THE INSTITUTE OF ELECTRONICS, INFORMATION AND COMMUNICATION ENGINEERS
電子情報通信学会
2020 年 12 月 1 日発行

IEICE

Communications Society —GLOBAL NEWSLETTER—

VOL.44 NO.4
Dec. 2020

IEICE
Communications Society

A PUBLICATION OF THE COMMUNICATIONS SOCIETY
The Institute of Electronics, Information and Communication Engineers

IEICE Communications Society GLOBAL NEWSLETTER *Vol. 44, No.4*
Contents

ⓒ 2020 IEICE All Rights Reserved

○ IEICE-CS Information

○ Photogravure

∗Color Version Available!

The PDF (color version) of this issue can be downloaded from IEICE-CS Web site below:

https://www.ieice.org/cs/pub/global_news.html

Digital Transformation for Energy Networks

Atsushi Hiramatsu
NTT Advanced Technology Corporation

1. Introduction

Digital transformation (DX) is the world-wide movement these days. Various information and communication technologies including the Internet of Things (IoT) and artificial intelligence (AI) are used to innovate and enhance the conventional business and work processes in many industries and organizations. One of such examples is the recent dramatic changes in the work styles and learning methods under the global COVID-19 spreading. Multi-media communication tools and broadband networking technologies helped world-wide office workers and college students to instantly work, study and collaborate from home or remote offices. DX is not just converting analog signals into digitized data or handling the information by computer software but reforming the whole processes of the industries and organizations and creating new business models or novel work-life styles. This paper overviews the current trends of digital transformation in ICT, car and energy industries, and shows the ICT technologies will play important roles in the future fusion of many industries and societies.

2. Digital Transformation in ICT Networks

The impacts of DX can be seen in the history of ICT networks (Fig. 1). In early days, the telephone service relied on human switchboard operators who connected lines for analog voice signals between speakers by their hands. To reduce the burden of operators, step-by-step automatic switching systems were developed, and analog crossbar switches later improved the switching system capacity (Fig. 1(a)). Then, the digital transmission and switching technologies were introduced to remove the distance limit in telecommunications and to expand the switching capacity by time-division technique. Also the computer software is used to control switching systems in place of logic circuits. This enabled network service providers to release new services quickly and upgrade their services easily (Fig. 1(b)).

Once the network core was digitalized, the innovation of ICT networks was accelerated. All of voice, video, pictures and documents can be encoded and multiplexed as one stream of data, and the digitalized information can be transferred not as continuous data stream, but as chunks of data by packets with routing headers. The software for communications services does not have to directly control the switching systems and can be executed on servers remotely located in the network (Fig. 1(c)).

Then the Internet based on packet network technology had spread quickly and became a global service infrastructure for various communication services and unique applications such as World-Wide-Web, Social Network Service and E-commerce. Also the dramatic progress of the technologies for very efficient and flexible wireless communications provided all users with mobile broadband access to the Internet from anywhere anytime. Virtual network and virtual machine technologies were developed to divide and share the network resources and computing power in the “cloud”. Now novel technologies such as IoT and AI are blooming (Fig. 1(d)).

Digitalization conceals the complicated physical or analog behaviors at the point of physical-digital interface. In the digital world, it is possible to virtually divide, combine or share those digitalized objects and to gather huge data and extract the hidden relationship between independent events. Also the knowledge from the different fields can be integrated. All these functions and operations are software-defined. This is the driving force of the DXs to generate new ideas and novel business models.

Recently, “Innovative Optical and Wireless Network (IOWN)” has been proposed by NTT [1]. This aims at transforming the current ICT network architecture by all photonic network technologies with digital twin computing functions for innovative data processing and cognitive foundation functions for service orchestration. These technologies will further accelerate the DX of other industries and societies.

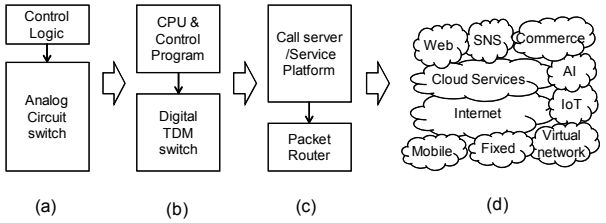


Fig. 1 Digital Transformation in ICT Networks.

3. Digital Transformation in Car Industry

DX in car industry has already started. In old days, cars were mechanically controlled by levers, gears and oil pressure pipes. Handles, gas pedals and even speed meters were directly connected to the target objects through such mechanism (Fig. 2(a)). When the parts of the car control are realized by CPU and software in a car, the digitalization of the car industry started (Fig. 2(b)). The technologies for autonomous car drive have been studied and released step-by-step to the mass production cars. Recent cars are full of sensors connected to the CPU through a car internal data BUS. Moreover, the electric vehicles (EV) using a motor and a battery have been commercialized and is accelerating the digitalization of cars (Fig. 2(c)).

Now most of cars have mobile communication capability to obtain various real time information including road traffic, accidents, hazards, and local information along the driving route. Using this communication capability, it is considered to connect all cars to the network AI functions or to each other. The aim of this "connected car" is to coordinate the movements of all cars. This technology is expected to make the autonomous car driving more comfortable and safer. Also new applications utilizing power stored in EV's batteries might be proposed (Fig. 2(d)).

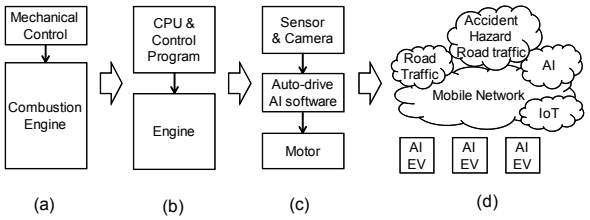


Fig. 2 Digital Transformation in Car Industry.

4. Digital Transformation in Energy Networks

DX of electric power networks is expected to start now. There are two driving forces for this change in electric power industry. One is the effort to tackle the global warming issues by increasing the share of the green energies. The other is the preparation for the recent increase in power grid failures caused by natural disasters. At the Great East Japan Earthquake in 2011, the electric power grid were severely damaged and the atomic power plants were shutdown. In 2018, the blackout occurred in Hokkaido Island after an earthquake. In 2019, the electric power grid is heavily damaged in Chiba prefecture by a big typhoon.

In order to promote the diversity in the electric power sources and to improve the resiliency of energy networks, the energy network reform has started. This transition in the energy network can be depicted as in Fig. 3.

For long period, the electric power grid was closed one-way distribution network from conventional hydro, fossil, and atomic power plants to home, offices and factories (Fig. 3(a)). Then, when the global warming was widely recognized as the real threat, the power grid became open to new energy suppliers using wind, photovoltaic and bio-mass energy sources. It was expected to increase the share of the green energies in Japan (Fig. 3(b)).

Now, "Energy White Paper 2020" from the Ministry of Economy, Trade and Industry [2] predicts that the energy networks become two-way. This means the power consumers can feed their power to the energy networks when they generate power from their own power equipment more than they need or hold enough power in their own batteries. For example, back-up batteries in local telecom offices or EV batteries can be utilized to support local communities at disaster situations [3]. It is thought that the utilization of distributed power is one of the effective options to enhance resilience of power systems against natural disasters (Fig. 3(c)).

It is also expected that new business models such as power aggregators emerge. Power aggregators manage power from small power sources such as wind power plants, bio-mass energy plants, home and office photovoltaic panels, and the electricity stored in EV's batteries. They sell the aggregated power in the open power market as big power plant owners. Virtual power plant (VPP) is the technology to monitor and control the power flow from small power sources as one plant [4].

To promote the DX for energy networks, the tight collaborations between ICT experts and energy network experts will be required. The technologies studied in ICT networks are useful for managing two-way energy networks, such as bi-directional network architecture, network virtualization, IoT, and AI. One example is the concept of "Energy Internet", which proposes to build energy networks based on the similar criteria of the Internet architecture [5]. However, the deep knowledge about the analog behaviors of power grid is no less important for stable and safe operation of digitalized energy networks. Thus, the collaboration of ICT and energy network engineers are inevitable.

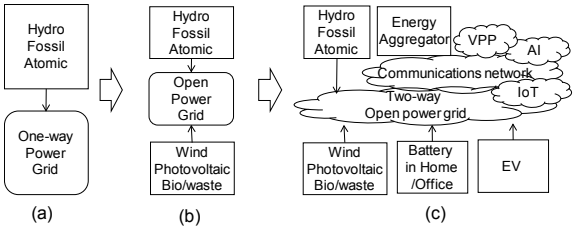


Fig. 3 Digital Transformation in Energy Networks.

5. Conclusion

DXs in many industries look similar, and ICT network technologies such as IoT, AI, mobile and virtualization are commonly exploited. This means technologies studied for ICT networks can be used to promote the DXs for other industries, such as energy industry. It is expected to encourage IEICE members to communicate and collaborate with research societies for other industries much more.

6. References

[1] Jun Sawada, NTT Technical Review, Vol. 18, No. 2, pp. 10-16, Feb. 2020.
[2] METI, "Energy White Paper 2020", https://www.enecho.meti.go.jp/en/category/whitepaper/pdf/2020_outline.pdf, June 2020.
[3] NTT, "TEPCO and NTT Join Forces in "TNcross" Joint Venture", https://www.ntt.co.jp/news2018/1804e/180418a.html, Apr. 2018.
[4] T. Sikorski, et al., Energies, Vol. 13, 3086, June 2020.
[5] A. Joseph, et al., Energies, Vol. 13, 4242, Aug. 2020.

Some Fundamental Concepts Underlying My Research Activities

Masaki Aida
Tokyo Metropolitan University

1. Introduction

Science & technology and religion are often talked about as being incompatible, but is that true? It was not so long ago in the history of humankind that science separated from religion, furthermore, it was only recent when technology was systematized as engineering. Both science & technology and religion are the result of human efforts to create a "complete system," and I think that the structures created by humans all have something in common. For example, the formulation of physical laws based on *the principle of least action* that appears in analytical mechanics seems to be motivated by the thought that physical laws should be derived from the first principle. This vision seems to be conscious of something that governs the laws of the world. In more detail, the existence of physics itself is based on the wishful assumption that *the laws of the world are indicative of a beautiful system* (which can be understood by mathematics). We may be able to interpret this is assuming the existence of God in a sense. Interestingly, the wishful assumption of physics remains undeniable after many measurements and validations and is still a force driving human effort.

In science and technology, "facts" that can be verified by experiments are sought after, and appeals to "the way it should be" are supposed to be denied. If these appeals are not adequately suppressed, there is a risk of biased observation that precludes direct observation of reality and generates incorrect conclusions. However, if there is no intimation of direction, the individual will be unable to secure guides to the understanding and systematization of unknown phenomena. Therefore, some intimations about how to proceed with research are necessary, making balance essential.

This essay introduces the fundamental concepts underlying my research activities. These have been introduced in detail in my Japanese textbooks [1], [2] (they are also outlined in [3], [4], respectively), but I will take the opportunity of this essay to elucidate them in English.

2. How is the Order of Our World Created?

The development of ICT has strengthened the linkage between users and information network systems. As a result, user behavior has come to affect the stable operation of information network systems. For example, the email generated to exchange New Year greetings is so large that receiving emails becomes problematic. Furthermore, the influence of the user's behavior also affects the behavior of other users via the information network. For example, when a web page takes too long to be displayed on a personal computer due to congestion of the server or the network, the user often clicks repeatedly. This behavior further loads the information network system, which makes it difficult for other users to display their requests, and the repeated click action propagates to other users. Following these considerations, it is difficult to think about the performance and stable operation of information network systems as a single isolated system, and it is necessary to enlarge the scope of the target to include users' behaviors. Furthermore, considering that various sensors and self-driving cars will soon be connected to the information network, the entire information network system will become massive in scale and complexity. It must be emphasized that no one knows all the details of the current state information of even the current information network systems. How can we properly operate a system that we do not know the whole picture? One way is to find a system that does not know the whole picture but is deemed to work well, and to draw conclusions about its mechanism.

The most well-known large-scale and complex system is our world. The number of components that form this world and their diversity readily confirm that it is the ultimate large-scale and complex system. So why is this ultimate large-scale and complex system, the world, stable? We believe that the world will still exist tomorrow and that the sun will rise tomorrow, just as in the past. Even though we know that no past state is ever repeated precisely at the scale of atoms or elementary particles that make up our world, we believe that the world is stable. Such orderly behavior of the world is created through so-called synergistic effect, self-organization, or the collective phenomena of fundamental structure. This framework is exciting and gives useful clues to engineering. The question of where the stability or orderly behavior of the world comes from probably corresponds to the following questions. Assuming that God created the world, what divine secrets were used at the Creation to yield the orderly behavior of the world? Conversely, even if we assume that God does not exist, what are the characteristics that make us feel that something is behind the orderly behaviors of the world?

If the characteristics indicative of the order in nature are known, it should be possible to create a mechanism

for creating order in a system by recreating it in an engineering system, even if there is no one who understands the state information of the entire system. In other words, it is a prospective attempt to create an engineering system that replicates the order assumed to indicate the presence of God.

