiwan), Joel Rodrigues (Inatel, Brazil), Jonghyun Park (ETRI, Korea), Yeong Min Jang (Kookmin Univ., Korea), Takeo Fujii (Univ. of Electro-Comms, Japan), and Dong Seog Han (Kyungpook National Univ., Korea). The technical program was organized by Technical Program Committee Chairs, Seokjoo Shin (Chosun Univ., Korea), Benaoumeur Senouci (ECE Paris, France), and Takaya Yamazato (Nagoya University, Japan). Around 200 technical program committee (TPC) members were involved in the review process.

3. Conference Program

The conference consists of one opening and plenary session, and 22 technical sessions (including 4 poster sessions). The opening session was started with a brief introduction by Prof. Yeong Min Jang (Organizing Chair), following with one welcome address by Prof. Takeo Fujii (Univ. of Electro-Comms, Japan).

After that, one keynote speech from Dong Seog Han (Kyungpook National Univ., Korea) was delivered. In the technical sessions, we had 154 presentations (selected from 344 submissions) with approximately 210 participants from 28 countries of the world, such as Korea, Japan, Germany, Canada, United Kingdom, USA, and so on. With regard to these technical sessions, there were 22 sessions including 4 poster sessions and the program covers a variety of topics on artificial intelligence, deep learning and their applications to wireless and wired communication and networking technologies such as cognitive radios, wireless sensor networks, Internet of Things (IoT), broadband wireless



Fig. 1 After Opening Session.

communications, future network issues, mobile multimedia networking, Big data, Cloud computing, Neuroscience and eHealth, and other important technologies.

The Welcome Reception and Banquet were held at Takakura Hotel Fukuoka. At the banquet, Prof. Yeong Min Jang (Kookmin Univ., Korea) delivered a banquet speech. The best and excellent paper award ceremony was held simultaneously during the banquet session.

- Best Paper Award
 - “Q-Transfer: A Novel Framework for Efficient Deep Transfer Learning in Networking,” Trung V. Phan (Technische Universitat Chemnitz, Germany), Shabnam Sultana (Technical University of Chemnitz, Germany), Tri Gia Nguyen (Duy Tan University, Vietnam), and Thomas Bauschert (Chemnitz University of Technology, Germany)
- Excellent Paper Awards
 - “Neural architecture search under black-box objectives with deep reinforcement learning and increasingly-sparse rewards,” Mitchel Alioscha-Perez (Vrije Universiteit Brussel, Belgium), Abel D’iaz Berenguer (Vrije Universiteit Brussel, Belgium), Ercheng Pei (Northwestern Polytechnical University, China), Meshia C’edric Oveneke (Vrije Universiteit Brussel, Belgium), and Hichem Sahli (Interuniv. MicroElectronics Centre, Belgium)
 - “A Deep Autoencoder Approach to Received Signal Strength-Based Localization with

Unknown Channel Parameters,” Chaehun Im, Sunghoon Jung, and Chungyoung Lee (Yonsei University, Korea)

- “Deep Learning Based CoMP Transmission Method Using Vehicle Position Information for Taxi Radio Systems,” Kazuki Kojima, Yukiko Shimbo, Hirofumi Sukanuma, and Fumiaki Maehara (Waseda University, Japan)



Fig. 2 After Banquet Session.

4. Conclusion

We believe that ICAIIC 2020 was a truly successful conference in the area of artificial intelligence and deep learning and their applications to networking. On behalf of the organizing committee, we would like to thank our sponsors, KICS, IEEE Communications Society, and IEICE-CS for their kind support to this successful event. We are happy to announce the next ICAIIC (ICAIIC2021) will be held in Roma, Italy. We are going to inform you about the detail of the next ICAIIC through the web site <http://icaaic.org/>. We are looking forward to seeing you in Roma.

