Tokyo University of Agriculture and Technology
Institute of Global Innovation Research

グローバルイノベーション研究院　公開セミナー
Institute of Global Innovation Research Open Seminar

Multi-antenna Interference Management for Coded Caching

言語 / 英語　Language/English

Tuesday, Oct 15, 2019, 16:30-18:00

東京農工大学 小金井キャンパス 13号館 4階 講義室 L1341
Lecture Room L1341, 4th Fl., Building 13, Koganei Campus, TUAT

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Antti Tölli (M'08, SM'14) received the Dr.Sc. (Tech.) degree in electrical engineering from the University of Oulu, Oulu, Finland, in 2008. Before joining the Centre for Wireless Communications (CWC) at the University of Oulu, he worked for 5 years with Nokia Networks as a Research Engineer and Project Manager both in Finland and Spain. In May 2014, he was granted a five year (2014-2019) Academy Research Fellow post by the Academy of Finland. Currently, he also holds an Associate Professor position with the University of Oulu. During the academic year 2015-2016, he visited at EURECOM, Sophia Antipolis, France, while from August 2018 till June 2019 he is visiting University of California - Santa Barbara, USA. He has authored numerous papers in peer-reviewed international journals and conferences and several patents all in the area of signal processing and wireless communications. His research interests include radio resource management and transceiver design for broadband wireless communications with a special emphasis on distributed interference management in heterogeneous wireless networks. He is currently serving as an Associate Editor for IEEE Transactions on Signal Processing.

Abstract

In Coded Caching (CC), instead of simply replicating high-popularity contents near-or-at end-users, the network should spread different contents at different caches such that common coded messages broadcast during the network high-peak hours to different users with different demands would benefit all the users simultaneously. In this talk, a multi-antenna broadcast channel scenario is considered where a base station delivers contents to cache-enabled user terminals. A joint design of CC and multigroup multicast beamforming is proposed to benefit from spatial multiplexing gain, improved interference management and the global CC gain, simultaneously. The developed general content delivery strategies utilize the multiantenna multicasting opportunities provided by the CC technique while optimally balancing the detrimental impact of both noise and inter-stream interference from coded messages transmitted in parallel. Moreover, reduced complexity alternatives, with a small loss in performance, are introduced by controlling the size of the subset of users served during a given time interval, and the overlap among the multicast messages transmitted in parallel, indicated by parameters α and β, respectively. Degrees of freedom (DoF) analysis is provided showing that the DoF only depends on α while it is independent of β. The proposed schemes are shown to provide the same degrees-of-freedom at high SNR as the state-of-art methods and, in general, to perform significantly better, especially in the finite SNR regime, than several baseline schemes.

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