Multi-user mmWave MIMO Channel Estimation with Hybrid Beamforming over Frequency Selective Fading Channels

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PROCEEDINGS OF THE 2019 IEEE INTERNATIONAL CONFERENCE ON SIGNAL AND IMAGE PROCESSING APPLICATIONS (IEEE ICSIPA 2019)
Book Group Author(s): IEEE
Book Series: IEEE International Conference on Signal and Image Processing Applications
Pages: 46-51
Published: 2019
Document Type: Proceedings Paper

Conference

Conference: IEEE International Conference on Signal and Image Processing Applications (IEEE ICSIPA)
Location: Kuala Lumpur, MALAYSIA
Date: SEP 17-19, 2019
Sponsor(s): IEEE; IEEE Signal Proc Soc Malaysia Chapter

Abstract

In multi-user millimeter wave (mmWave) multiple input multiple output (MIMO) systems, obtaining accurate information/knowledge regarding the channel state is crucial to achieving multi-user interference cancellation and reliable beamforming (BF)-to compensate for severe path loss. This knowledge is nonetheless very challenging to acquire in practice since large antenna arrays experience a low signal-to-noise ratio (SNR) before BF. In this paper, a multi-user channel estimation (CE) scheme namely generalized-block compressed sampling matching pursuit (G-BCoSaMP), is proposed for multi-user mmWave MIMO systems over frequency selective fading channels. This scheme exploits the cluster-structured sparsity in the angular and delay domain of mmWave channels determined by the actual spatial frequencies of each path. As the corresponding spatial frequencies of multi-user mmWave MIMO systems with Hybrid BF often fall between the discrete Fourier transform (DFT) bins due to the continuous Angle of Arrival (AoA)/Angle of Departure (AoD), the proposed G-BCoSaMP algorithm can address the resulting power leakage problem. Simulation results show that the proposed algorithm is effective and offer a better CE performance in terms of MSE when compared to the generalized block orthogonal matching pursuit (G-BOMP) algorithm that does not possess a pruning step.

Keywords

KeyWords Plus: BEAM SELECTION; WAVE; SYSTEMS

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Funding

Funding Agency (Show details)	Grant Number
School of Electrical and Electronic Engineering, Universiti Sains Malaysia, Malaysia	
Ministry of Education, Malaysia	FRGS 203/PELECT/6071373

View funding text

Publisher

IEEE, 345 E 47TH ST, NEW YORK, NY 10017 USA

Categories / Classification

Research Areas: Computer Science

Web of Science Categories: Computer Science, Information Systems; Computer Science, Interdisciplinary Applications; Computer Science, Software Engineering

See more data fields

1 of 1

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