IEICE-CS Related Conferences Calendar

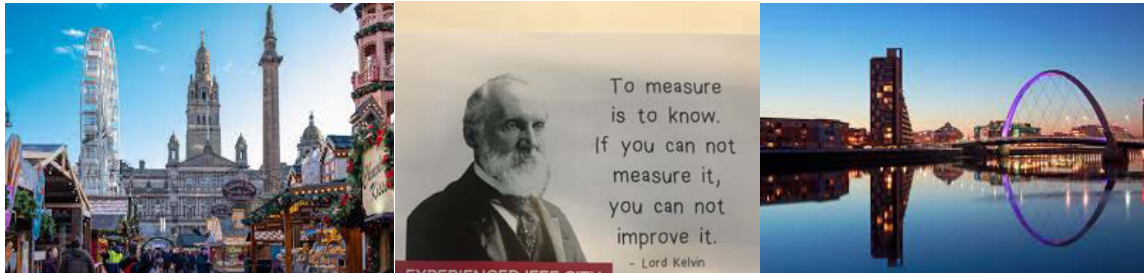
Date	Conference Name	Location	Note
26 Oct. - 30 Oct. 2020	2020 International Symposium on Antennas and Propagation (ISAP2020)	Osaka, Japan	Submission due: 15 June 2020 (Extend)
21 Oct. - 23 Oct. 2020	International Conference on Information and Communication Technology Conference 2020 (ICTC 2020)	Jeju Island, Korea	Submission due: 1 June 2020
18 Oct. - 21 Oct. 2020	The 23 rd International Symposium on Wireless Personal Multimedia Communications (WPMC2020)	Okayama, Japan	Submission deadline Closed
Postponed to 2021	The 26 th Asia-Pacific Conference on Communications (APCC2020)	Kuala Lumpur, Malaysia	TBD
27 Sep. - 30 Sep. 2020	International Conference on Renewable Energy Research and Applications 2020 (ICRERA 2020)	Glasgow, UK	Submission due: 15 July 2020
22 Sep. - 24 Sep. 2020	International Telecom Congress ITC 32 (ITC32)	Osaka, Japan	Submission deadline Closed
-	17 th IEEE Asia Pacific Wireless Communications Symposium 2020 (APWCS2020)	Osaka, Japan	Cancelled
13 Jul. - 15 Jul. 2020	2020 IEEE Photonics Society Summer Topicals Meeting Series (IEEE Summer Topicals 2020)	Cabo San Lucas, Mexico	To be held soon
4 Oct. - 8 Oct. 2020 (Postponed)	2020 Opto-Electronics and Communications Conference (OECC2020)	Taipei, Taiwan	Submission deadline Closed
Postponed to 2021	The 12 th International Conference on Ubiquitous and Future Networks (ICUFN2020)	Porto, Portugal	TBD
22 Jun. - 26 Jun. 2020	The 19 th International Workshop on Assurance in Distributed Systems and Networks (ADSN2020)	Calgary, Canada	To be held soon
7 Jun. - 11 Jun. 2020	IEEE ICC Workshop on Information-Centric Networking Solutions for Real-world Applications (ICN-SRA)	Dublin, Ireland	To be held soon
25 May 2020	Technology Trials and Proof-of-Concept Activities for 5G Evolution & Beyond 5G 2020 (TPoC5GE 2020)	Antwerp, Belgium	Done
20 May - 22 May 2020	The 14 th International Symposium on Medical Information and Communication Technology (ISMICT 2020)	Nara, Japan	Done
19 Feb. - 21 Feb. 2020	2020 International Conference on Artificial Intelligence in Information and Communication (ICAIIIC 2020)	Fukuoka, Japan	Reported on this issue
7 Jan. - 10 Jan. 2020	The 34 th International Conference on Information Networking (ICOIN 2020)	Barcelona, Spain	Reported on this issue
15 Dec. - 16 Dec. 2019	International Japan-Africa Conference on Electronics, Communications and Computations 2019 (JAC-ECC2019)	Alexandria, Egypt	Reported on this issue

Date	Conference Name	Location	Note
9 Dec. - 11 Dec. 2019	7 th International Conference on Smart Grid (icSmartGrid 2019)	Newcastle, Australia	Reported on this issue

Please confirm with the following IEICE-CS web site for the latest information.
<http://www.ieice.org/cs/conf/calendar.html>



IEEE



ICRERA 2020

9TH INTERNATIONAL CONFERENCE ON RENEWABLE ENERGY RESEARCH AND APPLICATIONS September 27-30, 2020, Glasgow/UK

Call for Papers

Dear Colleague,

The purpose of the International Conference on Renewable Energy Research and Applications (ICRERA) 2020 is to bring together researchers, engineers, manufacturers, practitioners and customers from all over the world to share and discuss advances and developments in renewable energy research and applications.

