International Workshop on Non-Orthogonal Multiple Access (NOMA) for 5G and IoT Networks

Call for Papers

1. Introduction/Overview

The rapid development of the Mobile Internet and the Internet of Things (IoT) leads to challenging requirements for the 5th generation (5G) of wireless networks, which are fuelled by the prediction of 1000-fold data traffic increase by 2020. Specifically, the key performance indicators (KPI) advocated for 5G can be summarized as follows: 1) The spectral efficiency is expected to increase by a factor of 5 to 15 compared to 4G; 2) To satisfy the demand of massive connectivity, especially required for the IoT, the connectivity density target is ten times higher than that of 4G, i.e., at least 106/km2; 3) 5G is also expected to satisfy the requirements of low latency (radio latency less than 1 ms), low cost (more than 100 times lower cost compared to 4G), and the support of diverse compelling services. In order to satisfy these stringent requirements, advanced solutions have to be conceived, which motivates the study of new types of multiple access techniques.

From the perspective of their design principles, with the exception of CDMA, these multiple access schemes belong to the category of orthogonal multiple access (OMA), where the wireless resources are orthogonally allocated to multiple users, in the time or frequency domain or a combination of both. We might collectively refer to these domains as “resources”. Consequently, the users’ information-bearing signals can be readily separated with low complexity by employing relatively cost-efficient receivers. However, the number of the supported users is limited by the number of available orthogonal resources in OMA. Another problem lies in the fact that despite using orthogonal time or frequency domain resources, the channel-induced impairments invariably destroy the orthogonality. Hence, typically high-complexity “orthogonality restoring measures”, such as multi-user equalizers have to be invoked. Consequently, it remains a challenge for OMA to satisfy the radical spectral efficiency and massive connectivity requirements of 5G. Non-orthogonal CDMA is resilient to such channel- induced impairments, but the chip rates need to be much higher than the information data rates. This means that the use of CDMA in 5G is also questionable, due to the expected ultra-high data rates.

Hence, the innovative concept of non-orthogonal multiple access (NOMA) has been proposed in order to support more users than the number of available orthogonal time, frequency, or code domain resources. The basic idea of NOMA is to support non- orthogonal resource allocation for multiple users, at a cost of increased receiver complexity, which is required for separating the non-orthogonal signals. Recently, several NOMA solutions have been actively investigated, and can be basically divided

into two main categories, namely power-domain NOMA and code-domain NOMA, including multiple access solutions relying on low-density spreading (LDS), sparse code multiple access (SCMA), multi-user shared access (MUSA), successive interference cancellation amenable multiple access (SAMA), etc. Some other closely- related multiple access schemes, such as spatial division multiple access (SDMA), pattern division multiple access (PDMA), and bit division multiplexing (BDM) have also been proposed.

Considering its promising application in 5G and beyond 5G wireless communication systems, NOMA really deserves to receive more attention from the research community. In particular, there are a number of important issues and have to be addressed before NOMA can be successfully applied in practical systems: the fundamental limits and performance analysis of NOMA, design of advanced channel coding and modulation schemes for NOMA, MIMO techniques for NOMA, cognitive radio networks with NOMA, security provisioning in NOMA, cross-layer design and optimization for NOMA, emerging applications of NOMA, practical implementations of NOMA, and so on. This workshop aims to bring together leading researchers in the field, both from academia and industry, to share their recent findings and views on what access methods best suit the diverse 5G requirements. Topics of interest mainly include NOMA in the power and code domains, but the workshop will also provide a forum for other access methods for massive connectivity, as specified in the call for papers.

We have also planned to have two keynote speeches to cover the recent signal advances for NOMA, MIMO techniques for NOMA, special modulation for NOMA, security concerns for NOMA, cross-layer design for NOMA, mmWave NOMA and multi-cell/massive MIMO NOMA, machine learning and big data for NOMA.

There will be two Keynote Speeches:
• "Machine Learning for Non-Orthogonal Multiple Access Networks," by Prof. Zhiguo Ding, Manchester University London, UK
• "Recent Standardization Progress on NOMA", by Dr. Chih-Lin I (Chief Scientist, Wireless Technologies), China Mobile Research Institute, China

We warmly welcome your paper submissions including newest research findings. Potential topics include but are not limited to

- Machine learning and big data aided adaptive NOMA
- Cooperative signal processing for NOMA
- NOMA assisted wireless caching and mobile edge computing
- Signal detection and joint transceiver design for NOMA
- Low-complexity channel estimation for NOMA
- NOMA for Internet-of-Things (IoT)
- Advanced coding and modulation for NOMA
- MIMO techniques for NOMA
- Multi-cell/massive MIMO NOMA
- Security concerns for NOMA
- Cross-layer design and optimization of NOMA
- Hardware implementation issues in NOMA
- Sparse code multiple access (SCMA)
- Multi-user shared access (MUSA)

- Lattice partition multiple access (LPMA)
- Coexistence of NOMA and OFDMA
- Interleave division multiple access (IDMA)
- Massive MTC applications
- Vehicle-to-X (V2X) and satellite networks

2. Workshop organizers:

. 1) Yuanwei Liu, Queen Mary University of London, UK Email: yuanwei.liu@qmul.ac.uk

. 2) Miaowen Wen, South China University of Technology, China Email: eemwwen@scut.edu.cn

. 3) Zhiguo Ding, Lancaster University, UK Email: z.ding@lancaster.ac.uk

. 4) Arumugam Nallanathan, Queen Mary University of London, UK Email: a.nallanathan@qmul.ac.uk

3. Program committee members

Zhiguo Ding Lancaster University, UK

Miaowen Wen Arumugam Nallanathan Yue Gao Linglong Dai Lingyang Song Hanjun Zhang

South China University of Technology, China Queen Mary University of London, UK Queen Mary University of London, UK Tsinghua University, China

Peaking University, China Beijing University Of Technology

4. Deadline

20th June2018