Of course, we cannot create a complete answer with regard to these characteristics since the natural mechanisms are not completely understood. However, since our purpose is not to understand nature but to create engineering systems that replicate its characteristics, we should assess our current understandings in terms of their usefulness in systems engineering. My current research activities consider the following two characteristics.

- Action through a medium (Local interaction)

  In physical systems, there are two concepts that describe the interactions that can occur between two objects in spatially different locations; action at a distance and action through a medium (local interaction). The former yields a model in which two widely-separated objects interact directly. The latter does not permit the existence of direct interaction between widely-separated objects; it assumes that interaction occurs only between spatially adjacent objects, and the effect of interaction is incrementally exchanged between the objects. Modern physics supports the action-through-a-medium concept, so interaction occurs locally. In such a model, space is filled with physical quantities at all points (which forms a field), and any variation in the physical quantity at a point propagates through the field at a finite speed.

- Renormalizability (Reducing the degrees of freedom in dynamics)

  When attempting to observe a massive aggregation of extremely small objects that interact in complex ways, we can more easily comprehend the aggregate (or system) by reducing either the temporal or spatial resolution (or both), i.e., coarse-graining the system. In the renormalization theory, complex systems are understood by observing changes in a measurable attribute identified by the coarse-grain transformation. The coarse grain transformation of observations is called renormalization. We consider a system that exhibits large (or infinite) degrees of freedom at the microscopic scale. If the system is well described by small (or finite) degrees of freedom at the macroscopic (measurable) scale through renormalization, the system is called renormalizable.

In the action-through-a-medium concept, an object interacts only with its neighbors, at any instant. In the world of action at a distance, changes in or by an object instantly influence all places, including the end of the universe, and conversely, the changes of any object, regardless of its location, instantly influence the object. In this situation, the components of reality are associated with each other very strongly, which might limit the flexibility of the world. Therefore, the action-through-a-medium concept appears to be a key characteristic in producing stable systems while also ensuring the freedom of local action.

Even if we do not fully comprehend the attributes of micro-components such as atoms or we do not understand the complete mechanisms of nature, we can admire the orderly behavior of the world. This means that even if there are huge degrees of freedom when the world is observed at the micro-scale, almost all degrees of freedom are missing at the macro-scale of human perception, and only a small number of macro parameters are needed to describe the world. This confirms the renormalizability of the world.

Based on these ideas, my research activities have been considering a hierarchical model based on temporal and spatial scales as a framework for information network control technologies. At each layer, the hierarchical model considers local interactions on the temporal and spatial scales that characterize the layer. The rules that describe local interactions are described by a partial differential equation, and the resulting overall system state is the solution of the partial differential equation. In other words, a macro-scale state is realized as a solution of a partial differential equation by the micro-scale action rule given as a local interaction. What kind of effect occurs between different layers involves renormalization from the perspective of how coarse-grained the observations are.

3. User Dynamics and Relativistic Quantum Mechanics

Imagine if there is any object in the world that does not interact with others, can it be said that it really exists? Since it does not interact with light, it does not reflect light and is therefore invisible. Since it escapes gravity, it must have no mass, and of course, it escapes the sense of touch. Even if such a thing exists, isn't it the same as not existing? From that point of view, it can be seen that real existence is a concept based on interaction with others. Then, what are the unique properties possessed by objects that actually exist? For example, attributes of the object itself, such as its color being red, are recognized only when there is another object that permits comparison, so it is also a concept that is based on mutual relationships. The real objects themselves and their interrelationships are inseparable, and they together make up this world. In the relationship between the characteristics of the “object” itself that really exists and the “environment” created by the interaction with others, we can recognize that their boundaries are ambiguous. If we consider this whole and inseparable world as a network, our world is the network itself.

A network that represents the relationship between people through an information network is called an online social network (OSN). Due to the rapid

development and spread of ICT in recent years, communication between people has been dramatically activated, and the ability to transmit information generated by individuals has been strengthened; this has greatly stimulated the activities of users in OSNs. Therefore, understanding user dynamics in OSNs have become a significant issue. In my research activities, the *oscillation model* was proposed to describe the user dynamics in OSN; it is formulated as a wave equation on the network. In research on wired networks, the first-order differential equations with respect to time, such as Markov chains, are often used, but second-order differential equations with respect to time, such as the wave equation, are rarely used. The reasons why my research uses the wave equation for modeling user dynamics are as follows. The strength of the user's activity influences the strength of the activity of other users via the OSN, but the influence does not spread instantaneously, rather it propagates across the OSN at a finite speed. The wave equation describes the characteristics of propagation in a medium at a finite velocity. For example, consider a function that expresses the effect of influence propagation among users. If the effect propagates at a finite speed, then the trigonometric functions yielded by Fourier transformation also move at the same speed. With regard to the trigonometric function at each frequency, if the movement is observed at a fixed point, it appears to be oscillating. In other words, behind the phenomenon of propagation at a finite velocity, a structure that instantiates wave propagation is necessary. The oscillation model was introduced for a purely theoretical reason following this background, but the oscillation energy is related to node centrality, a concept often used in conventional network analysis. For example, under the condition of uniform OSN use, if all link weights are one, the oscillation energy of a node represents its degree centrality, and if the link weight is the amount of traffic passing through the link, the oscillation energy of the node represents its betweenness centrality. Furthermore, oscillation energy may diverge depending on the structure of the network, which is considered to represent the situations in which the intensity of user dynamics activity diverges, such as the flaming phenomenon.

The oscillation model enables us to understand the relationship between user dynamics and network structure. Thus, the oscillation model has the potential to yield countermeasures to explosive user dynamics, including flaming, such as altering the network structure. In this situation, don't you want to understand the causal relationship between the kind of OSN structure and the type of user dynamics evidenced by the structure? The wave equation that describes user dynamics is a second-order differential equation with respect to time. Note that the first-order differential equation with respect to time is essential here as it can explicitly describe the causal relationship between the network structure and user dynamics. Of course, its solution must describe propagation at a finite velocity so that it must also be a solution to the original wave equation. If the equations that satisfy both requirements are created, the OSN structure will not be conserved, and problems will arise in which all users all over the world will be directly linked to each other. Therefore, in addition to the above requirements, we must find an equation that completely conserves the OSN link structure. The literature [5] (also [1] in Japanese) has succeeded in giving a fundamental equation that satisfies all of the above requirements. Interestingly enough, the fundamental equations of user dynamics thus obtained have the same structure as the Dirac equation that appears in relativistic quantum mechanics. Here, relativistic quantum mechanics is a fundamental theory of physics that combines special relativity and quantum mechanics and is the starting point of quantum field theory. From this, the user dynamics are described by the wave function that is quantized by the anticommutation relations yielded by fermionic fields.

Note that the research did not artificially apply the equations of physics to describe user dynamics. The fundamental equation of user dynamics is naturally obtained from the goal of explicitly describing the causal relationship of the network structure and conservation of the OSN link structure. Quantum theory often details a mysterious world that differs from the real world, such as Schrödinger's cat, often mentioned in public awareness books. However, the findings obtained from the fundamental equations of user dynamics suggest that the framework of quantum theory is not unique to the microscopic world, but instead is inherent in the description of causal relationships.

In quantum theory, there are several mathematically equivalent formulations, depending on the temporal changes in the linear operator and/or the state vector appearing in the equation. The formulation in which the linear operator evolves with time is called the Heisenberg picture, the formulation in which the state vector changes over time is called the Schrödinger picture, and the formulation in which both change over time is called the interaction picture. In the fundamental equation of user dynamics, the linear operator is a matrix that represents the network structure, and the state vector is the state of the user. Therefore, the time evolution of the linear operator is the change of the relation between the users, that is, the environment changes and the time evolution of the state vector is the time change of the user's state. Since there are multiple mathematically equivalent expressions depending on which one changes over time, it can be recognized that there are various views on whether the user's state is his or her personality or is created from the environment. As stated at the beginning of this section, this means that the user and the environment are inseparable.

4. Conclusions

This essay has introduced some of the concepts I have become aware of in my daily research activities. Although these are rarely stated explicitly in research

publications, they are the ideas that have become the guiding principles for my research activities. I do not know if they will help others, but if you are interested, feel free to contact me at any time. I hope that we can discuss related topics together.

5. Acknowledgments

I would like to thank Ms. Kozue Kamikura at Tokyo Metropolitan University for her comments and impression on my draft manuscript.

6. References

[1] M. Aida, Distributed Control and Hierarchical Structure in Information Networks, Corona Publishing Co. Ltd., 2015. (Japanese)
ISBN 978-4-339-02803-4

[2] M. Aida, Introduction to Network Dynamics, Morikita Publishing Co. Ltd., 2020. (Japanese)
ISBN 978-4-627-85511-3

[3] M. Aida, "Using a renormalization group to create ideal hierarchical network architecture with time scale dependency," IEICE Transactions on Communications, vol. E95-B, no. 5, pp. 1488-1500, May 2012.

[4] M. Aida, C. Takano, and M. Murata, "Oscillation model for describing network dynamics caused by asymmetric node interaction," IEICE Transactions on Communications, vol. E101-B, no. 1, pp. 123-136, Jan. 2018.

[5] M. Aida, C. Takano and M. Ogura, "On the fundamental equation of user dynamics and the structure of online social networks," proc. NetSci-X 2020: Sixth International Winter School and Conference on Network Science, pp. 155-170, Springer, 2020.
ISBN 978-3-030-38965-9

New Stage of Radar Signal Processing: with my research experience in radar and remote sensing

Hiroyoshi Yamada
Faculty of Engineering, Niigata University

1. Introduction

It is a great honor for me to have been awarded the IEICE fellow for my contribution on Application of Array Signal Processing to Array Antenna and Radar Remote Sensing. Most of all the results were obtained via joint research collaborated with colleagues and students in my laboratory. I express my deepest thanks for their cooperation.

My research carrier has started at antenna laboratory in late '80s at Hokkaido University, Japan. It was a time to dawn the Internet at Universities in Japan. The development of computer systems had brought about revolutionary changes in measurement in the radio field as well. I met a brand-new Network analyzer at the laboratory, which bring me to the array signal processing field.

2. Antenna Measurements with Network Analyzer

As many of you know that the network analyzer is a fundamental measurement equipment for frequency characteristics of microwave components such as antennas and circuits. The network analyzer appeared in late '80s could bring us many frequency sampled data, or *array data*, easily. On the other hand, research on high-resolution array signal processing was also very active, and many algorithms were proposed such as Capon, MUSIC, ESPRIT and so forth. These algorithms are focused on Direction-of-Arrival (DOA) estimation by using array antenna. Beamwidth of array antenna can be determined by the aperture size, or length of the array, then large antenna should be required to realize high angular resolution. Above algorithm realizes super-resolution property beyond beamwidth limit by solving the following equation:

$$\boldsymbol{r} = \boldsymbol{A}\boldsymbol{s} + \boldsymbol{n}\,, \qquad (1)$$

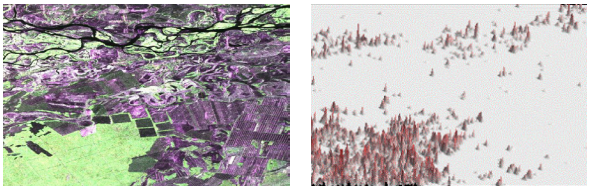
where $\boldsymbol{r}$ is a column vector whose elements are the received signal by the array antenna. $\boldsymbol{A}$ is a matrix whose columns contain the mode vector of incident waves, and $\boldsymbol{s}$ is a vector whose elements corresponds to the complex amplitude of each waves. The vector $\boldsymbol{n}$ is the additive noise vector. The unknown parameters to be solved in the above equation is DOA and complex amplitude of each incident wave. This problem can be solved when the number of incident waves are less than the number of array elements. Note that resolution limit does not depend on the beamwidth in this concept. The so-called superresolution techniques, such as MUSIC and ESPRIT, utilize second-order statistics property of signal and noise, then we can improve resolution performance in accordance with increasing the number of snapshots.

Let's get back to my first research. Equation (1) appears in many problems. We focused on an analogy between received data vector of array antenna (spatial domain data) and network analyzer (frequency domain data). We first demonstrated multiple reflection detection in the microwave circuits with narrow bandwidth data by using the MUISC algorithm [1]. The algorithm was also applied to the multipath reflection detection and rejection in the antenna gain [2] and pattern measurements [3]. In the microwave measurements, precise calibration can be done and available frequency bandwidth is often limited, then the superresolution technique becomes a powerful tool to detect multiple components and extract desired components.

After my Ph.D. research, I have been working at Niigata University where I had collaborated with Prof. Yamaguchi who is one of the leading researchers in radar polarimetry. For the DOA estimation of multipath waves with an array, decorrelation preprocessing should be required to attain high-resolution estimation. Polarization is one of the key properties in wave propagation. I found that the arrays having different, or orthogonal, polarization can be effective as subarrays to enhance decorrelation performance for distinct polarization incidences [4]. In addition, antenna array calibration is also very important to realize high-resolution DOA estimation by using superresolution techniques. There were many researches for calibration. However, most researches focused on antennas. In actual systems, not only element imbalance and mutual coupling but also coupling between array and adjacent objects often affected. These effects can also be modeled to add virtual elements and coupling coefficients among them. I modified the model in (1) and derive the algorithm [5, 6]. This idea leads to virtual array for MIMO radar later.