After the success of the first eighth editions of ICRERA in Nagasaki (2012), Madrid (2013), Milwaukee (2014), Palermo (2015), Birmingham (2016), San Diego (2017), Paris (2018), and Brasov (2019), the ninth edition will be in Glasgow, UK, and will continue focusing on several key topics and technologies related to renewable (green) energy systems and sources.

It is our happiness to share with you that 84 selected papers out of 178 papers at ICRERA2019 have been proposed for possible publications in IEEE Transactions on Industrial Applications (15 papers), [International Journal of Renewable Energy Research](#) (21 Papers), [International Journal of Smart Grid](#) (20) and [International Journal of Engineering Science and Applications](#) (28). We hope to select similar rate of papers for the ICRERA 2020.

Up to 2019, all papers presented ICRERA have been cited in IEEE Xplore, SCOPUS and Web of Science (Clarivate Analytics).

According to WEB of Science (Clarivate Analytics);

h-index = 14

Average citation per item = 1.97

Impact Factor = 4.16

ICRERA aims to present important results to the international renewable energy community in the form of research, development, applications, design, and technology. It is therefore intended to assist researchers, scientists, manufacturers, companies, communities, agencies, associations and societies to keep abreast on new developments in their specialties and to unite in finding alternative energy solutions to current issues such as the greenhouse effect, sustainable and clean energy issues.

Topics within the scope of the conference include the following areas, but not limited to:

- Renewable (Green) Energy Systems and Sources (RESSs) as Wind Power, Hydropower, Solar Energy, Biomass, Biofuel, Geothermal Energy,
- Wave Energy, Tidal energy, Hydrogen & Fuel Cells, Energy Storage
- New Trends and Technologies for RESSs

- Policies and Strategies for RESSs
- Energy Transformation from Renewable Energy System (RES) to Grid
- Novel Energy Conversion Studies for RESSs
- Power Devices and Driving Circuits for RESSs
- Control Techniques for RESSs
- Grid Interactive Systems Used in Hybrid RESSs
- Performance Analysis of RESSs
- Hybrid RESSs
- Decision Support Systems for RESSs
- Renewable Energy Research and Applications for Industries
- RESSs for Electrical Vehicles and Components
- Artificial Intelligence and Machine Learning Studies for RESSs and Applications
- Computational Methods for RESSs
- Energy Savings for Power Electronics, Vehicular Technology, Electric Machinery and Control, etc.
- New Approaches in Lightings
- Public Awareness and Education for Renewable Energy and Systems
- Reliability and Maintenance in RESSs
- Smart grids and RESSs
- Safety and Security of RESSs
- Renewable Energy Systems in Smart Cities
- Future Challenges and Directions for RESSs
- IoT for RESSs
- Energy Management, VPP(Virtual Power Plant) and ERAB (Energy Resource Aggregation Businesses) for RESSs
- Model based Design and Digital Twin for RESSs

Long Digest Submission: IEEE format, around 3 - 5 pages, single column, including figures and references. Selected papers will be published in following journals cited in Web of Science with higher impact factors.

- IEEE Transactions on Industrial Applications
- International Journal of Renewable Energy Research
- International Journal of Smart Grid
- International Journal of Engineering Science and Applications

ICRERA 2020 Author Deadlines:

3 to 5 Pages Long Digest Submission Deadline:	July 15, 2020
Notification of acceptance:	August 1, 2020
Final submissions due:	September 1, 2020
Conference:	September 27-30, 2020

Invitation:

On behalf of organizing committee, we would like to invite you to submit articles to ICRERA 2020. Proposals for special sessions, workshops, tutorials, challenges, competitions, etc. are most welcome.

