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Editorial

Editorial for Special Issue on Emerging Wireless Sensing Technologies for Smart Environments

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With the pervasiveness of wireless network and mobile devices, wireless signals are already everywhere, which encourages researchers to enable sensing capabilities using wireless signal. While promising results have been achieved in certain conditions, challenges still exist in many aspects. This special issue focuses on all aspects of signal processing, machine learning, and applications of emerging wireless sensing technologies. This special issue has collected five excellent articles reviewed and highly recommended by the editors and reviewers.

The 1st paper is titled "CRNet: Robust Millimeter Wave Gait Recognition Method Based on Contrastive Learning", authored by Zhen Meng, Anfu Zhou, Huadong Ma and Qian Zhang. This paper proposes a mmWave gait recognition method CRNet that is robust to both time and environment, which is realized through two-stage training. Experiments on multiple time and environment domains have been conducted and CRNet performs well in unfamiliar domains.

The 2nd paper is titled "Cross-domain Behavior Recognition Based on Millimeter-wave Radar", authored by Rendao Wang and Binquan Wang. In this paper, a domain adaptation model is designed, which adopts semi-supervised learning pre-training and fine-grained domain antagonism training to improve the domain adaptation performance of the network. In the experimental part,

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the cross-environment and cross-angle performance of the model is studied on several datasets, and the results demonstrate the feasibility and superiority of the proposed method.

The 3rd paper is titled "Contactless Micron-Level Vibration Measurement with Millimeter Wave Radar", authored by Renjie Wen, Dongheng Zhang, Jinbo Chen and Qibin Sun. This paper proposes DeepVib, a non-contact vibration measurement system that enables accurate micron-level vibration monitoring. A series of signal processing algorithms is utilized to extract the vibration object motion from mmWave reflection signals, while a deep neural network is used to effectively suppress noise interference. The experimental results show that the non-contact measurement method can accurately measure the vibration at the micron level.

The 4th paper is titled "Joint Optimization for RIS Assisted Dual Functional Radar Communication in IoV", authored by Yaping Cui, Kang Wang, Peng He, Ruyan Wang and Dapeng Wu. This paper studies the RIS-assisted dual function radar communication system (DFRC) in the Internet of Vehicles (IoV), and proposes an alternating optimization algorithm, named joint guaranteed radar communication (JGRC) algorithm, with sensed power and semidefinite relaxation to maximize the spectral efficiency of the communication vehicle while simultaneously ensuring the radar sensing performance of the target vehicle.

The 5th paper is titled "A Lightweight Remote Gesture Recognition System with Body-motion Suppression and Foreground Segmentation Using FMCW Radar", authored by Jingxuan Chen, Yajie Wu, Bo Zhang, Shisheng Guo and Guolong Cui. This paper proposes a lightweight real-time gesture recognition system based on support vector machines. By analyzing the Doppler features of different motion states, a Doppler weighting factor was constructed to suppress bodily micro-motion interference in the range-time spectrum, and achieve foreground extraction of gesture signals concurrently. Furthermore, Gaussian filtering is utilized to suppress abrupt transitions and noise inherent in the gesture signals.

Based on the papers published in this special issue, the issue brings together the recent advances of wireless sensing technologies from all aspects of signal processing, machine learning, and applications. This special issue is expected to be helpful for the readers to better understand the principles of emerging wireless sensing technologies and possibly inspire more novel systems and applications.

Guest Editors

Yan Chen, Vishal Monga, Chenshu Wu, Mojtaba Soltanalian, Dongheng Zhang and Daqing Zhang