Editorial

Editorial of Special Issue "Optimization and Applications of Modern Wireless Networks and Symmetry"

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This book contains the successfully published submissions [1–6] to a Special Issue of *Symmetry* on the subject area of "Optimization and Applications of Modern Wireless Networks and Symmetry".

Due to the future demands of IoT/5G communications, channel coding techniques are widely used in modern wireless communications to enhance reliability and spectral efficiency. In particular, channel coding and network protocol are being optimized for the next wireless standard and wireless sensor networks. This invokes a great deal of attention on the modern symmetry or asymmetry wireless communications.

This Special Issue covers channel coding, modulation, and network protocol of the recent advances in modern communications. The volume contains six published papers, with authors from areas throughout the world (Brazil, China, Taiwan).

In the first paper of this Special Issue, entitled "A Light and Anonymous Three-Factor Authentication Protocol for Wireless Sensor Networks", L. Zhu et al. propose a new lightweight and anonymous three-factor authentication based on symmetric cryptographic primitives for WSNs. By using the automated security verification tool ProVerif, BAN-logic verification, and an informal security analysis, the proposed scheme is proven to be secure and can achieve all known security features in WSNs. Moreover, the proposed scheme is shown to be practical and efficient through the comparison of security features and performance [1].

In the second paper, entitled "A CNN-MPSK Demodulation Architecture with Ultra-Light Weight and Low-Complexity for Communications", B. Wang et al. propose a generic architecture for MPSK demodulation, referred to as CNN-MPSK, from convolutional neural networks (CNNs). The architecture utilizes a single-layer CNN and a pooling trick to crop network parameters. In comparison with conventional coherent demodulation, the CNN-MPSK can avoid using three modules, carrier multiplication, bandpass filter, and sampling decision. Experimental results reveal that CNN-MPSK has almost the same performance as the conventional coherent demodulation, with much-reduced complexity. Additionally, the proposed scheme can be readily applied for demodulation of non-symmetric MPSK constellations that maybe distorted by linear and nonlinear impairments in communications [2].

In the paper entitled "Improving Decodability of Polar Codes by Adding Noise", L. Kong et al. present an online perturbed and directed neural-evolutionary (Online-PDNE) decoding algorithm for polar codes. This decoding algorithm converts uncorrectable received sequences into error-correcting regions of the decoding space by adding specific noises. Moreover, PDNE decoding and sole neural-evolutionary (SNE) decoding for polar codes are further proposed to provide a considerable tradeoff between the decoding performance and complexity. Numerical results suggest that the proposed decoding outperforms

other conventional decoding algorithms, such as simplified successive cancellation (SSC) decoding [3].

In the next paper, entitled "A General Framework for Geometrically Uniform Codes and Signal Sets Matched to Groups", E. Gomes et al. propose a general treatment of the metric, providing a necessary and sufficient condition for an isometry between a group G and a signal set S to be considered a matched labeling. The definition of the G-isometric signal set is presented to connect the various concepts discussed in this work. Despite emphasizing the hyperbolic case because of its rich properties and Euclidean cases for historical reasons and applications, the results are valid for any metric space. Additionally, the article opens up new possibilities for applying discrete metrics that come from the group metric obtained from the (finitely generated) group of labels [4].

In the paper entitled "Unlicensed Spectrum Allocation for LTE and Wi-Fi Coexistence with HAP", W. Lai et al. contribute to the determination of the optimal time ratio, δ, for the time-division multiplexing of LTE and Wi-Fi over unlicensed bands. By considering the asymmetric allocation according to QoS requirements and traffic demands, the problem is formulated as an optimization problem over the total throughput. The lower and upper bounds of δ are developed according to the QoS requirements of Wi-Fi and the admission control requirements of LTE. Simulations are conducted and demonstrate that the proposed approach improves the total throughput without compromising the fairness of Wi-Fi, as intended. Ten percent improvement in throughput compared with LTE-U can be achieved [5].

In the last paper, entitled "New Unequal Error Protection Strategy for Image Transmission Based on Bilayer-Lengthened PLDPC Code in Half-Duplex Relay System", T. Gao et al. propose new efficient UEP strategies of based on bilayer protograph-based low-density parity check (PLDPC) codes in decoding-and-forward (DF) relay systems. It jointly utilizes source coding and channel coding to design UEP strategies and then save transmission energy. Considering the different importance of DCT coefficients of image and variance statistical characteristics of image sub-blocks, bilayer-lengthened PLDPC codes are exploited to protect the transmitted image information in the half-duplex relay system. The simulation result shows that the proposed UEP schemes achieve excellent performance gains as compared to conventional equal-error protection schemes [6].

The Guest Editor hopes you will enjoy reading this Special Issue focused on cutting-edge research in channel coding and network protocols. We expect that the collected studies will motivate researchers to continue groundbreaking work in this emerging area.

Finally, the Guest Editor would like to thank the authors of all the papers submitted to this Special Issue, and the Guest Editor would like to thank the journal's editorial staff and reviewers for their efforts and help during the process.

Conflicts of Interest: The authors declare no conflict of interest.

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