External Awards

ICC 2014 Best Paper Award
Winner: Shohei Kamamura, Daisaku Shimazaki, Yoshihiko Uematsu, Koichi Genda, and Koji Sasayama, NTT Network Service Systems Laboratories
Date: June 14, 2014
Organization: Institute of Electrical and Electronics Engineers (IEEE)

For "Multi-staged Network Restoration from Massive Failures Considering Transition Risks".

In a scenario of restoration from massive failures, a network is repaired through multiple restoration stages because the availability of repair resources is limited. In a practical case, a network operator should assure the reachability of important traffic in transient stages, even as risks and/or operational overheads caused by stage transitions are suppressed. We discuss the novel problem of optimizing both traffic recovery ratio and transition risks caused by path switching operations. We formulate our problem as a linear programming problem and show that it obtains pareto-optimal solutions of traffic recovery versus transition risks. We also propose a heuristic algorithm for applying networks consisting of a few hundred nodes. The algorithm was able to produce sub-optimal solutions within a 4% difference from optimal solutions.

Published as: S. Kamamura, D. Shimazaki, Y. Uematsu, K. Genda, and K. Sasayama, "Multi-staged Network Restoration from Massive Failures Considering Transition Risks," Proc. of the IEEE International Conference on Communications (ICC) 2014, pp. 1314–1319, Sydney, Australia, June 2014.

Poster Presentation: Honorable Mention
Winner: Scinob Kuroki, Junji Watanabe, and Shin'ya Nishida, NTT Communication Science Laboratories
Date: June 26, 2014
Organization: EuroHaptics Society

For "Vibrotactile Frequency Discrimination Performance with Cross-channel Distractors".

Best Demonstration Award
Winner: Tomohiro Amemiya and Hiroaki Gomi, NTT Communication Science Laboratories
Date: June 26, 2014
Organization: EuroHaptics Society

For "Distinct Pseudo-attraction Force Sensation by a Thumb-sized Vibrator that Oscillates Asymmetrically".

Papers Published in Technical Journals and Conference Proceedings

Interference-aware Channel Segregation Based Dynamic Channel Assignment Using SNR-based Transmit Power Control
Y. Matsumura, K. Temma, K. Ishihara, B.A.H.S. Abeysekera, T. Kumagai, and F. Adachi
Proc. of ISPACS (International Symposium on Intelligent Signal Processing and Communications Systems) 2013, pp. 792–796, Naha, Japan, November 2013.

In any wireless network, the same channel must be reused at spatially separated access points or base stations and hence, the co-channel interference (CCI) limits the transmission quality. Therefore, it is very important to reuse the channels so as to minimize the CCIs. We recently proposed an interference-aware channel segregation based dynamic channel assignment (CS-DCA), which can form a stable channel reuse pattern in a distributed manner. The use of transmit power control (TPC) can avoid the excessive transmit power and hence, contributes to reducing the CCI. An interesting question is if the interference-aware CS-DCA can form a stable channel reuse pattern when TPC is used. In this paper, we give an answer to this question and show by computer simulation that a stable channel reuse pattern can be formed even if TPC is used and that the transmit power can be significantly reduced.

Wide-area Centralized Radio Resource Management for DCF-based Multi-hop Ad hoc Wireless Networks
S. Sampei, W. Jiang, S. Miyamoto, and N. Hayata
Proc. of ICNC (International Conference on Computing, Networking and Communications) 2014, pp. 710–715, Honolulu, HI, USA, February 2014.

This paper proposes a novel medium access control protocol that enables a wide area centralized radio resource management in a distributed coordination function (DCF)-based multi-hop wireless network.

A Novel Elastic Optical Path Network that Utilizes Bitrate-specific Anchored Frequency Slot Arrangement

Z. Shen, H. Hasegawa, K. Sato, T. Tanaka, and A. Hirano

Optics Express, Vol. 22, No. 3, pp. 3169–3179, February 2014.

We propose a novel elastic optical path network where each specific bitrate signal uses its own dedicated fixed grid and one edge of its frequency grid is anchored at a specific frequency. Numerical evaluations using various bitrate signal patterns and network topologies show that the network proposal can almost match the performance of conventional flexible grid networks, while greatly mitigating the hardware requirements: it allows the use of the tunable filters for the fixed grid systems.

Interoperability Enhancement for Realizing the Virtualization of Sensors for Smart Cities

H. Maeomichi and A. Tsutsui

Proc. of the IEEE World Forum on Internet of Things, pp. 365–366, Seoul, Korea, March 2014.

We discuss interoperability enhancement for sensor virtualization for smart cities. We propose a model of metadata and data conversion components for interoperability enhancement and introduce our research approach.

