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Scalability Analysis of Source Routing Multicast for Huge Numbers of Groups

Y. Katayama, T. Inoue, N. Takahashi, and R. Kawamura

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Source routing multicast has been gathering more attention than traditional Internet Protocol (IP) multicast, since it is thought to be more scalable in terms of the number of groups at the cost of higher traffic loads. This paper introduces a mathematical framework to analyze the scalability of source routing multicast and IP multicast by leveraging previous multicast studies. We first analyze the amount of data traffic based on the small-world nature of networks, and show that source routing multicast can be as efficient as IP multicast if a simple header fragmentation technique (subgrouping) is utilized. We also analyze scalability in terms of group numbers, which are derived under the equal budget assumption. Our analysis shows that source routing multicast is competitive for low bit-rate streams, like those in the publish/subscribe service, but we find some factors that offset the advantage. This is the first work to analytically investigate the scalability of source routing multicast.

Study on MIMO Transmission Using Orthogonal Directivities Obtained from Higher Order Microstrip Antenna Modes

M. Arai, T. Seki, K. Hiraga, K. Sakamoto, H. Toshinaga, T. Nakagawa, and K. Uehara

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This paper proposes a simpler multiple-input multiple-output (MIMO) transmission method by using orthogonal directivities. Higher data rates will be required since large amounts of data will be transmitted and received. MIMO technology is useful in order to achieve the higher data rates. However, since MIMO detection becomes complicated when the number of the antennas becomes large, a simpler method should be considered. To solve the problem, we previously proposed a spatial division method using orthogonal directivities. In this paper, we expand our previous method to N streams' transmission. Furthermore, we propose using higher order antenna modes at the same frequency to more easily obtain the orthogonal directivities. To evaluate the proposed method, we confirm that the capacity of the proposed method increases without MIMO detection when the number of antennas becomes large.

Performance Evaluation of a Simple Decoding Method for Millimeter-wave Short-range MIMO Transmission through a Wall

K. Sakamoto, K. Hiraga, T. Seki, T. Nakagawa, and K. Uehara

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The simple decoding method we have proposed for short-range multiple-input multiple-output (SR-MIMO) transmission is a promising means for reducing power consumption. The method performs MIMO detection with analog devices, thus reducing the number of quantization bits required in the analog-to-digital converter (ADC) of the receiver and the amount of signal processing calculation for MIMO detection. However, when the method is applied to a wall-transmissive wireless repeater on a multilayered wall, the transmission performance degrades due to multipath generated by the multilayered structure. In this letter, we evaluate the method's performance using data for a millimeter wave propagation channel that we measured from wall samples and the measured S-parameters of the method's analog circuit. As a result, we quantify the influence of multipath generated by a wall's multilayered structure on transmission performance.

Permutation-free Clustering Method for Underdetermined Blind Source Separation Based on Source Location Information

N. Ito, S. Araki, K. Kinoshita, and T. Nakatani

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We discuss the framework of underdetermined blind source separation (BSS) based on source location information. Conventional techniques in this framework work even for unknown microphone and source positions, if the number of sources is known. However, they cannot deal with an unknown number of sources, and this has significantly limited the real-world application of BSS techniques. We propose a permutation-free clustering method, which extends the above framework in general to the case of an unknown number of sources. Experiments show that the proposed method can separate sources effectively and enumerate sources perfectly, even under an underdetermined (two microphones and three sources), highly reverberant (440-ms reverberation time) condition.

Anticorrelated Bidirectional Output from Quasi-stadium-shaped Microlasers

T. Harayama, K. Arai, K. Yoshimura, S. Shinohara, T. Fukushima, and S. Sunada

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Time-domain properties of the output from quasi-stadium-shaped microcavity semiconductor lasers are studied. Ring modes generating a bidirectional output are selectively excited by partial pumping. We observe a high anticorrelation between the two beams output from the ring modes. This can be considered as the generalization of alternate oscillations reported previously. We find that the outputs exhibit a robust slow modulation of 4–10 MHz, and explain it by the quasi-degeneracy of the resonator modes.
