External Awards

Papers Published in Technical Journals and Conference Proceedings

Optimizing Informativeness and Readability for Sentiment Summarization

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Proc. of the ACL 2010 Conference Short Papers, pp. 325–330, Uppsala, Sweden, 2010.

We propose a novel algorithm for sentiment summarization that takes account of informativeness and readability, simultaneously. Our algorithm generates a summary by selecting and ordering sentences taken from multiple review texts according to two scores that represent the informativeness and readability of the sentence order. The informativeness score is defined by the number of sentiment expressions and the readability score is learned from the target corpus. We evaluate our method by summarizing reviews of restaurants. Our method outperforms an existing algorithm as indicated by its ROUGE score and human readability experiments.

Half-integer Quantum Hall Effect in Gate-controlled Epitaxial Graphene Devices

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Appl. Phys. Express 3, No. 075102, 2010.

High-quality monolayer graphene was grown on the Si face of SiC by thermal decomposition, and its electrical properties were investigated in topgated devices. At 2 K, the carrier mobility of the graphene exceeded $10,000$ cm^2 V^{-1} s^{-1} and the half-integer quantum Hall effect was observed. The quantum Hall states were even observed at various carrier densities when top-gate bias was applied. These findings suggest that high-quality epitaxial graphene possesses the unique nature of monolayer graphene and is robust against device fabrication, which holds potential for graphene-based electronics applications.

Effect of PLC Signal Induced into VDSL System by Conductive Coupling

Y. Akiyama, H. Yamane, and N. Kuwabara

IEICE Trans. on Commun., Vol. E93-B, No. 7, pp. 1807–1813, 2010.

We investigated the effect of a high-speed power line communication (PLC) signal induced into a very high-speed digital subscriber line (VDSL) system by conductive coupling on the basis of a network model. Four electronic devices with AC mains and telecommunication ports were modeled using a 4-port network, and the network parameters were obtained by measuring the impedance and transmission loss. We evaluated the decoupling factor from the mains port to the telecommunication port of a VDSL modem using these parameters for the four electrical and electronic devices. The results indicate that the mean value of the decoupling factor for the differential and common mode signals were more than 88 and 62 dB, respectively, in the frequency range of a PLC system. Taking into consideration the following parameters, decoupling factor Ld, average transmission signal powers of VDSL and PLC, desired and undesired ratio, and transmission loss of a typical 300-m-long indoor telecommunication line, we found that the VDSL system cannot be disturbed by the PLC signal induced into the VDSL modem from the AC mains port in a normal installation.

Meta-envy-free Cake-cutting Protocols

Y. Manabe and T. Okamoto

P. Hlin˘en´y and A. Ku˘cera (Eds.), MFCS 2010, Lecture Notes in Computer Science, Vol. 6281, No. 1, pp. 501–512, 2010.

This paper discusses cake-cutting protocols when the cake is a heterogeneous good represented by an interval on a real line. We propose a new desirable property, the meta-envy-freeness of cake-cutting, which has not been formally considered before. Though envy-freeness was considered to be one of the most important desirable properties, it does not prevent envy about role assignment

in the protocols. We define meta-envy-freeness, which formalizes this kind of envy. We show that current envy-free cake-cutting protocols do not satisfy meta-envy-freeness. Previously proposed properties such as strong envy-freeness, exactness, and equitability do not directly consider this type of envy and these properties are very difficult to realize. This paper then shows meta-envy-free cake-cutting protocols for two- and three-party cases.

Opinion Summarization with Integer Linear Programming Formulation for Sentence Extraction and Ordering

H. Nishikawa, T. Hasegawa, Y. Matsuo, and G. Kikui
Coling 2010, Poster Volume, pp. 910–918, Beijing, China, Aug. 2010.

In this paper we propose a novel algorithm for opinion summarization that takes account of content and coherence, simultaneously. We consider a summary as a sequence of sentences and directly acquire the optimum sequence from multiple review documents by extracting and ordering the sentences. We achieve this with a novel integer linear programming formulation. Our proposed formulation is a powerful mixture of the maximum coverage problem and the traveling salesman problem and is widely applicable to text generation and summarization tasks. We score each candidate sequence according to its content and coherence. Since our research goal is to summarize reviews, the content score is defined by opinions and the coherence score is developed in training against the review document corpus. We evaluate our method using reviews of commodities and restaurants. Our method outperforms existing opinion summarizers as indicated by its ROUGE score. We also report the results of human readability experiments.