100 Gbit/s DP-QPSK Transmission over a 32 km Legacy Multi-mode GI Fiber Using a Real-time Digital Coherent Transceiver

T. Hirooka, M. Nakazawa, T. Komukai, and T. Sakano

Proc. of OFC (Optical Fiber Communication Conference and Exposition) 2014, W2A.1, San Francisco, CA, USA, March 2014.

We demonstrate a 100-Gbit/s real-time digital coherent transmission over a 32-km GI-MMF (graded-index multimode fiber) with a 62.5-μm core diameter. The DSP enables the optical channel to be switched from SMF (single mode fiber) to GIF within 70 ms.

Network-controlled Channel Allocation Scheme for IEEE 802.11 Wireless LANs: Experimental and Simulation Study

B.A.H.S. Abeysekera, K. Ishihara, Y. Inoue, and M. Mizoguchi

Proc. of 2014 IEEE 79th Vehicular Technology Conference (VTC2014-Spring), Seoul, Korea, May 2014.

The increased density of wireless local area network (wireless LAN) access points (APs) based on the IEEE 802.11 standard has induced inter-cell interference that severely degrades system performance. In order to mitigate this issue, this paper proposes an efficient network-controlled channel allocation scheme that can be applied to a managed wireless LAN system with a central coordinator. On the basis of channel monitoring results obtained from APs and the data traffic amount at each AP, the central coordinator computes the quasi-optimal frequency channel of each AP in such a way that the given utility function is maximized. Numerous simulations and testbed experiments with UDP traffic flows show that the proposed scheme works well and improves the overall system throughput and fairness among throughput of APs even when there exist uncontrollable APs of other domains.

To Relive a Valuable Experience of the World at the Digital Museum

Y. Ikei, Y. Okuya, S. Shimabukuro, K. Abe, K. Hirota, and T. Amemiya

Proc. of HCI International 2014 (the 16th International Conference on Human-Computer Interaction), pp. 501–510, Heraklion, Crete, Greece, June 2014.

This paper describes a new concept of bodily experience that may be used in future museum exhibits. An ordinary museum exhibits objects so that they convey authenticity to visitors. However, these exhibits do not provide any interaction or a vivid context in which they existed. A virtual experience system which creates multisensory stimuli potentially presents the realistic state of valuable artificial objects in their original environments. We think the experience of objects in a particular space is another theme that future museums can present. A novel rendering technique of a virtual body of a visitor is introduced in such a way that multisensory displays impart the sensation of presence of an environment and objects of interest through a pseudo walking experience. This digital museum device will add a new experience of reliving a trip by walking around objects based on recorded data from real tourists.

First Step Guide for Building Cyber Threat Intelligence Team

H. Endoh and N. Inui

Proc. of the 26th Annual FIRST Conference, Boston, MA, USA, June 2014.

As cyber threats and attacks have evolved into sophisticated and goal-oriented attack scenarios, protection using conventional incident response methods has become increasingly difficult. The importance of Cyber Threat Intelligence is widely known by CSIRTs for the reason that although the detection phase is the first of the three basic incident response steps (detection, triage, response), recent attacks often go unnoticed for long periods of time, in some cases for years. On the other hand, there is a lack of know-how in building a Cyber Threat Intelligence Team. Through incident response services, the Cyber Defense Institute (CDI-CIRT) has gained knowledge on the importance of situational awareness, and the processes that follow in building a Cyber Threat intelligence team.

Multi View Layered GPDM for View Invariant Human 3D Pose Estimation from Single RGB Camera Input

A. Matsumoto, D. Mikami, X. Wu, H. Kawamura, and A. Kojima

IEICE Transactions on Information and Systems (Japanese Edition), Vol. J97-D, No. 7, pp. 1189–1201, July 2014.

We proposed a view-invariant 3D human pose estimation method from a monocular camera. Our method enables simultaneous estimation of 3D poses and viewpoints. In pre-learning, this method generates 2D pose data corresponding to the virtual multiple views from 3D pose data; then it builds view-prior models in the low-dimensional space from 2D position data of each point of view. In the pose estimation, it only provides the initial viewpoint and dynamically chooses a view-prior model. This is what makes simultaneous estimation of the 3D pose and viewpoint data possible. In this paper, we describe experiments on motion category of "walking." It was confirmed that even when the relative unknown positional relationship between the person and the camera moves, stable pose estimation results as compared with the conventional method are obtained.

