Speech Title: Non-orthogonal Transmission Technology: Theory and Application

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Abstract: Communication systems, whether optical or wireless, always strive for high spectrum efficiency (SE). As the orthogonal transmission technologies approach the potential SE limit, non-orthogonal transmission technologies are utilized to make the breakthrough. In terms of the single-user transmission, faster-than-Nyquist (FTN) signaling uses the faster sampling rate to provide higher SE than the orthogonal Nyquist system, which is very promising for the satellite and the optical communication. The FTN system introduces the man-made inter-symbol interference (ISI), which is similar to the convolutional encoder. Thus, the channel coding and the FTN signaling form a serially-concatenated Turbo code at the transmitter, and the maximum a posteriori (MAP) equalization is adopted at the receiver. In terms of the multi-user transmission, non-orthogonal multiple access (NOMA) technologies can take advantage of the superposition coding principle and achieve higher spectrum efficiency and more massive connectivity to meet the fifth generation (5G) wireless communication scenarios, such as mMTC, eMBB and URLLC. We classify the NOMA schemes into four categories: scrambling-based, spreading-based, coding-based and interleaving-based NOMA, and systematically summarize basic principles, key features and transmission-reception algorithms of all NOMA schemes. By comparing their performance, some promising schemes and directions are suggested for the future 5G NOMA development.