3. Application to SAR Image Analysis

In late '90s, I had a chance to join the Jet Propulsion Laboratory, NASA, as a visiting scholar for one year, where I devoted in polarimetric Synthetic Aperture



(a) (b)

Fig. 1 Tree-height estimation by using ESPRIT algorithm. (a) PolSAR image (false color), (b) Estimated tree height.

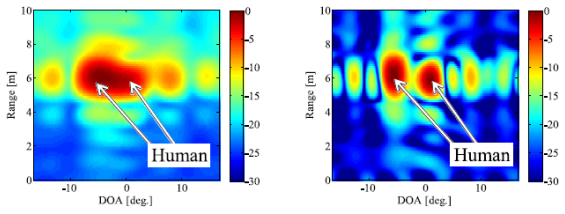
Radar (PolSAR) image analysis. In the PolSAR analysis we obtain the images by combination of horizontal and vertical transmission and reception. SAR Interferometry is a technique to estimate height of the terrain/targets by using a pair of SAR images.

In this problem, we find many problems shown in (1) [7-9]. I have struggled with polarimetric SAR interferometry, which is combination of PolSAR and interferometry, to discriminate mixture of reflection waves in small area. For example, in forest observation by using Interferometry at L-band, we have a problem because part of transmitting wave is reflected by canopy and the rest is reflected by the ground. I got an idea to use polarimetry and a superresolution technique to solve the problem,that is array data in (1) can be arranged by the combination of PolSAR images and a pair of data as a doublet for ESPRIT algorithm. Figure 1 shows an example of the results [7, 8]. This results are the start point for high-resolution 3D SAR image reconstruction reported in [10].

4. High-resolution Radar Imaging

Although the superresolution technique is a powerful tool for radar and remote sensing, high-resolution property deteriorates for distributed scatterings. In such a case, we should increase array aperture by adding elements. That is costly. Next problem is how we can solve the problem without increasing actual elements. Here comes the virtual array concept again. I employed Khatri-Rao matrix product virtual array technique for the Ocean Surface Current Radar to improve angular resolution, which makes original array aperture almost doubled [11].

From 2010s, MIMO (Multiple-Input Multiple-Output) technique has been actively introduced in sensing. MIMO itself is a kind of virtual array technique to realize $N \times M$ elements with N transmitting and M receiving elements. We began to



(a) (b)

Fig. 2 Human location estimation by using MIMO radar. (a) Conventional MIMO (b) MIMO with KR virtual array.

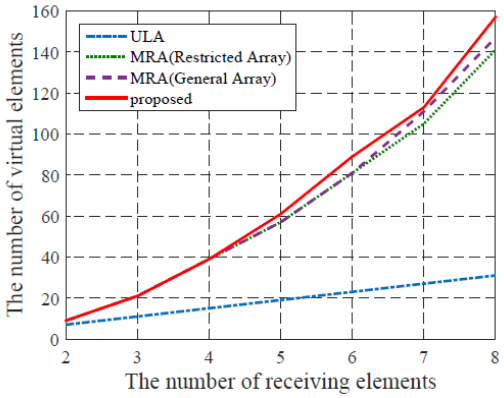
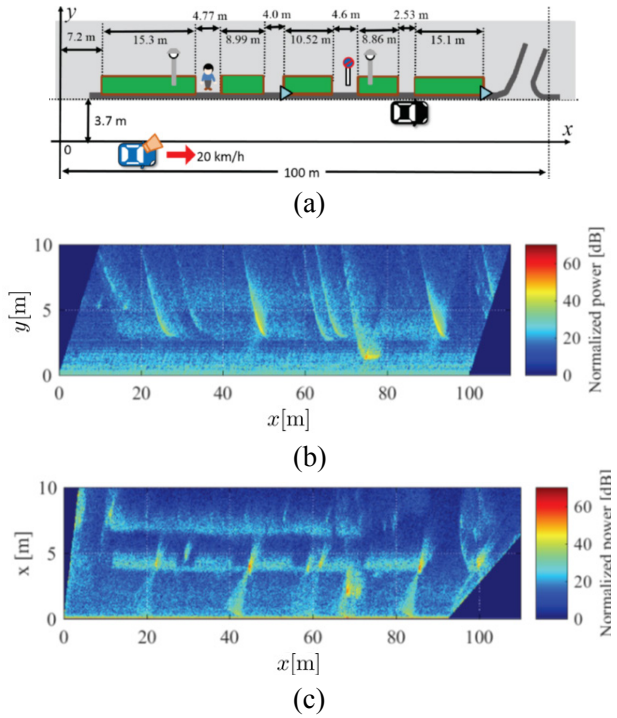


Fig. 3 Number of effective elements for two transmission elements in each MIMO virtual array technique.

start developing MIMO radar for human detection and tracking at ISM band in early 2010s. The first system had only two transmission and three reception. Angular resolution of the system was not satisfactory even when we apply the MIMO. For uncorrelated targets, the Khari-Rao virtual array technique in [11] is available for passive arrays. Since human motion arises diverse Doppler, the reflected waves have low correlation. We have modified the Khari-Rao virtual array technique for MIMO radar to enhance effective aperture [12-15]. Figure 2 shows an example of indoor human detection (two persons) by using conventional MIMO and the proposed virtual array techniques. In addition, number of effective elements with two transmitting antennas by the technique is shown in Fig. 3. See [14] for the details.

With progressing Millimeter wave (MW) radar



(a)

(b)

(c)

Fig. 4 2D imaging results for automobile MW radar (squint angle 45 degree). (a) Experimental environment, (b) Real aperture image, (c) SAR image.

system, we can easily obtain a MW-MIMO radar. Researches on application of MIMO radar have been activated. Since micro Doppler by human motion becomes larger in MW radar, the virtual array technique works more effectively [15].

To realize high-resolution imaging radar, SAR for MW Radar is another solution. When we apply the SAR with squint looking MW radar on automobile, 2D imaging can be realized [16]. Figure 4 shows an example of the real-aperture (w/o SAR processing) and SAR imaging results. It will bring us important information that complements the shortcomings of optical camera and LiDAR.

5. Conclusions

I reviewed my almost 30-year research work for array signal processing for antennas and radars. In early radar research, improvement of *detection* performance was the most important issue. This may say *detection* stage. The superresolution technique by using second-order statistics property of targets realizes not only high detection performance independent of SNR but also high resolution estimation. We have been struggling to get better performance beyond the physical limit such as SNR, bandwidth, array elements, and so forth. Deep understandings for physical characteristics of waves is the key to create effective signal processing technique to exceed the limit. We may say this is *estimation* stage.

Now is the stage of *recognition*. We can obtain high-resolution 2D/3D target images showing spatial distribution of targets. In addition, time series of the images, or Doppler history, bring us motion information. These features can realize advanced target recognition and classification. Machine learning is accelerating researches in this field. This is the new Era for sensing. I expect that new sensing applications will be cultivated by the fusion of researchers in various fields.

6. References

[1] H. Yamada, M. Ohmiya, Y. Ogawa, and K. Itoh, “Superresolution techniques for time-domain measurement with a network analyzer,” IEEE Trans. Antennas and Propagat. vol.39, no.2, pp.177-183, Feb. 1991.

[2] H. Yamada, Y. Ogawa, and K. Itoh, “Antenna gain measurements in the presence of unwanted multipath signals using a superresolution technique,” IEICE Trans. Commun., Vol.E76-B, No.6, pp. 694-702, June 1993.

[3] Y. Ogawa, T. Nakajima, H. Yamada and K. Itoh, “Superresolution technique for antenna pattern measurements,” IEICE Trans. Commun., Vol.E76-B, No.12, pp.1532-1538, Dec. 1993.

[4] T. Yamakura, H. Yamada, Y. Yamaguchi, “Resolution improvement of the MUSIC algorithm utilizing two differently polarized antennas,” IEICE Trans. Commun., Vol.E79-B, no.12, pp.1827-1832, Dec. 1996.

[5] T. Naito, H. Yamada, Y. Yamaguchi, “Extended Array Calibration Technique by Using Virtual Elements for DOA Estimation,” Electronic Proc. of ISAP 2008, Taipei, Taiwan, Oct. 2008.

[6] H. Yamada, “Array Calibration Technique for High-Resolution Direction of Arrival Estimation,” IEICE Trans. on Commun. (Japanese), Vol.J92-B, no.9, pp.1308-1321, Sep. 2009.

[7] H. Yamada, Y. Yamaguchi, Y. Kim, E. Rodriguez, Wolfgang-Martin Boerner, “Polarimetric SAR Interferometry for Forest Analysis Based on the ESPRIT Algorithm,” IEICE Trans. Electron., vol.E84-C, No.12, pp.1917-1924, Dec. 2001.

[8] K. Sato, H. Yamada, Y. Yamaguchi, “Advantage of the ESPRIT method in Polarimetric Interferometry for Forest Analysis,” IEICE Trans. Commun., vol.E86-B, no.5, pp.1666-1672, May 2003.

[9] Y. Yamaguchi, T. Moriyama, M. Ishido, H. Yamada, “Four-component scattering model for polarimetric SAR image decomposition,” IEEE Trans. Geosci. Remote Sens., vol.43, no.8, pp.1699-1706, Aug. 2005.

[10] M. Gocho, H. Yamada, M. Arii, S. Kojima, R. Sato, and Yoshio Yamaguchi, “3-D Imaging Using SAR Tomography with Pi-SAR2-X Dataset,” IEICE Transactions on Commun., Vol.E101-B, No.2, pp.409-417, Feb. 2018.

[11] H. Yamada, N. Ozawa, Y. Yamaguchi, K. Hirano, and H. Ito, “Angular Resolution Improvement of Ocean Surface Current Radar Based on the Khatri-Rao Product Array Processing,” IEICE Trans. Commun., Vol.E96-B, no.10, Oct. 2013.

[12] H. Yamada, Y. Wakamatsu, K. Sato, Y. Yamaguchi, “Indoor Human Detection by Using Quasi-MIMO Doppler Radar,” International Workshop on Antenna Technology (iWAT2015), Seoul, Korea, Mar. 2015.

[13] Y. Wakamatsu, H. Yamada, Y. Yamaguchi, “MIMO Doppler Radar Using Khatri-Rao Product Virtual Array for Indoor Human Detection,” IEICE Trans. Commun., Vol.E99-B, No.1, pp.124-133, Jan. 2016.

[14] J. Konishi, H. Yamada, Y. Yamaguchi, “Optimum element arrangements in MIMO radar using Khatri-Rao product virtual array processing,” IEICE Communications Express (ComEX), 2018, vol.7, no.11, pp. 407-414, Nov. 2018.

[15] T. Horiuchi, J. Konishi, H. Yamada, S. Muramatsu, “Indoor Human Tracking with Millimeter-Wave Minimum Redundancy MIMO Radar,” Proc. ISAP2019, p.49, X'ian, China, Oct. 28-30, 2019.

[16] H. Yamada, T. Kobayashi, Y. Yamaguchi, Y. Sugiyama, “High-Resolution 2D SAR Imaging by the Millimeter-Wave Automobile Radar,” Proc. 2017 IEEE Conference on Antenna Measurements & Applications (CAMA2017), Tsukuba, Japan, Dec. 5, 2017.

Cross-disciplinary Research on Cooperation in Heterogeneous Networks

Ryoichi Shinkuma
Graduate School of Informatics, Kyoto University

1. Introduction

It is a great honor to write this article as a new fellow of IEICE. I was awarded a fellowship from IEICE on March 19th, 2020 for my cross-disciplinary research on cooperation in heterogeneous networks. In this article, I will summarize my awarded research and how it will impact the future.

2. Heterogeneous Networks

Heterogeneous networks are beneficial thanks to the diversity of nodes. As Fig. 1 (a) shows, if two nodes have different connectivity, they might help each other to satisfy a requirement in terms of communication speed and range [1]. In Fig. 1 (b), one node has a rich communication resource and the other has a rich computing resource, so they might integrate their resources to satisfy the application requirement [2]. Thus, nodes in a heterogeneous network could produce a kind of "gain" from their diversity through cooperation. However, compared with homogeneous networks, it is not easy to operate heterogeneous networks optimally and efficiently because we need to handle different kinds of devices. In addition, owners of those devices might also be heterogeneous and further complicate the operation of heterogeneous networks if they behave selfishly.

3. Incentive Mechanism for Cooperation in Heterogeneous networks

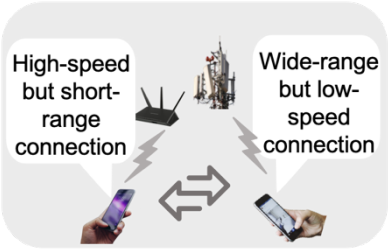
As the author mentioned, a single owner does not operate all the nodes in a heterogeneous network, so cooperation between nodes is essential for optimal and efficient operation. Figure 2 illustrates an incentive mechanism for cooperation [3,4]. First, basically, the utility achieved through cooperation must exceed the cost of motivating nodes to behave cooperatively. However, since this is not always guaranteed, incentive rewarding must be introduced to keep the utility and the given reward greater than the cost of establishing cooperation.