Plug-and-play Optical Interconnection Using Digital Coherent Technology for Resilient Network Based on Movable and Deployable ICT Resource Unit

T. Komukai, T. Sakano, H. Kubota, T. Hirooka, and M. Nakazawa
IEICE Transactions on Communications, Vol. E97-B, No. 7, pp. 1334–1341, July 2014.

In response to the Great East Japan Earthquake in March 2011, the authors have been studying a resilient network whose key element is a movable and deployable ICT resource unit. The resilient network needs a function of robust and immediate connection to a wide area network that is active outside the damaged area. This paper proposes an application of digital coherent technology for establishing optical interconnection between the movable ICT resource unit and existing network nodes through a photonic network rapidly, easily, and with a minimum of manual work. We developed a prototype of a 100-Gbit/s digital coherent transponder that can be installed in our movable and deployable ICT resource unit and experimentally confirmed the robust and immediate connection by virtue of the plug and play function.

Recent Advances in Elastic Optical Networking

T. Tanaka and M. Jinno
IEICE Transactions on Communications, Vol. E97-B, No. 7, pp. 1252–1258, July 2014.

Many detailed studies ranging from networking to hardware as well as standardization activities over the last few years have advanced the performance of the elastic optical network. Thanks to these intensive studies, the elastic optical network is becoming feasible. This paper reviews the recent advances in the elastic optical network from the aspects of networking technology and hardware design. For the former, we focus on the efficient elastic network design technology related to routing and spectrum assignment (RSA) of elastic optical paths including network optimization or standardization activities, and for the latter, two key enabling technologies are discussed: elastic transponders/regenerators and gridless optical switches. Making closely dependent networking and hardware technologies work synergistically is the key factor in implementing truly effective elastic optical networks.

A Distributed Topic-based Pub/Sub Method for Exhaust-data Streams towards Scalable Event-driven Systems

R. Banno, S. Takeuchi, M. Takemoto, T. Kawano, T. Kambayashi, and M. Matsuo
Proc. of COMPSAC 2014 (the IEEE 38th Annual International Computers, Software & Applications Conference), pp. 311–320, Vasteras, Sweden, July 2014.

Distributed topic-based pub/sub has become indispensable for event-driven systems. There exist some methods achieving high scalability by using structured overlay networks. However, those methods involve inefficiency for "exhaust data" which has low or no value most of the time. In those methods, low-value data are gratuitously forwarded along multicast trees, and each publisher continues to forward such data to a relay node even if the data have no value. Consequently, network resources are wasted. To overcome these issues, we first defined a desirable property of overlay networks named "strong relay-free." The strong relay-free property enables publishers and subscribers to compose connected subgraphs so that elasticity of the tree size and the ability to suspend publishing are realized. Subsequently, we propose a new method to construct topologies that satisfy the property using skip graphs. We implemented simulation programs of the method and confirmed that it achieved an improvement.

Low-loss Wavelength Routing Optical Switch Consisting of Small Matrix Switch and Cyclic Arrayed-waveguide Gratings for Colorless Add/Drop

T. Watanabe, S. Sohma, and S. Kamei
Japanese Journal of Applied Physics, Vol. 53, No. 8S2, 08MB02, August 2014.

We describe a new wavelength routing switch architecture that uses matrix switches and cyclic arrayed-waveguide gratings (AWGs). By devising connections between them, we construct a large port count optical switch using small port count matrix switches and AWGs. An 80×8 switch that consists of 8×8 matrix switches and 10×1 cyclic AWGs exhibits an insertion loss of only 4–7 dB. This switch enables us to make add/drop ports colorless in the existing reconfigurable optical add/drop multiplexer nodes.

Network Controlled Frequency Channel and Bandwidth Allocation Scheme for IEEE 802.11a/n/ac Wireless LANs: RATOP

B.A.H.S. Abeysekera, M. Matsui, Y. Asai, and M. Mizoguchi
Proc. of PIMRC (Annual IEEE International Symposium on Personal, Indoor, and Mobile Radio Communications) 2014, Washington D.C., USA, September 2014.

The increased density of wireless LAN access points (APs) has induced inter-cell interference that severely degrades system performance. This problem seems to be getting worse with the increase in 802.11n- and 802.11ac-based APs, which establish basic service sets (BSSs) with wider channel bandwidths. In order to mitigate this problem, we propose an efficient radio resource allocation scheme called RATOP that can be applied to a managed wireless LAN system with a central coordinator. On the basis of channel monitoring results, capability, and data traffic information obtained from APs, the central coordinator computes the quasi-optimal frequency channel and channel bandwidth of each AP in such a way that the given utility function is maximized. Numerous simulations with UDP traffic flows on the coexistence scenarios of 802.11a/n/ac show that the RATOP works well and reduces the number of overlapping BSSs.