Awards:

Awards will be provided to some Outstanding Papers and some Student Excellent Presentations selected and conferred by the ICRERA 2020 Program Committee. In order to qualify for the award, the paper must be presented at the conference.

Best regards,

Dr. Khaled Ahmed
General Chair, ICRERA
Strathclyde University, Glasgow,
UK

Prof. ILHAMI COLAK
General Co-Chair, ICRERA
Nisantasi University, Turkey

Prof. FUJIO KUROKAWA
General Co-Chair, ICRERA
Nagasaki Institute of Applied Science,
Japan

www.icrera.org ; icrera@gmail.com

Special Section Calendar of IEICE Transactions on Communications

Issue	Special Section	Note
Dec. 2021	Recent Progress in Networking Science and Practice in Conjunction with Main Topics of ITC32	Submission due: 15 January 2021
Nov. 2021	No special section this issue	
Oct. 2021	No special section this issue	
Sep. 2021	No special section this issue	
Aug. 2021	No special section this issue	
Jul. 2021	Future Directions of Research and Development on Communication Quality	Submission due: 28 August 2020
Jun. 2021	ICT for Medical, Healthcare and Welfare Applications in Conjunction with Main Topics of ISMICT 2020	Submission due: 15 July 2020
May 2021	No special section this issue	
Apr. 2021	No special section this issue	
Mar. 2021	Network Virtualization/Softwarization and Artificial Intelligence towards Beyond-5G Innovative IoT Services	To be issued
Feb. 2021	No special section this issue	
Jan. 2021	No special section this issue	
Dec. 2020	IoT Sensor Networks and Mobile Intelligence	To be issued
Nov. 2020	Opto-electronics and Communications for Future Optical Network	To be issued
Oct. 2020	New Era of Satellite Communication / Broadcasting / Application Technologies	To be issued
Sep. 2020	Electromagnetic Compatibility in Conjunction with EMC Sapporo and APEMC 2019	To be issued
Aug. 2020	No special section this issue	
Jul. 2020	No special section this issue	
Jun. 2020	Information and Communication Technology for IoT/CPS in Medicine and Healthcare	Vol. E103-B, No. 6
May 2020	No special section this issue	
Apr. 2020	Network Resource Control and Management Technologies for Sustainable Social Information Infrastructure	Vol. E103-B, No. 4

Please confirm with the following IEICE web site for the latest CALL FOR PAPERS
<http://www.ieice.org/event/ronbun-e.php?society=cs>

Call for Papers

----- Special Section on Information and Communication Technology for Medical, Healthcare and Welfare Applications in Conjunction with Main Topics of ISMICT 2020 -----

The IEICE Transactions on Communications announces that it will publish a special section entitled " ICT for Medical, Healthcare and Welfare Applications in Conjunction with Main Topics of ISMICT 2020" in **June 2021**.

With the evolution of technologies and platforms such as sensing, mobile computing, and cloud servers, the Internet of Things (IoT) is recognized as a very important technology worldwide. In addition, the commercial service of the 5th generation mobile communication system (5G) is scheduled to start in Japan in 2020. The medical, healthcare and welfare fields are receiving great attention as a target for these applications. There is great expectation for innovation of medical, health and welfare care services such as telemedicine or telesurgery using 5G, and health monitoring using biomedical sensors equipped with wireless communication functions. To promptly bring those technologies to practical use, it is desirable to develop basic research such as biosensors, AI/data analysis, communication systems, security, infrastructure and so on as soon as possible. In response to those circumstances, the Technical Committee on Healthcare and Medical ICT (MICT) will hold the 14th International Symposium on Medical Information and Communication Technology (ISMICT 2020) in Nara in May 2020. For the 100-year life, ISMICT 2020 aims to establish a forum to present new researches and development results, exchange ideas, discuss practices, and share experiences, among technology and medical sides.