4. Approaches to Solving Cooperation Problems in Heterogeneous Networks

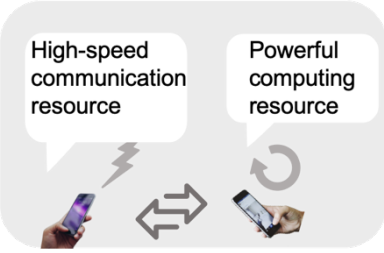
To satisfy the condition to establish cooperation in a heterogeneous network (see previous section), the author came up with several solutions, categorized into four approaches: cost model, utility model, incentive rewarding methods, and cooperation optimality and efficiency. The first approach is modeling the cooperation cost to reduce the overall cost. It is widely known that individuals behave altruistically for those they are socially close to. Inspired by this, the author proposes reducing the psychological cost of cooperation by forming networks based on social relationships [5–7]. The second approach is modeling the utility of cooperation. Although delaying communication requests and moving to a better communication area contribute to offloading in heavily loaded networks [8–11], unfortunately, the benefits for the contributors themselves are indirect and implicit. We need to design the system so that benefits from cooperation become more direct and explicit to encourage cooperation. The third approach is rewarding incentives. Although monetary rewarding is a straightforward way, managing both real and virtual currency is too complicated. Therefore, instead of a monetary reward, the author proposed ways incentive rewarding is achieved in each communication layer from physical to application. In wireless relay networks, nodes that relay data to other nodes can obtain additional bandwidth for their own transmission, which incentivizes nodes to cooperate (Fig. 3) [12]. This idea can be implemented in the physical layer [12], the MAC layer [13], the network layer [14], and the transport layer [15]. In the application layer, gifting additional content with no charge can be a good reward for forwarding content to other nodes in content delivery networks [16]. The fourth approach is ensuring the optimality and efficiency of cooperation. Methodologies from economics such as game theory effectively model and solve the problem formulation [12,14].

5. Conclusion and Future Direction

Before 2000, only servers and personal computers were connected via networks. Around 2005, many kinds of smart devices were connected. Now, in the Internet of Things era, nodes are becoming more diverse in networks day by day. The approaches to cooperation in heterogeneous networks introduced in this article will help researchers and engineers design heterogeneous networks optimally and efficiently. Furthermore, these approaches will be broadly applicable to other fields, such as human-machine cooperation.



(a) Diversity of connectivity



(b) Diversity of resources

Fig. 1 Diversity of nodes in heterogeneous networks.

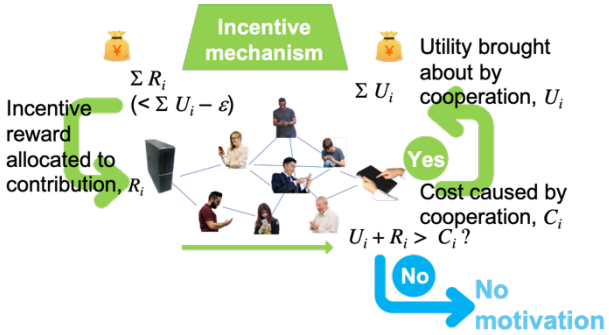


Fig. 2 Incentive mechanism for cooperation.

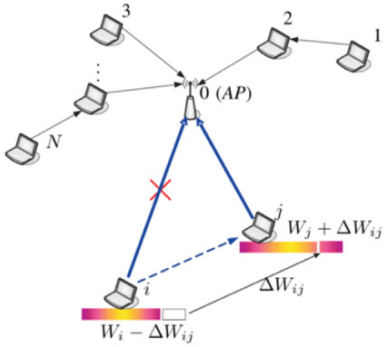


Fig. 3 Bandwidth as incentive reward for relaying.

6. References

[1] M. Yamada, R. Shinkuma, and T. Takahashi, "Cooperative Networking Based on Infrastructure Multihop Architecture in Heterogeneous Mobile Networks," IEICE Trans. Commun., Vol.E89-B, No.10, pp.2763-2773, Oct. 2006.

[2] T. Nishio, R. Shinkuma, T. Takahashi, and N. Mandayam, "Service-Oriented Heterogeneous Resource Sharing for Optimizing Service Latency in Mobile Cloud," Proc. ACM Mobile Cloud'13 in Conjunction with MobiHoc 2013, pp.19-26, July 2013.

[3] (Invited) R. Shinkuma and K. Yamori, "A Dynamic Traffic Control Technique in Communication Networks Using Incentive Engineering," IEICE Technical report, CQ2012-69, Nov. 2012 (Japanese).

[4] M. Yoshino, R. Shinkuma, and T. Takahashi, "Incentive-rewarding mechanism for radio resource control based on users' contributions," Proc. IEEE GLOBECOM 2008, vol. 12, pp. 5042-5046, Dec. 2008.

[5] H. Kubo, R. Shinkuma, and T. Takahashi, "Social Network based P2P Multicast Reducing Psychological Forwarding Cost in Mobile Networks," IEICE Trans. Inf. & Syst., Vol.E93-D, No.12, pp.3260-3268, Dec. 2012.

[6] Y. Inagaki and R. Shinkuma, "Shared-Resource Management Using Online Social-Relationship Metric for Altruistic Device Sharing," IEEE Access, vol. 6, pp. 23191-23201, Apr. 2018.

[7] R. Shinkuma, Y. Sugimoto, and Y. Inagaki, "Weighted network graph for interpersonal communication with temporal regularity," Springer Soft Computing, Nov. 2017.

[8] R. Shinkuma, Y. Tanaka, Y. Yamada, E. Takahashi, and T. Onishi, "User instruction mechanism for temporal traffic smoothing in mobile networks," Elsevier Computer Networks, vol. 137, pp. 17-26, June 2018.

[9] T. Kangawa, M. Yoshino, R. Shinkuna, and T. Takahashi, "Modeling of Utility and Cost and Its Application for User Position Control Based on Radio Channel Quality," IEICE Trans. Communications, vol. J90-B, no. 12, pp. 1263-1273, Dec. 2007 (Japanese).

[10] M. Yoshino, K. Sato, R. Shinkuma, and T. Takahashi, "Incentive-rewarding Mechanism for User-position Control in Mobile Services," IEICE Trans. Commun., vol. E91-B, no. 10, pp. 3132-3140, Oct. 2008.

[11] T. Kakehi, R. Shinkuma, T. Murase, G. Motoyoshi, K. Yamori, and T. Takahashi, "Route Instruction Mechanism for Mobile Users Leveraging Distributed Wireless Resources," IEICE Trans. Commun., vol. E95-B, no. 6, pp. 1965-1973, June 2012.

[12] D. Zhang, R. Shinkuma, and N. Mandayam, "Bandwidth Exchange: An Energy Conserving Incentive Mechanism for Cooperation," IEEE Trans. Wireless Communications, vol. 9, no. 6, pp. 2055-2065, June 2010.

[13] T. Nishio, R. Shinkuma, T. Takahashi, and N. Mandayam, "TXOP Exchange: A Mechanism for Cooperation in CSMA Networks," IEICE Trans. Commun., vol. E95-B, no. 6, pp. 1944-1952, June 2012.

[14] W. Liu, R. Hu, R. Shinkuma, and T. Takahashi, "A Fair Resource Sharing Mechanism between Mobile Virtual Network Operators," IEICE Trans. Commun., vol. E98.B, no. 11, pp. 2141-2150, Nov. 2015.

[15] T. Nishio, R. Shinkuma, T. Takahashi, and G. Hasegawa, "TCP-based Window-size Delegation Method for TXOP Exchange in Wireless Local Area Networks," EURASIP Journal on Wireless Communications and Networking, vol. 2011, no. 1, Aug. 2011.

[16] N. Maki, T. Nishio, R. Shinkuma, T. Mori, N. Kamiyama, R. Kawahara, and T. Takahashi, "Traffic engineering of peer-assisted content delivery network with content-oriented incentive mechanism," IEICE Trans. Inf. & Syst., vol. E95-D, no. 12, pp. 2860-2869, Dec. 2012.

Report on ICM English Session at 2020 IEICE Society Conference – BS-8, Network and Service Design, Control and Management –

Yoichi Yamashita
Session Organizer, NTT Neomeit

1. Introduction

The 2020 IEICE Society Conference was held online September 15-18, 2020, where four Societies of IEICE, Engineering Sciences Society (ESS), Nonlinear Theory and Its Applications Society (NLS), Communications Society (CS), and Electronics Society (ES), joined.

In the Conference, the IEICE Technical Committee on Information Communication Management (ICM) [1] hosted a full English Session entitled "Network and Service Design, Control and Management" as one of eight Symposium Sessions which focused on special topics of advanced technologies.

2. Background of ICM English Session

ICM has been hosting English session every year since 2004. The purpose of this English session is to contribute to the globalization of IEICE by offering the chance of the presentation and discussion in English to the foreign researchers/students living in Japan and the overseas researchers/students.

Figure 1 shows the change in the number of contribution papers since 2004. When the session began in 2004, only 15 papers were submitted. Since then, the number of papers has gradually increased, and it reached 55 papers in 2013. But this year, because of the large negative impact of COVID-19, 13 papers were posted.

The holding period of the session in the 2004 was one and half days, and that in this year was two days.

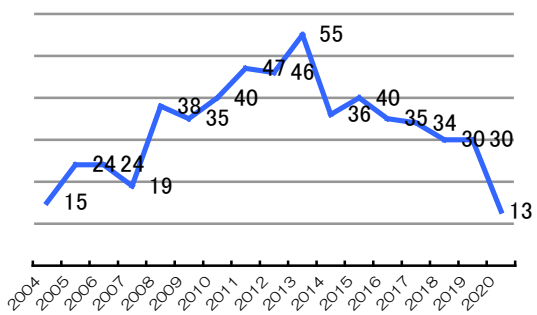


Fig. 1 The number of contribution papers since 2004.

3. Presentations in ICM English Session

The contribution papers were classified into four sub-sessions according to the topics. Various topics are discussed in each sub-session every year.

Figure 2 shows the number of papers corresponding to their topics related to 5G, machine learning (ML)/data analytics, path control theory were presented.

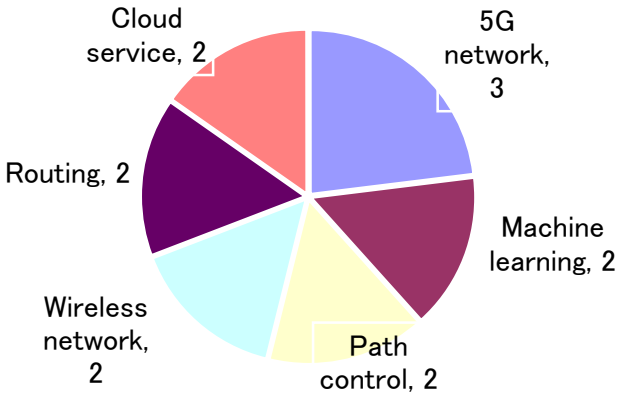


Fig. 2 The number of contribution papers corresponding to their topics.

4. Authors

Figure 3 shows the number of papers corresponding to the categorization of the presenters' affiliations. 85% of the speakers belonged to the university, and remained 15% belongs to the industries. The situation in which the contribution from the university occupied the majority did not change.

Although most of speakers were international students studying in Japan, three presenters were Japanese students or researchers. In this symposium, ICM expects the open contribution from not only the university but also enterprise, and expects the various presenters from not only the international students and the foreign researchers but also Japanese students and researchers, too.

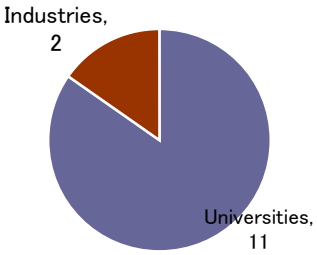


Fig. 3 The number of papers corresponding to the categorization of the speakers' affiliations.

Every speaker and audience enthusiastically discussed ideas and opinions in the time assigned for question and answer. There were many suggestive comments for promotion of research and study.

5. Award of ICM English Session

ICM will select the best papers and award a prize of the session in the near future to encourage their continuous activities. The best papers will be awarded in the upcoming ICM workshop in March 2021.

Table 1 shows the awarded papers presented in the 2019 IEICE Society Conference in March this year [2].

Table 1 English session Awardees of ICM Committee.

Awardees:
Badr Mochizuki (The Kyoto College of Graduate Studies for Informatics), Takuji Tachibana (Univ. of Fukui)
Title:
Online Lightpath Establishment with Expanded/ Contracted Service Provisioning in Elastic Optical Networks

6. ICM Conclusions

ICM English session in 2020 successfully finished with a lot of excellent presentations and a very active discussion. The organizer believes that this session became fruitful for all people and was able to contribute to the globalization of IEICE. He wishes that more papers will be contributed to the session in the next year.

