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Modulation and Multiple Access for 5G Networks

Yunlong Cai, Zhijin Qin, Fangyu Cui, Geoffrey Ye Li, and Julie A. McCann

Abstract

Fifth generation (5G) wireless networks face various challenges in order to support large-scale heterogeneous traffic and users, therefore new modulation and multiple access (MA) schemes are being developed to meet the changing demands. As this research space is ever increasing, it becomes more important to analyze the various approaches, therefore, in this article we present a comprehensive overview of the most promising modulation and MA schemes for 5G networks. Unlike other surreys of 5G networks, our article focuses on multiplexing techniques, including modulation techniques in orthogonal multiple access (OMA) and various types of non-orthogonal multiple access (NOMA) techniques. Specifically, we first introduce different types of modulation schemes, potential for OMA, and compare their performance in terms of spectral efficiency, out-of-band leakage, and bit-error rate. We then pay close attention to various types of NOMA candidates, including power-domain NOMA, code-domain NOMA, and NOMA multiplexing in multiple domains. From this exploration, we can identify the opportunities and challenges that will have the most significant impacts on modulation and MA designs for 5G networks.

Index Terms

5G, modulation, non-orthogonal multiple access.

I. Introduction

In recent years, fifth generation (5G) wireless networks have attracted extensive research interest. According to the 3rd generation partnership project (3GPP) [1], [2], 5G networks should support

Y. Cai and F. Cui are with the College of Information Science and Electronic Engineering, Zhejiang University, Hangzhou 310027, China. $email: ylcai@zju.edu.cn, cfy531@zju.edu.cn$

Z. Qin is with the School of Computing and Communications, Lancaster University, Lancaster, U.K., LA1 4YW, $email: zhijin.qin@lancaster.ac.uk$. Part of this work was done when she was with Imperial College London.

G. Y. Li is with the School of Electrical and Computer Engineering, Georgia Institute of Technology, Atlanta, USA. $email: liye@ece.gatech.edu$

J. A. McCann is with the Department of Computing, Imperial College London, London, U.K., SW7 2AZ. $email: jamm@imperial.ac.uk$