The special section is planned to publish papers on the related fields of ISMICT 2020 toward realization of innovative medical, healthcare, and welfare systems and services. However, anyone can submit a paper to the special section as well as the ISMICT 2020 contributor.

1. Scope

This special section aims at timely dissemination of research in these areas. Possible topics include, but are not limited to:

- Medical, Healthcare and Welfare Communication System, Antenna and Propagation
- AI and Big Data Analytics for Medical, Healthcare and Welfare
- Biosensor application
- Security and Personal Data Protection for Medical, Healthcare and Welfare
- Electromagnetic Compatibility for Medical, Healthcare and Welfare
- Medical, Healthcare and Welfare Service, Real Implementation, Experimentation Results
- Regulatory Science for Medical Equipment

2. Submission Instructions

The standard number of pages is 8. The page charges are considerably higher for extra pages. Manuscripts should be prepared according to the guideline in the "Information for Authors." The latest version is available at the web site, https://www.ieice.org/eng/shiori/mokuji_cs.html. The term for revising the manuscript after acknowledgement of conditional acceptance for this special section could be shorter than that for regular issues (60 days) because of the tight review schedule.

This special section will accept papers only by electronic submission. Submit a manuscript and electronic source files (LaTeX/Word files, figures, authors' photos and biographies) via the IEICE Web site https://review.ieice.org/regist/regist_baseinfo_e.aspx by **July 15, 2020 (JST)**. Authors should choose the Information and Communication Technology for Medical, Healthcare and Welfare Applications in Conjunction with Main Topics of ISMICT 2020 as a "Journal/Section" on the online screen. Do not choose [Regular EB].

Contact point:

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Okayama Prefectural University

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3. Special Section Editorial Committee

Guest Editor-in-Chief: Hirokazu Tanaka (Hiroshima City Univ.)

Guest Editor: Kento Takabayashi (Okayama Prefectural Univ.)

Guest Associate Editors: Toshinori Kagawa (NICT), Daisuke Anzai (Nagoya Inst. of Tech.), Tetsushi Ikegami (Meiji Univ.), Ichirou Ida (Fujitsu Ltd.), Natsuki Nakayama (Nagoya Univ.), Dairoku Muramatsu (Tokyo Univ. of Science), Soichi Watanabe (NICT)

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* Upon accepted for publication, all authors, including authors of invited papers, should pay the page charges covering the partial cost of publication around December 2020.

* At least one of the authors must be an IEICE member when the manuscript is submitted for review. Invited papers are an exception.

We recommend that authors unaffiliated with IEICE apply for membership. For membership applications, please visit

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* The accepted papers will be published online soon after notification of acceptance on the web site of Transactions Online. For detailed information, please visit

https://www.ieice.org/eng/shiori/page2_cs.html#8

Call for Papers

--- Special Section on Future Directions of Research and Development on Communication Quality ---

The IEICE Transactions on Communications announces that it will publish a special section entitled "Special Section on Future Directions of Research and Development on Communication Quality" in the **July 2021** issue.

The technical committee on Communication Quality of IEICE Communication Society has reached 30th anniversary from the foundation as a type 2 workshop. This technical committee has focused on research and development on design, management, control, and evaluation of network technologies / systems / services, the quality of network applications, user-perceived quality, user needs, and their standardization process. Considering the recent development of 5th generation cellular networks, virtualization technologies, Internet of Things technologies, and the progress of machine learning / artificial intelligence, communication quality has more and more diversified aspects in the future information networks. Therefore, the research and development activities on communication quality becomes significantly important.

This Special Section focuses on broad topic of research and development of communication quality, including optimization, control, and design technologies, in order to explore their future directions of the research and development of communication quality. Note that paper submission is NOT limited from researchers related to the technical committee on Communication Quality of IEICE Communication Society.