7. Acknowledgements

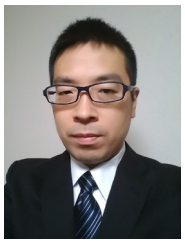
The organizer would like to thank Prof. Yoshiaki Tanaka at Waseda University, who made a great contribution in soliciting papers, utilizing his nation-wide academic authority and human relations. He would also like to thank all the member of the ICM committee, the attendees and everyone who contributed to the discussions and supported the session.

8. References

[1] IEICE ICM Technical Committee web site, https://www.ieice.org/~icm/eng/

[2] Badr Mochizuki and Takuji Tachibana, "Online Lightpath Establishment with Expanded/Contracted Service Provisioning in Elastic Optical Networks," 2019 IEICE Society Conference, BS-4-8, Sep. 2019.

Activities of Technical Committee on Optical Fiber Technologies (OFT)

Hajime Arao* and Yukihiro Goto**
Sumitomo Electric Industries, Ltd.*, NTT**
URL: https://www.ieice.org/~oft/jpn/english.html

1. Introduction

The Optical Fiber Technologies (OFT) committee, which was established in April 1998, is one of the technical committees of the Communications Society of the IEICE. One of the most important aims of our committee is to contribute to technological innovation in relation to optical fiber technologies for the development of industrial applications. We do this by focusing on the technologies from cross-sector viewpoints with reference to communication engineering, measurement technologies, optical devices, and materials. When OFT committee was established, optical fiber was applied in practical use. Since then, there is a great interest in optical fiber application such as sensing, signal processing, energy transport and the progress in the study is expected in the future.

Our topics of interest mainly include optical fiber sensing, optical fiber devices, optical fiber systems, optical fiber wiring/installation, maintenance/operation, and the design of optical fiber/cables. We discuss optical devices that are applied to actual communication equipment. OFT covers research areas ranging from basic optical technology to actual maintenance.

2. OFT Activities in FY 2019

2.1 Technical Meeting

We hold one- or two-day technical meetings six times a year. Many researchers participate in the meetings, and they report their latest results. The schedule in FY 2019, which consists of six regular technical meetings, is shown in Table 1. Three meetings are co-organized with other committees and there were wide range of presentations including optical communication, broadcasting, optoelectronics and laser. Seventy-one papers were presented at our regular meetings in FY 2019.

2.2 Poster Session for Students

We held the poster session for students in the 1st technical meeting (Osaka Prefecture Univ. I-site Namba). The aim is to hold a meeting for students to present easily and to enhance the discussion between students. Excellent presentations are awarded to motivate researchers. There were 18 presentations. This session got a good reputation from presenters and audiences and we also held it in October 2020.

Table 1 Technical meetings schedule for FY 2019.

Date	Venue	Joint committee
2019 5/16-17	Osaka Prefecture Univ. I-site Namba (Osaka)	
2019 8/29-30	Doto Keizai Center Building (Kushiro)	OCS, LSJ
2019 10/11	Ekimae Office Kashikaigishitsu (Niigata)	
2019 11/21-22	Kaikyo Messe Shimonoseki (Shimonoseki)	IEE-CMN, ITE-BCT, OCS
2020 1/16-17	NINS Okazaki Conference Center (Okazaki)	
2020 2/27-28	Okinawa Jichikaikan (Naha)	OPE, OCS

Fig. 1 Student poster session.

2.3 OFT Encouragement Award in 2019

Since the program was launched in 2011, OFT has encouraged the research activities of young researchers. This program has two awards for young researchers and students. The winners of the Young Researcher Award were Yoshifumi Wakisaka (NTT) and Ai Hosoki (NIG) who both presented papers [1, 2]. The winners of the Young Researcher Award for Students were Miyu Okawa (Shimane Univ.) and Shiori Nozawa (Meiji Univ.) who also presented papers [3, 4].

2.4 Special Events of OFT in FY 2019

We also held a tour of Tsutsumi plant, which is an automobile plant of Toyota Motor Corporation, as a special event in the 5th technical meeting in Okazaki. The participants of this tour were excited because they could see the huge facilities that we cannot usually see. In the technical session, we had an invited talk related to optical fiber networks for automobile. We can learn the examples of optical fiber technology which could be applied to automobile.

Fig. 2 Automobile plant tour.

2.5 Activities of IEICE Society and General Conferences

Forty-one papers were presented at the IEICE Society Conference 2019 (September 10th-13th, 2019, Osaka Univ., Osaka). We organized the symposium "Research trend and applications of specialty optical fibers" on 10th September. Eight outstanding speakers were invited, and they gave talks on topics about specialized optical fiber. Another symposium, "Inter-Datacenter Communications and Related Technologies" was organized on 11th September. There were seven invited talks and next generation network for data center was discussed. The IEICE General Conference 2020 was cancelled due to the COVID-19. Twenty five papers would have been presented and the symposium "Progress of optical fiber measurement technology for the next generation industry" if the conference had been held.

3. Technical Meetings in FY 2020

We planned to hold six successive technical meetings. But, unfortunately, 1st meeting was cancelled, and the other meeting will be held remotely due to the COVID-19. We now try to hold a remote meeting so that participants can feel the same as the previous meetings. So we would welcome your submissions to and/or participation in our conferences (https://www.ieice.org/~oft/jpn/english.html).

4. Conclusion

This report has summarized the activities of the Technical Committee on Optical Fiber Technologies. We will continue to contribute to technological innovation in relation to optical fiber technologies. To conclude, we would like to thank all the speakers and participants for their contributions.

5. References

[1] Yoshifumi Wakisaka, et al., "Sensitivity enhancement of phase-OTDR vibration sensing for correctly visualizing optical fiber cable states," IEICE Tech. Rep., vol.119, no.301, OFT2019-45, pp.49-53, Nov. 2019.

[2] Ai Hosoki, et al., "Chemical sensing using a hetero-core optical fiber with lipid membranes," IEICE Tech. Rep., vol.119, no.223, OFT2019-38, pp.33-36, Oct. 2019.

[3] Miyu Okawa, et al., "Comb-like Brillouin spectrum generated by pulse train arranged at power intervals," IEICE Tech. Rep., vol.119, no.301, OFT2019-40, pp.23-27, Nov. 2019.

[4] Shiori Nozawa and Ryu Shiro, " Study of Optical Phase Characteristics of Stokes and Transmitted Light in Fiber Brillouin Scattering," IEICE Tech. Rep., vol.119, no.187, OFT2019-28, pp.23-28, Aug. 2019.

Report on IEEE ICC Workshop on Information-Centric Networking Solutions for Real-world Applications (ICN-SRA)

Hidenori Nakazato
Waseda University

1. Introduction

Workshop on Information Centric Networking Solutions for Real-world Applications (ICN-SRA) was held in conjunction with IEEE International Conference on Communications (ICC) scheduled from 7th to 11th of June 2020. ICN-SRA was organized with support from IEICE Technical Committee on Information Centric Networking. The conference was originally planned to be held in Dublin, Ireland. Due to COVID-19 pandemic, the entire ICC conference was organized in virtual format. In particular, ICN-SRA was held in "on-demand" format throughout the conference period, i.e., ICN-SRA on-demand presentations were made viewable from June 7th to 11th. The authors prepared their presentation videos, and the videos were made viewable at the conference web site during the period.

This ICN-SRA was the fourth reincarnation of the series. The focus of the workshop is research, development, and evaluation of Information Centric Networking (ICN) architecture and technology in real-world applications. ICN is now deployable thanks to implementations such as NFD (Named Data Networking (NDN) [1] Forwarding Daemon), Cefore [2], and CICN [3], and is ready to be used for real-world applications. The workshop targeted to provide a forum for researchers from both academia and industry to demonstrate their recent progress in applying ICN in their problem space as well as identify new opportunities and research gaps.

Sixteen manuscripts were submitted, and eight excellent papers were selected for presentation in the workshop.

2. Program

Due to on-demand format, only paper presentations were scheduled. The presented papers were as follows.

- **Enabling Named Data Networking Forwarder to Work Out-of-the-box at Edge Networks**: Self-configuration mechanism for edge network forwarding plane in NDN was proposed. The mechanism was implemented in NFD.
- **Next-Generation Networking and Edge Computing for Mixed Reality Real-Time Interactive Systems**: The challenges in networking for AR/VR applications are discussed based on analysis of AR/VR network interactions and community survey among AR/VR researchers. Also, an NDN-based framework to address the challenges is proposed.
- **Context-based forwarding for mobile ICNs**: A context-based packet forwarding strategy, exploiting content names and network condition surrounding routers, is proposed to deliver urgent information as well as non-urgent information.
- **NDNViber: Vibration-Assisted Automated Bootstrapping of IoT Devices**: NDNViber which conveys secret information to establish secure communication channel between IoT devices and a controller using vibration as the communication media and NDN protocol is proposed.
- **Leveraging Named Data Networking for Industrial Automation: Opportunities and Challenges**: Application of NDN to industrial automation and control systems is explored and the opportunities and challenges for future research is discussed.
- **NDNconf: Network Management Framework for Named Data Networking**: A management framework and protocol for NDN is proposed. The management framework is an adaptation and extension of NDNCONF.
- **Rapid Establishment of Transient Trust for NDN-Based Vehicular Networks**: Application of Swift Trust model to NDN-base vehicular network is explored.
- **Supporting Delay Tolerant Networking: A Comparative Study of Epidemic Routing and NDN**: Epidemic Routing and NDN are compared in terms of Delay Tolerant Networking support. Simulation results show how the design differences lead to different functionalities and protocol performance.

3. Conclusion

It is pity for not being able to hold face-to-face discussions among researchers in the developing field like ICN. We are hoping to have another workshop face-to-face in a near future. Please join us to discuss networking of the future at the next workshop.

4. References

[1] "Named data networking project website," Last accessed on Nov. 2, 2019. [Online]. Available: https://named-data.net

[2] "Cefore – Information Centric Network Platform webpage," Last accessed on Oct. 7, 2020. [Online]. Available: https://cefore.net

[3] "CICN project," Last accessed on Feb. 2, 2020. [Online]. Available: https: //wiki.fd.io/view/Cicn

Report on the 8th International Conference on Smart Grid (icSmartGrid2020)


Yuji Mizuno* and Nobumasa Matsui**
*Osaka Electro-Communication University
**Nagasaki Institute of Applied Science

1. Introduction

The 8th International Conference on Smart Grid (icSmartGrid2020) was held 17-19th June 2020 at Paris, France. While several international conferences were being canceled one after another due to COVID-19 pandemic all over the world, the icSmartGrid2020 was held online on digital platform. icSmartGrid is the annual world-class technical forum presenting the latest research topics in the smart grid, renewable energy technologies and their applications.

The icSmartGrid2020 is organized the International Journal of Renewable Energy (IJRER). IEEE Industry Applications Society (IAS) and IEEE Industrial Electronics Society (IES) has joined as one of the technical co-sponsors. The IEE-Japan Industry Applications Society Conference (IEEJAS), one of the divisions of the institute of Electrical Engineers of Japan (IEEJ), and the Institute of Electronics and Information and Communication Engineers (IEICE) support the conference in cooperation.

2. Opening Ceremony and Keynote Speeches

The conference program consisted of 5 keynote addresses, 3 tutorials and 7 virtual technical sessions.

On Wednesday morning, the first day of the conference, the opening ceremony was held by General Chair, Prof. Brayima Dakyo, General co-chairs, Prof. Ilhami Colak and Prof. Fujio Kurokawa. After the opening ceremony, two high-profile keynote speakers, Prof. Adel Nasiri, University of Wisconsin-Milwaukee, USA and Mr. Akira Kawaguchi, Vice President of TMEIC, Japan gave keynote speeches.

Firstly, Prof. Adel Nasiri have presented about dual active bridges that are common power electronics building blocks traditionally used in various electrically isolated converter systems. In secondary keynote speech, recent technology trend of industrial power electronics especially on the high capacity in the range of MW have presented by Mr. Akira Kawaguchi.

On Thursday morning, the second day of the conference, in the keynote, Prof. Daniel Hissel, the French National Hydrogen Research Federation (CNRS), France, presented on the theme “Hydrogen economy: myth or reality?”, and the key challenges of cyber security and big data issues on power grid was presented on the theme “Cyber Security and big data perspective for Smart Grid Systems” by Prof. Seref Sagiroglu, Gazi University, Turkey.

On Friday morning, the last day of the conference, in the keynote, Prof. Nouredine Hadj-Said of G2Elab, Domaine Universitaire, France, has presented on the theme “Smartgrids for Energy Transition: from DER integration to system flexibility”.

Each day of the conference, there were three tutorials. Three high-profile tutorial speakers, Dr. Grain Philip Ased, Institute of Energy and Environment, University of Strathclyde, (UK), Dr. Massimo, Caruso Department of Engineering, University of Palermo, Italy, and Prof. Inno Davidson, Durban University of Technology, Durban, South Africa gave keynote speeches. The three speakers have presented about several topics and technologies related to smart energy systems and sources and so on.

