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Visual SyncAR: Augmented Reality which Synchronizes Video and Overlaid Information

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We developed video synchronized augmented reality technology called Visual SyncAR. The novel technology is characterized by the ability to superimpose three-dimensional computer graphic (CG) animations that are synchronized with the timing of the video captured by the smartphone camera. By embedding time codes into the video's digital watermarks in advance and detecting these watermarks at a reliably high speed, it is possible to synchronize the video and the CG animation. This enables unprecedented visual expression for mobile devices that jumps out beyond the *fourth wall*, a term used in the theatrical world.

Programming Education by Non-professionals in the Extra-curricular Activities of Public Elementary Schools

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Recently, computer programming has been recognized as an important subject for elementary schools in the next decade. Even in Japan, various activities that involve teaching programming to elementary school children are in progress. However, most of those activities are taught by professional programming educators, with support from many assistants; such activities cannot simply be ported as-is to public schools. In this paper, we introduce our experiences with the *Viscuit* educational programming language in Midorikko-club, a club for after-school activities held at Midori elementary school, in Sumida-ku, Tokyo. The activities are held for groups of children and have been led by a small number (one or two) of local non-professional volunteers for more than three years. Thanks to the novel teaching method and the support functions of the *Viscuit* system, both described in this paper, the activities have been very successful. We evaluated the results by conducting interviews with some of the children who took part. The results indicated that (1) children have come to recognize that computers are not just boxes, but are something on which they can create interesting things, and (2) they have come to enjoy teaching various programming techniques to each other, thus realizing cooperative learning.

Predicate-argument Structure Analysis with Zero-anaphora Resolution for Dialogue Systems

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Proc. of COLING 2014, the 25th International Conference on Computational Linguistics: Technical Papers, pp. 806–815, Dublin, Ireland, August 2014.

This paper presents predicate-argument structure analysis (PASA) for dialogue systems in Japanese. Conventional PASA and semantic role labeling have been applied to newspaper articles. Because pronominalization and ellipses frequently appear in dialogues, we base our PASA on a strategy that simultaneously resolves zero-anaphora

and adapts it to dialogues. By incorporating parameter adaptation and automatically acquiring knowledge from large text corpora, we achieve a PASA specialized for dialogues that has higher accuracy than that for newspaper articles.

Flexible and Robust Optical Network Technologies for SDN and Network Virtualization

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Proc. of the 12 International Conference on Optical Internet (COIN 2014), FA3-2, Jeju, Korea, August 2014.

This paper reviews the progress of flexible and robust technologies for a reliable optical network infrastructure that can be used for software-defined networking (SDN) and network virtualization. We focus on the elastic optical network (EON), which will play an important role in achieving both flexibility and robustness, and introduce our current works on fault tolerance.

Flow-based User Pairing Scheme for Multi-user Transmissions over WLANs

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Proc. of the 11th IEEE Vehicular Technology Society Asia Pacific Wireless Communications Symposium (APWCS 2014), Ping Tung, Taiwan, August 2014.

To enhance system capacity and spectrum efficiency, multi-user transmission techniques such as MU-MIMO (multi-user multiple-input multiple-output) and OFDMA (orthogonal frequency-division multiple access) have been extensively studied and adopted in recent wireless standards such as IEEE 802.16e and IEEE 802.11ac. In order to achieve high efficiency of multi-user transmissions, it is important to consider characteristics of the traffic flow when determining the users group for the multi-user transmissions. In this paper, a flow based user pairing scheme for multi-user transmissions over WLANs (wireless local area networks) is proposed. The proposed scheme collects characteristics of traffic flows by using an existing admission control mechanism. Those parameters are considered in order to determine the users group for multi-user transmissions to achieve higher efficiency. The effect of the multi-user transmissions with the proposed pairing scheme was evaluated by computer simulations. We also discuss the effect of pairing policies of the user selection process.

Adaptive Sampling for Estimating True Values in Participatory Sensing Environment

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Participatory sensing causes huge network traffic in spatiotemporally dense areas where participants upload large numbers of sensor values. Furthermore, sensor values of participatory sensing are often inaccurate due to both measurement error and variations in the sensing accuracy of devices. Thus, if we control the network traffic

regardless of the accuracy of sensor values, the measurement results will be unreliable. We propose a method to control the sampling rate of devices while maintaining high reliability of the measurement results. This method involves calculating a sufficient number of sensor values to estimate the true value on the basis of the confidence interval for a population mean of sensor values from a spatiotemporal area. The same sampling rate is then set for all sensing devices in the area based on that amount, and network traffic is reduced.

Privacy-preserving Statistical Analysis Method by Splitting Server Roles for Distributed Real-world Data

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IEICE Transactions on Communications, Vol. E97-B, No. 9, pp. 1779–1789, September 2014.

This paper proposes a novel method for obtaining statistical results such as averages, variances, and correlations without leaking any raw data values from data-holders by using multiple pseudonyms. The authors split the roles of servers into publishing pseudonyms and collecting answers. Splitting these roles enables different entities to more easily join as pseudonym servers than in previous secure multi-party computation methods, and there is less chance of collusion between servers. We also estimated a typical problem that occurred with our method and added a pseudonym availability confirmation protocol to prevent the problem. We report our evaluation of the effectiveness of our method through implementation and experimen-

tation. Finally, we explain how our method can obtain averages, variances, and correlations from 5000 data holders within 50 seconds.

An Access Control Model Based on Feature Structure

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In this paper, we report on access control because it is the underlying core technology to enforce security and privacy. Access control determines whether packets are permitted or denied according to access control policies. Since the notations of policies are specialized in each system, it is difficult to ensure consistency of policies that have different notations. In this paper, we propose a descriptive notation for policies by adopting the concept of feature structures, a technique which has mainly been used for parsing in natural language processing. Our proposed notation is also logically well-founded, which guarantees strict access control decisions, and expressive in that it returns not only a binary value of permit or deny but also various result values through the application of partial order relations of the security risk level. We illustrate the effectiveness of our proposed method using examples from P3P (Platform for Privacy Preferences).