1. Scope

Areas of interest of this issue are closely related to Communication Quality. Research targets are placed but are not limited to the following list of areas:

- Optimization, Control and Design of QoE / QoS
Game Theory, Data Mining, Personalization and Environmental Adaptation of Service, Network Control Considering QoE, Communication Behavior Model and Behavior Modification, Resource Allocation Optimization for Social Infrastructure, QoE and Business Model, User Engagement, Subjective / Objective Evaluation, QoE Estimation Model, Psychological Assessment, Biological Information Measurement, Realistic / Ultra-Realistic, Usability, Crowdsourcing, Quality Visualization
- Optimization, Control and Design of Network Services
IoT / M2M, Cloud / Fog Computing, DTN / Challenged Network, V2V / V2X, Voice / Audio / Visual / Haptic Media, Web Service, Interactive System, Social Network Service, Network Performance Indicator (KPI), Quality Measure and Standardization, Traffic Measurement / Planning / Control / Management, Network Tomography, Cross-Layer Control, Green / Energy Saving Technology, Fairness, Reliability / Safety
- A Optimization, Control and Design of Wireless Communication Quality
Communication Quality of Mobile Communication, Communication Quality of Wireless LAN, Communication Quality of Sensor Network, Communication / Access Method, Wireless Resource Allocation, Optimization Control, Signal Processing, Efficiency of Frequency / Energy Usage

2. Submission Instructions

The standard number of pages is 8. The page charges are considerably higher for extra pages. Manuscripts should be prepared according to the guideline in the "Information for Authors". The latest version is available at the web site, https://www.ieice.org/eng/shiori/mokuji_cs.html (IEICE Transactions on Communications). The term for revising the manuscript after acknowledgement of conditional acceptance for this special section could be shorter than that for regular issues (60 days) because of the tight review schedule.

This special section will accept papers only by electronic submission. Submit a manuscript and electronic source files (TeX/Word files, figures, authors' photos and biographies) via the IEICE Web site https://review.ieice.org/regist/regist_baseinfo_e.aspx **by August 28, 2020 (Japan Time)**. Authors should choose the Future Directions of Research and Development on Communication Quality as a "Journal/Section" on the online screen. Do not choose [Regular EB].

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3. Special Section Editorial Committee

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Guest Editors: Go Hasegawa (Tohoku Univ.), Ryo Yamamoto (UEC)

Guest Associate Editors: Yoshimasa Egashira (Toshiba), Megumi Kaneko (NII), Sumaru Niida (KDDI Lab.), Tatsuma Matsuki (Fujitsu Lab.), Osamu Muta (Kyushu Univ.), Masahiro Sasabe (NAIST), Shigeo Shioda (Chiba Univ.), Mutsumi Sukanuma (Waseda Univ.), Kazuhisa Yamagishi (NTT), Celimuge Wu (UEC)

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* Please note that if the submitted paper is accepted, all authors, including authors of invited papers, are requested to pay for the page charges covering partial cost of publications. For detailed information, please visit https://www.ieice.org/eng/shiori/page2_cs.html#5

* Upon accepted for publication, all authors, including authors of invited papers, should pay the page charges covering the partial cost of publication around January 2021.

* At least one of the authors must be an IEICE member when the manuscript is submitted for review. Invited papers are an exception. We recommend that authors unaffiliated with IEICE apply for membership. For membership applications, please visit <https://www.ieice.org/eng/member/OM-appli.html>

* The accepted papers for IEICE Transactions on Communications will be published online soon on the web site of Transactions Online after the payment of page charges has been completed. For detailed information, please visit https://www.ieice.org/eng/shiori/page2_cs.html#8

Call for Papers

----- Special Section on Recent Progress in Networking Science and Practice in Conjunction with Main Topics of ITC32 -----

The IEICE Transactions on Communications announces that it will publish a special section entitled "Special Section on Recent Progress in Networking Science and Practice in Conjunction with Main Topics of ITC32" in the **December 2021** issue.

The international teletraffic congress (ITC) is the first international conference in networking science and practice. Since 1955, ITC has established a multi-decade tradition as the primary forum for presenting and discussing the latest technical advances in teletraffic models, network systems, and measurements. The ITC32 is the 32nd edition of this congress and will be held in Osaka during September 22-24, 2020. The research on the network science and practice, especially on the modelling, design and performance of communication systems, networks and services will be presented at ITC32.