3. Technical Program

There were total 57 submissions from 25 countries. 32 oral presentations papers were accepted for presentation by careful peer review process. The technical program was scheduled through Wednesday afternoon and Friday afternoon. Each session was kept to the schedule, and attendances discussed about the interesting subjects, advances and developments in smart grid technologies and their applications. The three best papers selected in a conference proceeding.

4. Conclusions

After the successes of the previous editions of Smart Grids Workshops on behalf of European Commission Joint Research Centre in Antalya in 2013 and 2014, and in February and April 2015, and with technical co-sponsorship of IEEE IES in March 2016 in Istanbul, we are now organizing International Conference on Smart Grid will continue promoting and disseminating the knowledge concerning several topics and technologies related to smart energy systems and sources.

icSmartGrid2021 is still TBD at the moment.

https://www.icsmartgrid.org

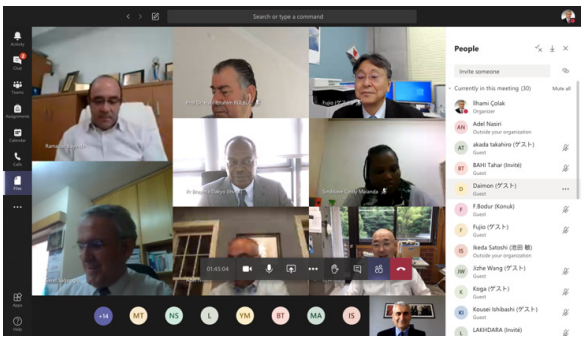


Fig. 1 Capture of icSmartGrid2020 on digital platform.

Report on the 2020 IEEE Summer Topicals Meeting Series: Space Division Multiplexing

Werner Klaus and Georg Rademacher
National Institute of Information and Communications Technology (NICT)

1. Introduction

The IEEE Summer Topicals Meeting Series [www.ieee-sum.org] is held annually in July and serves as an international forum to facilitate information exchange between various technical communities working in rapidly growing areas of technology or on emerging topics related to the general field of Photonics. This year's conference was supposed to be held in the city of Cabo San Lucas in Mexico from July 13th to 15th, however, due to the outbreak of Covid-19, took place in an all-virtual format on the same dates. Historically, the conference hosts 4-7 topics that are proposed by international researchers who also work as topic (co-)chairs if the topic is adopted for the conference. Besides accepting contributed papers, the chairs invite some 20-30 world-renowned experts to present the latest advancements and research results in the respective field. This year's topics were:

- Coherent Optics for Short Reach Network
- Signal Reconstruction Using Photonics
- Silicon Integrated Mid-Infrared Photonics
- Space Division Multiplexing
- Structured Light Interaction with Matter and the Environment

The topical on Space Division Multiplexing was technically co-sponsored by the IEICE Technical Committee on Extremely Advanced Transmission Technologies (EXAT). Due to the special circumstances and the all-virtual format, registration to the conference was free of charge resulting in an unprecedented high number of both total registrations of over 860 and average attendance per technical session of around 70.

2. Background

Space division multiplexing (SDM) is seen as a promising solution to overcome the capacity limit of the single-mode fibers used in today's optical networks. Research in this field aims at exploiting spatial diversity in optical transceivers, fibers, amplifiers, etc. to increase transmission capacity whilst reducing cost, complexity and energy consumption. Intensive research carried out over the past decade has brought forth sophisticated multi-core/multi-mode fiber designs and novel transmission techniques constantly pushing the limits on achievable data rates and spectral efficiency with regard to a single strand of fiber. Recently, efforts are also under way in taking SDM out of the laboratory and bringing it closer to its adoption in commercial systems.

3. Outline of the SDM topical

The goal of this year's SDM topical was threefold: (1) gaining an overview of the state of the art on SDM fibers, devices and systems; (2) stimulating discussions on the challenges that lie ahead for developing and deploying massive parallel transmission systems; and (3) exploring applications of SDM technologies in optics-related research areas other than fiber-optics communications. To achieve this goal, the co-chairs Dr. Georg Rademacher (NICT), Prof. Cristian Antonelli (Univ. L'Aquila) and Dr. Roland Ryf (Nokia Bell Labs) put together a total of 11 exciting 1.5-hour technical sessions over the three days. The sessions comprised 2 tutorials, 23 invited presentations and 3 contributed talks covering areas such the techno-economics as well as nonlinear and quantum properties of SDM fibers, SDM transceivers, amplifiers and networks as well as signal processing and free-space communications. The invited speakers included, among others, Dr. Itsuro Morita (KDDI Research, incumbent chair of EXAT) who presented the latest research activities within the EXAT initiative with a focus on EXAT's Roadmap ver.2 that was released earlier this summer, Prof. Masahiko Jinno (Kagawa Univ.), a world-leading expert on SDM networks, and Dr. Hitoshi Takeshita (NEC) who has been developing efficient multi-core fiber amplifiers. Furthermore, Prof. Kunimasa Saitoh (Hokkaido Univ.) and Dr. Tetsuya Hayashi (Sumitomo Elec.) presented some new insights on the design of randomly-coupled multi-core fibers and experimental measurements on the first field-deployed multi-core fibers. In the first tutorial Prof. Siddharth Ramachandran (Boston University) gave a comprehensive overview on orbital angular momentum modes in optical fibers and how these can be used in telecom and sensing applications. In the second tutorial, Dr. Nicolas Fontaine (Nokia Bell Labs) introduced the latest multimode technologies being employed for free-space communications.

4. Conclusion

Owing to the effort of all speakers preparing presentations of outstanding quality despite the worldwide pandemic, and the possibility to attend the conference for free from anywhere in the world, the SDM topical of the IEEE Summer Topicals 2020 Meeting closed with great success offering ample opportunity for learning as well as exchanging ideas on cutting-edge SDM technologies and the future of optical communications.

IEICE-CS Related Conferences Calendar

Date	Conference Name	Location	Note
3 July - 7 July 2022	27th Optoelectronics and Communications Conference / International Conference on Photonics in Switching and Computing 2022 **(OECC/PSC 2022)**	Toyama, Japan	TBD
28 June - 2 July 2021	International Conference on Network Softwarization 2021 **(NetSoft 2021)**	Tokyo, Japan/Online	Submission due: 14 Dec. 2020
9 June - 11 June 2021	International Symposium on Extremely Advanced Transmission Technologies **(EXAT2021)**	Matsue, Japan	Submission due: 9 Apr. 2020
20 Apr. - 23 Apr. 2021	The 3rd International Conference on Artificial Intelligence in Information and Communication **(ICAIIC2021)**	Jeju Island, Korea	Submission due: 1 Jan. 2021
25 Jan. - 28 Jan. 2021	2020 International Symposium on Antennas and Propagation **(ISAP2020)**	Osaka, Japan	To be held soon
13 Jan. 16 Jan. 2021	The 35th International Conference on Information Networking **(ICOIN 2021)**	Bangkok, Thailand	To be held soon
Postponed to 2021	The 26th Asia-Pacific Conference on Communications **(APCC2020)**	Kuala Lumpur, Malaysia	TBD
14 Dec. - 15 Dec. 2020	International Japan-Africa Conference on Electronics, Communications and Computations 2020 (JAC-ECC 2020)	Virtual Conference	To be held soon
21 Oct. - 23 Oct. 2020	International Conference on Information and Communication Technology Conference 2020 **(ICTC 2020)**	Jeju Island, Korea	Done
19 Oct. - 26 Oct. 2020	The 23rd International Symposium on Wireless Personal Multimedia Communications **(WPMC2020)**	Virtual Edition	Done
4 Oct. - 8 Oct. 2020	2020 Opto-Electronics and Communications Conference **(OECC2020)**	Taipei, Taiwan	Done
27 Sep. - 30 Sep. 2020	International Conference on Renewable Energy Research and Applications 2020 **(ICRERA 2020)**	Glasgow, UK	Done
23 Sep. - 25 Sep. 2020	Asia-Pacific Network Operations and Management Symposium **(APNOMS2020)**	Daegu, Korea	Done
22 Sep. - 24 Sep. 2020	International Telecom Congress ITC 32 **(ITC32)**	Osaka, Japan	Done
13 Jul. - 15 Jul. 2020	2020 IEEE Photonics Society Summer Topicals Meeting Series **(IEEE Summer Topicals 2020)**	Cabo San Lucas, Mexico	**Reported** on this issue
17 Jun. - 19 Jun. 2020	8th International Conference on Smart Grid **(icSmartGrid2020)**	Paris, France	**Reported** on this issue
7 Jun. - 11 Jun. 2020	IEEE ICC Workshop on Information-Centric Networking Solutions for Real-world Applications **(ICN-SRA)**	Virtual Conference	**Reported** on this issue

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

Special Section Calendar of IEICE Transactions on Communications

Issue	Special Section	Note
Sep. 2022	No special section this issue	
Aug. 2022	No special section this issue	
Jul. 2022	No special section this issue	
Jun. 2022	Special Section on Recent Progress in Antennas and Propagation in Conjunction with Main Topics of ISAP2020	Submission due: 15 Jun. 2021
May 2022	No special section this issue	
Apr. 2022	Special Section on Wired-and-Wireless Network System Technologies in Beyond 5G Era	Submission due: 10 May 2021
Mar. 2022	No special section this issue	
Feb. 2022	Special Section on Emerging Communication Technologies in Conjunction with Main Topics of ICETC2020	Submission due: 24 Feb. 2021
Jan. 2022	No special section this issue	
Dec. 2021	Recent Progress in Networking Science and Practice in Conjunction with Main Topics of ITC32	Submission due: 15 Jan. 2021
Nov. 2021	No special section this issue	
Oct. 2021	Special Section on Dynamic Spectrum Sharing for Future Wireless Systems	Submission due: 2 Nov. 2020
Sep. 2021	Special Section on Technology Trials and Proof-of-Concept Activities for 5G Evolution and Beyond	To be issued
Aug. 2021	No special section this issue	
Jul. 2021	Future Directions of Research and Development on Communication Quality	To be issued
Jun. 2021	ICT for Medical, Healthcare and Welfare Applications in Conjunction with Main Topics of ISMICT 2020	To be issued
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	Vol. E103-B, No. 12
Nov. 2020	Opto-electronics and Communications for Future Optical Network	Vol. E103-B, No. 11
Oct. 2020	New Era of Satellite Communication / Broadcasting / Application Technologies	Vol. E103-B, No. 10

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

Call for Papers

Special Section on Dynamic Spectrum Sharing for Future Wireless Systems

The IEICE Transactions on Communications announces that it will publish a special section entitled “Dynamic Spectrum Sharing for Future Wireless Systems” in the **October 2021** issue.

To satisfy increasing demands for wireless communications as infrastructure of IoT, flexible operation of variety of wireless systems is necessary. New wireless systems, such as 5G, support detailed management of radio resources in frequency and time domains. Some of such systems downscale the cell sizes which consequently increases the number of base stations and requires allocation of more frequency. On the other hand, self-operation of wireless systems is recently getting attracted along with the diversification of use cases for wireless communications. For the future of wireless communications, the way to secure more radio resources and utilize them flexibly are the key issue. One of the solutions is dynamic spectrum sharing (DSS), where vacancy of frequency is identified by sensing and database analysis so that other wireless system reuses the frequency. Since R&D activities and experimental demonstrations are now ongoing in the world to establish the technologies including radio regulations, it is the best opportunity at this point of time to share the research results on DSS, investigate its feasibility widely and look for further academic issues. For these reasons, a special section on DSS was planned scheduled to appear in the October 2021 issue.

1. Scope

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

(1) **Principle theories and their application to DSS** (Architectural concept, Machine learning, Artificial intelligence)
(2) **Sensing technologies of DSS** (Distributed sensing, System recognition, Direction measurement, Monitoring system)
(3) **Radio database management of DSS** (Radio resource management, Radio database management, Radio environment recognition, Interference control, Transmission power control)
(4) **Radio system and operation for DSS** (Dynamic spectrum access, Software defined radio, Spectrum shaping, Traffic control, Beam-forming, Interference cancellation, NOMA, Self organized networks, Local 5G, Massive MIMO)
(5) **Experimental demonstration of DSS** (Feasibility experiment, Field test, Application to 5G, Experimental testbed)

A submitted paper should be related to DSS. Otherwise, the editorial committee decides it as out of scope in this special section.

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 **November 2, 2020 (JST)**. Authors should choose the Dynamic Spectrum Sharing for Future Wireless Systems as a "Journal/Section" on the online screen. Do not choose [Regular EB].