Evaluating Estimation of Direct-to-reverberation Energy Ratio Using D/R Spatial Correlation Matrix Model

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Proc. of 20th International Congress on Acoustics, ICA 2010, pp. 1–7, Sydney, Australia.

We evaluate the accuracy of direct-to-reverberation energy ratio (DRR) estimation that uses the direct sound to reverberation spatial correlation matrix model (DRSC model). The DRSC model, which expresses the spatial correlation matrix with two different matrices of direct sound and reverberation, assumes that the direct sound propagates only from the direction of the sound source but that the reverberation arrives uniformly from every direction. The DRR is calculated from the power spectra of both the direct sound and reverberation, which are estimated from the spatial correlation matrix of the observed signal. The method was evaluated using various scales in both simulated and actual acoustical environments. The evaluation results confirmed the effectiveness of DRR estimation using the DRSC model and also revealed its limitations.

A Common Perceptual Temporal Limit of Binding Synchronous Inputs Across Different Sensory Attributes and Modalities

W. Fujisaki and S. Nishida
Proc. of the Royal Society B, Published online, Mar. 24, 2010.

The human brain processes different aspects of the surrounding environment through multiple sensory modalities, and each modality can be subdivided into multiple attribute-specific channels. When the brain rebinds sensory content information (*what*) across different channels, temporal coincidence (*when*) along with spatial coincidence (*where*) provides a critical clue. However, it remains unknown whether neural mechanisms for binding synchronous attributes are specific to each attribute combination or universal and central. In human psychophysical experiments, we examined how combinations of visual, auditory, and tactile attributes affected the temporal frequency limit of synchrony-based binding. The results indicated that the upper limits of cross-attribute binding were lower than those of within-attribute binding, and surprisingly similar for any combination of visual, auditory, and tactile attributes (2–3 Hz). They are unlikely to be the limits for judging synchrony since the temporal limit of a cross-attribute synchrony judgment was higher and varied with the modality combination (4–9 Hz). These findings suggest that cross-attribute temporal binding is mediated by a slow central process that combines separately processed *what* and *when* properties of a single event. While the synchrony performance reflects temporal bottlenecks existing in *when* processing, the binding performance reflects the central temporal limit of integrating *when* and *what* properties.

Coherent WDM-PON Using Heterodyne Detection with Transmitter-side Polarization Diversity

S. Narikawa, H. Sanjoh, and N. Sakurai
IEICE Electron. Express, Vol. 7, No. 16, pp. 1195–1200, 2010.

Coherent detection can improve the receiver sensitivity and spectral density, so it has become a key technology in realizing the advanced access network. Adding optical heterodyne detection to the wavelength division multiplexing passive optical network (WDM-PON) makes it possible to increase the number of accommodated optical network units and the transmission distance. In this letter, we propose and demonstrate a heterodyne detection scheme that realizes polarization diversity with one photodetector and one receiving circuit by centralizing diversity devices at the transmitter. We experimentally achieved a cost-effective polarization diversity technique with receiver sensitivity fluctuation of 1.2 dB and power penalty of less than 0.8 dB after transmission through a 10-km single-mode fiber.

Tactile Duration Compression by Vibrotactile Adaptation

J. Watanabe, T. Amemiya, S. Nishida, and A. Johnston
NeuroReport, Vol. 21, No. 13, pp. 856–860, 2010.

In the visual modality, adaptation to a high temporal frequency can result in spatially localized apparent duration compression. The principal point of adaptation is thought to be early in the visual system, at which point temporal information is encoded within sustained (parvocellular) and transient (magnocellular) channels. We investigated whether adaptation-based time compression could also be found in the tactile modality, which also has sustained (slowly adapting) and transient (rapidly adapting) neural channels. Our results showed that periods of vibration seem compressed when presented to a region of the skin surface adapted earlier to higher frequencies. This finding indicates that human duration perception can be altered by adaptation of temporal sensory channels in similar ways to those in vision and touch.