This special section aims at timely dissemination of progressing research fields in networking science and practice. Submission of the paper presented at ITC32 is strongly encouraged. However, presentation of the paper at ITC32 is not mandatory for its inclusion in this special section.

1. Scope

This special section aims at timely dissemination of progressing research fields in networking science and practice, especially researches on the modelling, design and performance of communication systems, networks and services. We encourage original contributions which bridge the gap between performance modeling and real-life operational aspects, including works which leverage measurement data to provide a better understanding of the wired and wireless networks' operation under realistic conditions.

The topics covered by this special section include the following topics.

- Performance evaluation, control, and optimization based on network science and model
- Network measurement and analysis
- Modeling and design of network architectures
- Modeling and design of wireless and cellular networks

2. Submission Instructions

The standard number of pages is 8. The page charges are considerably higher for extra pages. Manuscripts should be prepared according to the guideline in the "Information for Authors." The latest version is available at the web site, https://www.ieice.org/eng/shiori/mokuji_cs.html. The term for revising the manuscript after acknowledgement of conditional acceptance for this special section could be shorter than that for regular issues (60 days) because of the tight review schedule.

This special section will accept papers only by electronic submission. Submit a manuscript and electronic source files (LaTeX/Word files, figures, authors' photos and biographies) via the IEICE Web site https://review.ieice.org/regist/regist_baseinfo_e.aspx by **January 15, 2021 (JST)**. Authors should choose the **Recent Progress in Networking Science and Practice in Conjunction with Main Topics of ITC32** as a "Journal/Section" on the online screen. Do not choose [Regular EB].

Contact point:

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3. Special Section Editorial Committee

Guest Editor-in-Chief: Hideyuki Shimonishi (NEC)

Guest Editors: Yuichi Ohsita (Osaka Univ.), Chisa Takano (Hiroshima City Univ.)

Guest Associate Editors: Masaki Aida (Tokyo Metropolitan University), Keisuke Ishibashi (ICU), Megumi Kaneko (NII), Ryoichi Kawahara (Toyo University), Leibnitz Kenji (NICT), Zhisheng Niu (Tsinghua University),

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* At least one of the authors must be an IEICE member when the manuscript is submitted for review. Invited papers are an exception. We recommend that authors unaffiliated with IEICE apply for membership. For membership applications, please visit

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* The accepted papers will be published online soon after notification of acceptance on the web site of Transactions Online. For detailed information, please visit https://www.ieice.org/eng/shiori/page2_cs.html#8

Call for Papers

----- Special Cluster in Conjunction with IEICE General Conference 2020 -----

The IEICE Communications Express (ComEX) announces that it will publish a special cluster entitled “Special Cluster in Conjunction with IEICE General Conference 2020” in **December 2020**. ComEX is an online open access letter journal with binary peer review publishing system established in June 2012 by the IEICE covering the entire field of communications. The editorial committee of ComEX thinks much of rapid yet careful peer review, and the average period from submission to decision is less than one month in 2019 and the acceptance rate is 45.5% in 2019. In order to keep the promptness of the review process and provide high quality letters in a timely manner, the numbers of words and items (Figures, Tables, and Algorithms) in the manuscript are limited up to 1500 and 3, respectively. We believe those requirements are met by typical papers presented at IEICE General Conference or IEICE Society Conference meaning that papers of the conferences can be submitted to ComEX after polishing sentences without significant addition and/or change of the items. Based on the above considerations, the editorial committee of ComEX has planned the special cluster to seamlessly publish letters in the entire field of communications from, but not limited to, authors of IEICE General Conference 2020.