Contact point:
Osamu Takyu
Graduate School of Science and Technology, Shinshu University
Tel: +81-26-269-5255, E-mail: sr_ac-eb_dss@mail.ieice.org

3. Special Section Editorial Committee

Guest Editor-in-Chief: Yasushi Yamao (UEC)
Guest Editors: Osamu Takyu (Shinshu Univ.) Kentaro Ishizu (NICT)
Guest Associate Editors: Atsushi Nagate (Softbank), Atsushi Yamaoka (Toshiba Wireless Lab), Doohwan Lee (NTT), Khanh Tran Gia (TiTech), Mai Ohta (Fukuoka Univ.), Minseok Kim (Niigata Univ.), Suguru Kameda (Tohoku Univ.), Taichi Ohtsuji (NEC), Takayuki Nishio (Kyoto Univ.), Toshiyuki Saito (Hitachi)

* Authors must agree to the "Copyright Transfer and Page Charge Agreement" via electronic submission.
* Upon accepted for publication, all authors, including authors of invited papers, should pay the page charges covering the partial cost of publication around April 2021. For detailed information, please visit https://www.ieice.org/eng/shiori/page2_cs.html#5
* 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/join/member.html
* The accepted papers 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:
Yuichi Ohsita
Osaka University
Tel: +81-6-6879-4542, E-mail: eb-itc2021@mail.ieice.org

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),

* Authors must agree to the "Copyright Transfer and Page Charge Agreement" via electronic submission.
* Upon accepted for publication, all authors, including authors of invited papers, should pay for the page charges covering partial cost of publications around June 2021. For detailed information, please visit https://www.ieice.org/eng/shiori/page2_cs.html#5
* 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/join/member.html
* 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 Emerging Communication Technologies in Conjunction with Main Topics of ICETC2020 —

The IEICE Transactions on Communications announces that it will publish a special section entitled "Special Section on Emerging Communication Technologies in Conjunction with Main Topics of ICETC2020" in February 2022.

The 2020 International Conference on Emerging Technologies for Communications (ICETC2020) will be held as a virtual conference on December 2nd-4th, 2020. This is the first international conference on all the technical fields covered by IEICE Communication Society. The objectives of the conference are synergistic effects beyond the technical fields, expansion of research areas and development of young researchers. This international conference is a place for discussions; therefore, not only recent research results but also preliminary results at initial stage on a research are welcomed. ICETC2020 has two special sections of online journals, which are in the IEICE Transactions on Communications (Trans-B), and in the IEICE Communications Express (ComEX).

This special section strongly encourages the presenters and co-authors at ICETC2020 to submit your papers to promote the publication of extended version of your papers. The paper submission is not limited to the authors of ICETC2020.

1. Scope

The scope of this special section includes, but is not limited to, the following topics:

- Antennas and Propagation
- Internet Architecture
- Space, Aeronautical and Navigational Electronics
- Satellite Telecommunications
- Electromagnetic Compatibility
- Communication Quality
- Information and Communication Management
- Information Networks
- Smart Radio
- Short Range Wireless Communications
- Sensor Network and Mobile Intelligence
- Communication Systems
- Energy Engineering in Electronics and Communications
- Network Systems
- Optical Communication Systems
- Optical Fiber Technology
- Photonic Network
- Standardization & Innovation in ICT Technologies
- Radio Communication Systems
- Wireless Power Transmission
- RFID networking
- Extremely advanced Optical Transmission
- Information Network Science
- Photonics-applied Electromagnetic Measurement
- Information-Centric Networking
- Digital Service and Platform Technology
- Underwater Technologies

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 **February 24, 2021 (JST)**. Authors should choose the Emerging Communication Technologies in Conjunction with Main Topics of ICETC2020 as a "Journal/Section" on the online screen. Do not choose [Regular EB]. Be sure to submit to the journal of your choice (Trans-B or ComEX).

Contact point:
Yohei Hasegawa
NEC
Email: eb-icetc2020@mail.ieice.org

3. Special Section Editorial Committee

Guest Editor-in-Chief: Tomoaki Ohtsuki (Keio. Univ.)
Guest Editors: Yuichi Kimura (Saitama Univ.), Yohei Hasegawa (NEC)
Guest Associate Editors: Daisuke Anzai (Nagoya Institute of Technology), Satoshi Ohtsu (NTT Facilities Research Institute), Tatsuki Okuyama (NTT Docomo), Kenji Kanai (Waseda Univ.), Naoki Kita (NTT), Tomotaka Kimura (Doshisha Univ.), Kazuya Suzuki (Akita prefectural Univ.), Ken Tanizawa (Tamagawa Univ.), Tazuko Tomioka (Toshiba), Takuya Fujihashi (Osaka Univ.), Tetsuya Yamamoto (Panasonic)

* Authors must agree to the "Copyright Transfer and Page Charge Agreement" via electronic submission.
* Upon accepted for publication, all authors, including authors of invited papers, should pay the page charges covering the partial cost of publication around Feb 2022. For detailed information, please visit https://www.ieice.org/eng/shiori/page2_cs.html#5
* 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_r/join/individual_member.html
* The accepted papers 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 Wired-and-Wireless Network System Technologies in Beyond 5G Era -------

The IEICE Transactions on Communications announces that it will publish a special section entitled "Special Section on Wired-and-Wireless Network System Technologies in Beyond 5G Era" in the April 2022 issue**.**

Studies on advanced wired-and-wireless network system technologies for beyond 5G era are in progress, and with the flexible network infrastructures supporting the creation of various application services, it is expected to solve social issues such as declining birthrate and aging population, energy depletion, and serious natural disasters. In Society 5.0, information networks are expected to contribute to economic development as well as solving such social issues by the advanced fusion of cyber and physical spaces. In order to realize such expectations, it is essential to establish wired-and-wireless network system technologies that create innovative value such as zero touch and infinite frontier, in addition to the advancement of existing technologies for larger capacity, power saving, ultra-low latency, flexibility, high efficiency, safety and reliability. Furthermore, artificial intelligence (AI)/machine learning (ML) techniques are expected to play an important role for establishing such network systems.

In order to further promote the above-mentioned researches of networks beyond 5G era, we thus call publications (scheduled to appear in the April 2022 issue) to discuss and develop wired-and-wireless network system technologies including beyond 5G/6G networks, AI/ML, 5G/local 5G, LTE/4G, network virtualization/softwarization/programmability, network slicing, cloud/edge/fog computing, cyber-physical system (CPS), Internet of Things/Everything (IoT/IoE:IoX), optical network architecture, wireless access/core network, as well as promising application fields such as utilization of data, security/privacy, cooperation in different fields, and so on.

1. Scope

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

- Artificial Intelligence (AI)/ Machine Learning (ML)-based Techniques
- Cyber-Physical System (CPS)
- Internet of Things/Everything (IoT/IoE:IoX)
- Beyond 5G/6G
- 5G/Local 5G
- LTE/4G
- Network Function Virtualization (NFV)
- Network Slicing
- Software-Defined-Network (SDN)
- Network Softwarization
- Network Programmability
- Big Data
- (Multi/Mobile) Edge Computing
- Fog Computing
- Cloud Networking
- Future Network Architecture
- Network Infrastructure
- Fault Tolerance
- Wireless Access/Core Network
- Mobile Networks and Mobility
- Optical Network Architecture
- Routers, Middleboxes, End-host Network Stacks
- Information-Centric Network (ICN)
- Energy-Efficient/Green Network
- Cross Field Cooperation
- Security/Privacy
- Theory/Simulation/Experiments
- Measurements
- Deployment and Experience

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 **10th May 2021 (JST)**. Authors should choose the Wired-and-Wireless Network System Technologies in Beyond 5G Era as a "Journal/Section" on the online screen. Do not choose [Regular EB].

Contact point:
Yosuke Tanigawa
Department of Computer Science and Intelligent Systems, Osaka Prefecture University
Tel: +81-72-254-9275, E-mail: ns-ss2021-kanji@mail.ieice.org

3. Special Section Editorial Committee

Guest Editor-in-Chief: Akihiro Nakao (The Univ. of Tokyo)
Guest Editors: Masahiro Yoshida (Chuo Univ.), Yosuke Tanigawa (Osaka Prefecture Univ.)
Guest Associate Editors: Shin'ichi Arakawa (Osaka Univ.), Satoru Izumi (National Institute of Tech., Sendai Coll.), Ved Prasad Kafle (NICT), Kenji Kanai (Waseda Univ.), Shinya Kawano (NTT), Yoshihiro Nakahira (OKI), Kosuke Sanada (Mie Univ.), Daisuke Takita (Mitsubishi Electric Corp.), Kohei Watabe (Nagaoka Univ. of Tech.), Saneyasu Yamaguchi (Kogakuin Univ.)

* Authors must agree to the "Copyright Transfer and Page Charge Agreement" via electronic submission.
* Upon accepted for publication, all authors, including authors of invited papers, should pay the page charges covering the partial cost of publication around October 2021. For detailed information, please visit https://www.ieice.org/eng/shiori/page2_cs.html#5
* 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/join/member.html
* The accepted papers 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 Antennas and Propagation in Conjunction with Main Topics of ISAP2020 -------

The IEICE Transactions on Communications announces that it will publish a special section entitled "Special Section on Recent Progress in Antennas and Propagation in Conjunction with Main Topics of ISAP2020" in **June 2022.**
The objective of this special section is to discuss the antenna and propagation technologies related to progressing technologies for 5G mobile communication systems, MIMO, PAN/BAN, and wireless power transmission and so on. The 2020 International Symposium on Antennas and Propagation (ISAP2020) will be held in Osaka, Japan during January 25 – 28, 2021, which aims at providing an international forum for exchanging information on such progress of research and development in antennas, propagation, electromagnetic wave theory, and the related fields. By taking this opportunity the special section has been planned to publish papers on advanced technologies in antennas, propagation and the related fields. The special section seeks for submission particularly from, but not limited to, the authors of ISAP2020.

1. Scope

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

Antennas
- Small Antennas and RF Sensors
- Antennas for Mobile and Wireless Applications
- Broadband and Multi-band Antennas
- Tunable and Reconfigurable Antennas
- 2D and 3D Printed Antennas and Arrays
- Millimeter-wave, THz and Optical Antennas
- Active and On-Chip Antennas
- Adaptive and Smart Antennas
- Antenna Theory and Design
- Antenna Measurements
- Other related topics

Propagation
- Indoor and Mobile Propagation
- Millimeter-wave, THz and Optical propagation
- Machine-to-Machine/Infrastructure Propagation
- Channel Sounding and Channel Estimation
- Propagation Measurement Techniques
- Terrestrial, Earth-Space, and Ionospheric Propagation
- Propagation Fundamentals,
- DOA Estimation
- Remote Sensing and Radar
- Other related topics

Electromagnetic-wave Theory
- Computational Electromagnetics
- Optimization Methods in EM Problems
- Frequency Selective Surfaces and Filters
- EBG, Metamaterials, and Applications
- Time-Domain Techniques
- Scattering, Diffraction, and RCS
- Inverse and Imaging Techniques
- Passive and Active Components
- Nano-Electromagnetics
- Other related topics

AP-related Topics
- MIMO and Its Applications
- Antenna Systems for Mobile Communications
- Broadcasting and Receiving Technologies
- Wireless Power Transfer Technologies
- Wearable Device Networks and Medical Applications
- Sensor Networks and Adhoc Systems
- RFID and Applications,
- EMC/EMI Technologies
- Other related topics

2. Submission Instructions

The standard number of pages is 8. The page charges are considerably higher for extra pages. Submissions of "letters" are not accepted. 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 period 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 only papers by electronic submission. Submit a manuscript and electronic source files (LaTeX/Word files, figures, authors' photos and biography) via the IEICE Web site https://review.ieice.org/regist/regist_baseinfo_e.aspx **by June 15th, 2021 (JST)**. Authors should choose the Recent Progress in Antennas and Propagation in Conjunction with Main Topics of ISAP2020 as a "Journal/Section" on the online screen. Do not choose [Regular-EB].

Contact Person: Kunio Sakakibara
Nagoya Institute of Technology
Tel: +81-52-735-5416, Email: ap_ac-isap2020ss@mail.ieice.org

3. Special Section Editorial Committee

Guest Editor-in-Chief: Hiroyoshi Yamada (Niigata Univ.)
Guest Editors: Manabu Yamamoto (Hokkaido Univ.), Kunio Sakakibara (Nagoya Inst. of Tech.)
Guest Associate Editors: Michitaka Ameya (AIST), Koichi Ichige (Yokohama Natl. Univ.), Shinichi Ichitsubo (Kyushu Inst. of Tech.), Minseok Kim (Niigata Univ.), Yuichi Kimura (Saitama Univ.), Keizo Cho (Chiba Inst. of Tech.), Toshihiko Nishimura (Hokkaido Univ.), Kentaro Nishimori (Niigata Univ.), Takafumi Fujimoto (Nagasaki Univ.), Naoki Honma (Iwate Univ.), Naobumi Michishita (Natl. Defense Acad.)

* Authors must agree to the "Copyright Transfer and Page Charge Agreement" via electric submission.
* Upon accepted for publication, all authors, including authors of invited papers, should pay the page charges covering the partial cost of publication around December 2021. For detailed information, please visit https://www.ieice.org/eng/shiori/page2_cs.html#5
* 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 the web-page, https://www.ieice.org/eng/join/member.html.
* 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 on Advanced Communication Technologies in Conjunction with Main Topics of ICETC2020 -------

The IEICE Communications Express (ComEX) announces that it will publish a special cluster entitled "Special Cluster on Advanced Communication Technologies in Conjunction with Main Topics of ICETC2020" in **August 2021**.

The 2020 International Conference on Emerging Technologies for Communications (ICETC2020) as a virtual conference, December 2nd-4th, 2020. This is the first international conference on all the technical fields covered by IEICE Communication Society. The objectives of the conference are synergistic effects beyond the technical fields, expansion of research areas and development of young researchers. This international conference is a place for discussions; therefore, not only recent research results but also preliminary results at initial stage on a research are welcomed.

This special cluster strongly encourages the presenters and co-authors at ICETC2020 to submit your papers to promote the publication of extended version of your papers. The paper submission is not limited to the authors of ICETC2020.

1. Scope

The scope of this special cluster includes, but is not limited to, the following topics:

- Antennas and Propagation
- Electromagnetic Compatibility
- Space, Aeronautical and Navigational Electronics
- Smart Radio
- Communication Systems
- Optical Fiber Technology
- Healthcare and Medical Information Communication Technology
- Wireless Power Transmission
- Information-Centric Networking
- Internet Architecture
- Communication Quality
- Information and Communication Management
- Short Range Wireless Communications
- Network Systems
- Photonic Network
- Standardization & Innovation in ICT Technologies
- Network Virtualization
- Digital Service and Platform Technology
- Satellite Telecommunications
- Information Networks
- Energy Engineering in Electronics and Communications
- Sensor Network and Mobile Intelligence
- Optical Communication Systems
- Radio Communication Systems
- Photonics-applied Electromagnetic Measurement
- Extremely advanced Optical Transmission
- Underwater Technologies

2. Schedule

Two submission periods are prepared for this special cluster, and the deadlines are set as:

First deadline: January 4th, 2021 (JST) (Submission will open about one month prior to the first deadline.)
Second deadline: February 16th, 2021 (JST) (Submission will open about three weeks prior to the second deadline.)

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, https://www.ieice.org/publications/comex/data/for_authors.html. In particular, please refer to the section of "Originality of manuscript". Review process will begin immediately after submission. The notification of review evaluation for the letter submitted in the first submission period and that in the second one will be sent by January 25th, 2021 and March 9th, 2021, respectively. It is allowed that authors submit a revised version of the letter, which is rejected in the first submission period, in the second submission period. All the accepted papers will appear on the IEICE ComEX web site immediately as pre-print version of the manuscripts posterior to the notification of acceptance. The publication date of the special cluster is fixed at August 1st, 2021.

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 [Advanced Communication Technologies in Conjunction with Main Topics of ICETC2020] as a "Journal/Section" on the online screen. Do not choose [Regular-XB].

Contact Person: Takuji Tachibana
Graduate School of Engineering, University of Fukui
Email: comex-ss-icetc2020@ieice.org

4. Special Cluster Editorial Committee

Guest Editor-in-Chief: Masaharu Takahashi (Chiba Univ.)
Guest Editors: Hiroaki Morino (Shibaura Inst. Tech.), Takuji Tachibana (Univ. Fukui)
Guest Associate Editors: Kazuhiko Aikawa (Fujikura Ltd.), Mikio Hasegawa (Tokyo Univ. of Sci.), Katsuyoshi Iida (Hokkaido Univ.), Yuki Inoue (NTT Docomo, Inc.), Toshinori Kagawa (CRIEPI), Megumi Kaneko (NII), Nobuhiko Miki (Kagawa Univ.), Kimihiro Mizutani (Kindai Univ.), Keisuke Noguchi (Kanazawa Inst. of Tech.), Takuya Sakamoto (Kyoto Univ.), Hiroo Sekiya (Chiba Univ.), Hidehisa Shiomi (Osaka Univ.), Celimuge Wu (Univ. of Electro-Commun.), Saneyasu Yamaguchi (Kogakuin Univ.)

* Authors must agree to the "Copyright Transfer and Page Charge Agreement" via electric submission.
* Please note that if accepted, all authors are requested to pay for the article charges.
* At least one of the authors must be an IEICE member when the manuscript is submitted for review. We recommend that authors unaffiliated with IEICE apply for membership. For membership applications, please visit the web-page, https://www.ieice.org/eng/join/member.html.

From Editor's Desk

●GNL will go online

As announced in previous issues, GNL will be published fully online from next issue. Advance publications will be newly available every month in addition to the regular publications on our web site, which will be renewed on coming February or earlier. Stay tuned.

●IEICE General Conference 2021

IEICE General Conference 2021 will be held online, from 9th to 12th of March 2021. Complete English sessions are also scheduled in the conference. Please check out the latest conference information on the IEICE web site.
https://www.ieice-taikai.jp/2021general/en/index.html

●Season's Greetings from New Editor

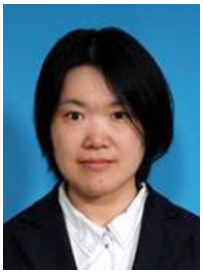
Hi. My name is Kaoru Yokoo. I was appointed as the director of planning and member activities of IEICE Communication Society this June, and have been working as a staff of GLOBAL NEWS LETETR(GNL) editorial team. It is my honor to deliver profitable and attractive contents to you through GNL.
We have successfully published GNL four times in 2020, we thank all authors and readers for great contributions. We are facing a difficult situation due to COVID-19, we will get through this together.

We welcome your contribution of article submissions to GNL. For article submission, please refer to the Submission Guideline of IEICE-CS GLOBAL NEWSLETTER:
[ENG] http://www.ieice.org/cs/pub/global_howto.html
[JPN] http://www.ieice.org/cs/jpn/pub/global_howto.html

IEICE-CS GLOBAL NEWSLETTER Editorial Staff

Editorial Staff of this issue

No special order is observed.



Nazuki HONDA
Nippon Telegraph and Telephone Corporation
Access Network Service Systems Laboratories
Director, Planning and Member Activities, IEICE Communications Society

Kaoru YOKOO
Fujitsu Laboratories, Ltd.
Digital Innovation Core Unit
Director, Planning and Member Activities, IEICE Communications Society

Yohei KOGA
Fujitsu Connected Technologies, Ltd.
Platform Development Div.
Director, International Publication, IEICE Communications Society

The Institute of Electronics, Information and Communication Engineers (IEICE)
Communications Society

About Communications Society

IEICE Communications Society shall endeavor to facilitate research and investigation activities in the field of communications, and to contribute to research activities through cooperation with other societies, in order to promote the development of science and technology in this field.

◆ Technical Committees

Twenty regular technical committees, seven ad hoc technical committees and one special ad hoc technical committee carry out research activities. The following is a list of the technical committees.

Regular Technical Committees

- Antennas and Propagation (AP)
- Internet Architecture (IA)
- Space, Aeronautical and Navigational Electronics (SANE)
- Satellite Telecommunications (SAT)
- Electromagnetic Compatibility (EMCJ)
- Communication Quality (CQ)
- Information and Communication Management (ICM)
- Information Networks (IN)
- Smart Radio (SR)
- Short Range Wireless Communications (SRW)
- Communication Systems (CS)
- Energy Engineering in Electronics and Communications (EE)
- Network Systems (NS)
- Optical Communication Systems (OCS)
- Optical Fiber Technology (OFT)
- Photonic Network (PN)
- Healthcare and Medical Information Communication Technology (MICT)
- Radio Communication Systems (RCS)
- Wireless Power Transmission (WPT)
- Sensor Network and Mobile Intelligence (SeMI) (Joint committees of ASN/MoNA)

Ad Hoc Technical Committees

- Standardization & Innovation in ICT Technologies (SIIT)
- Extremely Advanced Optical Transmission (EXAT)
- Network Virtualization (NV)
- Photonics-applied Electromagnetic Measurement (PEM)
- Information-Centric Networking (ICN)
- Networked Digital Service Platform (DPF)
- Underwater Wireless Technology (UWT)

Special Ad Hoc Technical Committees

- Multiple Innovative Kenkyu-kai Association for wireless communications (MIKA)

◆ Publications

IEICE Transactions on Communication

The IEICE Transactions on Communications (English and Japanese editions) are published monthly.

The impact factor of IEICE Transactions on Communications (English edition) was 0.580 in 2018.

https://www.ieice.org/cs/jpn/EB/index.html

Document date: 2020.4 © 2020 IEICE All Rights Reserved

IEICE Communications Express (ComEX)

IEICE Communications Express (ComEX) is an online letter journal, where researchers can exchange new topics easily and in a timely manner.

You can download PDF files from the ComEX site.

https://www.ieice.org/publications/comex/

Magazines

➢ GLOBAL NEWSLETTER (GNL)

GLOBAL NEWSLETTER (GNL) exchanges information on global activity between overseas/foreign members and other members in IEICE-CS.

GNL is published every March, June, September, and December.

https://www.ieice.org/cs/pub/global_news.html

➢ Communications Society Magazine "B-plus"

The Communications Society Magazine (Japanese edition only) "B-plus" provides technical reviews, surveys, practical topics, etc. "B-plus" is published quarterly in Japanese. The electronic version has been accessible free of charge since March 2015.

https://www.ieice.org/~cs-edit/magazine/

◆ Membership Services

Technical Report Archives

Technical Report Archives is an archive of all the technical reports of IEICE-CS published more than one month ago. It is part of the IEICE Technical Report Online System.

Email News

We call for papers of transactions and international conferences, as well as technical workshops from CS members by email.

◆ Sister Societies

Communications Society has sister-society agreements with the following six overseas societies.

- IEEE Communications Society (ComSoc)
- Informationstechnische Gesellschaft within The Verband Der Elektrotechnik Elektronik Informationstechnik (VDE/ITG)
- Korean Institute of Electromagnetic Engineering and Science (KIEES)
- The Korean Institute of Communications and Information Sciences (KICS)
- China Institute of Communications (CIC)
- IEEE Electromagnetic Compatibility Society (EMCS)

© 2020 IEICE All Rights Reserved

IEICE Overseas Membership Application Form

URL http://www.ieice.org/eng/member/OM-appli.html **E-mail** member@ieice.org **FAX** +81-3-3433-6659

◆ **Please type or print in English. The deadline for submitting application form is the 1st day of every month.**

Personal Information

Full name: _____ ***Nationality:*** _____ ☐Male ☐Female
First name Middle name Last name

☐Prof. ☐Dr. ☐Mr. ☐Ms. ***Place of birth:*** _____ ***Date of birth:*** _____
Day Month Year

Mailing Address ☐Home ☐Office

Name of Company/School/College Department/Section

Street City State/Province

Postal code Country

TEL FAX E-mail

Academic Background The highest academic degree: ☐Ph.D. ☐Masters ☐Bachelors ☐Others: _____

University/college/school of the highest academic degree Month & year of graduation

(For Student Member) Academic degree which will be conferred on you Month & year when the degree will be conferred on you

Application Information

Membership: I want to apply for the following membership (check one item!)

☐Member (Overseas) ☐Student Member (Overseas)

◆If you want to apply for OMDP, please check; ☐OMDP (Overseas Membership Development Program)

Society registration (Membership fee includes one Society of Transaction of Online version.):

☐A: Engineering Sciences ☐B: Communications ☐C: Electronics ☐D: Information and Systems

Additional Society (optional): ☐A: Engineering Sciences ☐B: Communications ☐C: Electronics ☐D: Information and Systems

Additional Transactions of paper version (optional):

☐EA: Fundamentals ☐EB: Communications ☐EC: Electronics ☐ED: Information and Systems

☐A: Fundamentals (Japanese) ☐B: Communications (Japanese) ☐C: Electronics (Japanese) ☐D: Information and Systems (Japanese)

Journal subscription (optional): ☐(Japanese)

Remittance Remittance is available only in *Japanese yen* by a *credit card*.

Admission charge……¥_____ Journal subscription (optional)……..¥ _____

Annual charge……¥_____ Mailing option: ☐Air mail……..……¥ _____

Additional Society (optional) …… ¥_____ ☐SAL mail……¥ _____

Additional Transactions (optional)……..…¥_____ **Total……..……¥** _____

Credit Card: ☐UC ☐Master Card ☐VISA ☐JCB ☐American Express

Card number: | | | | | | | | | | | | | | | | |

Expiry date: _____/_____ Credit Card Holder: _____ Signature: _____
Year Month

Endorsement *Endorsements by one IEICE Member application is required. If it is difficult to find endorsers, please contact the IEICE Membership Activities Section by sending this sheet, and we will help you.*

I recommend this applicant for IEICE membership.

Endorser's name Membership number Endorser's signature Date

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

IEICE Communications Society

IEICE General Conference 2021

9-12 March 2021
Online Conference

Every spring, the four Societies, together with the Human communications Group, jointly hold a General Conference to provide a forum where members can present their study results and exchange views. Besides the presentation of papers, there are special events, conferment ceremonies of Young Investigators Awards, and a social party. The Communications Society holds English-language sessions as well.

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

https://www.ieice-taikai.jp/2021general/en/index.html

Kikai-Shinko-Kaikan Bldg.,5-8, Shiba-Koen, 3, Minato-ku, Tokyo, 105-0011, JAPAN
Web: http://www.ieice.org TEL: +81-3-3433-6691 FAX: +81-3-3433-6659
IEICE Communications Society: cs-secretariat@ieice.org