1. Scope

This special cluster aims at seamless publication of the work in the entire field of communications. Possible topics include, but are not limited to, Fundamental Theories for Communications, Energy in Electronics Communications, Transmission Systems and Transmission Equipment for Communications, Optical Fiber for Communications, Fiber-Optic Transmission for Communications, Network System, Network, Internet, Network Management/Operation, Antennas and Propagation, Electromagnetic Compatibility (EMC), Wireless Communication Technologies, Terrestrial Wireless Communication/Broadcasting Technologies, Satellite Communications, Sensing, Navigation, Guidance and Control Systems, Space Utilization Systems for Communications, and Multimedia Systems for Communications.

2. Schedule

Submission Open: April 1st, 2020 (JST)

Submission Deadline: June 30th, 2020 (JST)

We note that the submitted paper will proceed to review process right after the submission and the review result will be sent to authors as soon as the decision is made. Authors can resubmit the rejected manuscript in the special cluster after careful revisions as many times as possible during the submission period. All the accepted papers, which will have submitted by the submission deadline, will be published in this special cluster of the ComEX.

3. Submission Instructions

The maximum number of words is 1500; the maximum number of items (Figures, Tables, and Algorithms) is 3. Manuscripts should be prepared according to the guideline in the “Information for Authors.” The latest version is available at the web site, http://www.comex.ieice.org/data/for_authors.html. In particular, please refer to the paragraph on novelty. Review process will begin immediately after submission.

When authors resubmit the revised manuscript whose original version has been rejected in the previous submission, the authors are encouraged to indicate a manuscript ID assigned in the previous submission and to append a "Reply Letter" to expedite the review process. Accepted papers will appear on the IEICE ComEX web site as advance publication as soon as payment of the article charge is confirmed by the ComEX Publishing Office. All of them will appear as a special cluster in ComEX web site on December 1st, 2020.

ComEX will accept only the letter type of manuscripts by electronic submission using one of the officially approved formats (LaTeX style file or Microsoft Word template). Submit a manuscript and electronic source files (LaTeX/Word files, figures) via the IEICE Web site https://review.ieice.org/regist/regist_baseinfo_e.aspx. In this regard, authors should choose [in Conjunction with IEICE General Conference 2020] as a “Journal/Section” on the online screen. Do not choose [Regular-XB].

Contact Person: Noriaki Kamiyama
Faculty of Engineering, Fukuoka University
Email: comex-ss-gc2020@ml.ieice.org

4. Special Cluster Editorial Committee

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From Editor's Desk

● IEICE Society Conference 2020

IEICE Society Conference 2020 will be held at Tokushima University, Tokushima-city, from 15th to 18th September 2020. English sessions are scheduled in the conference. Please check out the latest conference information on the IEICE web site at:

<https://www.ieice-taikai.jp/2020society/en/index.html>

● Planning to renew GNL in 2021

IEICE-CS GLOBAL NEWSLETTER (GNL) was first published in August 2002 and has been published 72 times over approximately 18 years. We plan to renew GNL in 2021 for immediately providing society activities, related conference reports, and society information via the IEICE-CS Web site.

● My Treasures

I'm Yoshitaka Enomoto, Director, International Publication, IEICE Communications Society. In June of 2018, I became the Director of Planning and Member Activities of IEICE-CS, and started editing the IEICE-CS GLOBAL NEWSLETTER (GNL). While editing GNL, I sent many emails to GNL authors and read over 100 articles in about 3 years. It was hard but enjoyable work. This time I will resign from the editorial staff of GNL. I show a photo of my treasures. Many thanks to all GNL authors, readers and editorial staffs. See you again sometime and somewhere!



IEICE-CS GLOBAL NEWSLETTER Editorial Staff

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To Probe Further and Keep Up-to-date with Communication Technologies

IEICE Communications Society



IEICE Society Conference 2020

15-18 September 2020

Tokushima University, Josanjima Campus

Every autumn, each Society organizes a Society Conference to provide a forum where members can present their study results and exchange views. At present, four of the Societies -- the Engineering Sciences Society, the NOLTA Society, the Communications Society, and the Electronics Society -- hold their Society Conferences as a joint event. The Communications Society Conference includes English-language sessions in addition to the Japanese-language sessions.

Please check out the latest information on the IEICE web site at:

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