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Editorial

Advanced Sensing Techniques for Intelligent Human Activity Recognition Using Machine Learning

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State-of-the-art network architectures ensure fast and dependable real-time communication with abundant data and minimal delays. This technology has the potential to transform various fields, such as remote healthcare monitoring, agriculture technology, cyber security, transportation, and so on.

In the healthcare domain, radio sensing is progressing towards achieving reliable detection, specifically for human activity recognition, detecting events such as falls, respiratory rate, cardiac activity, and so on. Radio-based communication systems offer capabilities such as high data rates, elevated carrier frequencies, expanded system capacities, adaptable hardware systems, and the ability to focus energy radiation in specific areas, such as beamforming.

Indoor localization encounters challenges stemming from environmental factors such as noise, signal distortions, and physical obstructions such as furniture. These complexities must be carefully considered when implementing indoor localization systems.

In recent years, significant progress has been made in indoor localization, driven by advancements in wireless communication, computational capabilities, and various sensing techniques. Context-aware systems, wearable technologies, and non-contact methods represent notable approaches for recognizing human activities within indoor environments.

One intriguing approach involves leveraging devices worn by users to detect their behaviors while preserving their privacy. Context-aware systems employ an array of sensors, including microphones, cameras, and other sensor types. However, these systems face limitations in tracking activities once a user exits the surveillance zone. Notably, video surveillance systems fall within the context-aware technology category, but pose privacy concerns for patients, particularly in healthcare settings.

Conversely, outdoor localization has benefited from cutting-edge satellite positioning technologies like GPS, delivering highly accurate location services. However, indoors, the precision of location services diminishes due to weak signals and limited signal penetration.

To address indoor localization challenges, researchers have proposed various technologies, including RF identification (RFID), Ultra-Wideband (UWB), Bluetooth, Wi-Fi, light-based solutions, and audio-based methods. Given the prevalence of Wi-Fi infrastructure in many households, this article opts for RF-based Wi-Fi sensing to obviate the need for additional sensing technologies. RF sensing systems exhibit variations in hardware requirements, operating frequencies, classification techniques, monitored activity types, and target subjects.

Two prominent methods employed by tracking systems for RF-based activity identification are Channel State Information (CSI) and Received Signal Strength Indicator (RSSI). These techniques enhance the accuracy and effectiveness of indoor localization systems by harnessing the properties of radio frequency signals.

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This Special Issue's editorial review process accepted 12 high-quality manuscripts focusing on human activity recognition using different technologies, algorithms, systems and so on. Notable articles include:

1. dos Santos, L.; Winkler, I.; Nascimento, E. Adapting a Supervised Learning Approach to a Semi-Supervised Approach for Human Action Recognition. *Electronics* 2022, 11, 1471.

2. Ding, X.; Jiang, T.; Zhong, Y.; Wu, S.; Yang, J.; Zeng, J. Wi-Fi-based location-independent human activity recognition with attention mechanism enhanced method. *Electronics* 2022, 11, 642.

3. Akhtar, T.; Gilani, S.O.; Mushtaq, Z.; Arif, S.; Jamil, M.; Ayaz, Y.; Butt, S.I.; Waris, A. Effective voting ensemble of homogenous ensembling with multiple attribute-selection approaches for improved identification of thyroid disorder. *Electronics* 2021, 10, 3026.

4. Mehmood, F.; Chen, E.; Akbar, M.A.; Alsanad, A.A. Human action recognition of spatiotemporal parameters for skeleton sequences using MTLN feature learning framework. *Electronics* 2021, 10, 2708.

5. Boulila, W.; Shah, S.A.; Ahmad, J.; Driss, M.; Ghandorh, H.; Alsaeedi, A.; Al-Sarem, M.; Saeed, F. Noninvasive detection of respiratory disorder due to COVID-19 at the early stages in Saudi Arabia. *Electronics* 2021, 10, 2701.

6. Mollineda, R.A.; Chía, D.; Fernandez-Beltran, R.; Ortells, J. Arm Swing Asymmetry Measurement from 2D Gait Videos. *Electronics* 2021, 10, 2602.

7. Mahmood, S.N.; Ishak, A.J.; Jalal, A.; Saeidi, T.; Shafie, S.; Soh, A.C.; Imran, M.A.; Abbasi, Q.H. A Bra Monitoring System Using a Miniaturized Wearable Ultra-Wideband MIMO Antenna for Breast Cancer Imaging. *Electronics* 2021, 10, 2563.

8. Saeed, U.; Shah, S.Y.; Shah, S.A.; Ahmad, J.; Alotaibi, A.A.; Althobaiti, T.; Ramzan, N.; Alomainy, A.; Abbasi, Q.H. Discrete human activity recognition and fall detection by combining FMCW RADAR data of heterogeneous environments for independent assistive living. *Electronics* 2021, 10, 2237.

9. Lakhan, A.; Mastoi, Q.u.r.; Dootio, M.; Alqahtani, F.; Alzahrani, I.; Baothman, F.; Khokar, M.; Shah, S.; Shah, S.; Anjum, N.; et al. Hybrid Workload Enabled and Secure Healthcare Monitoring Sensing Framework in Distributed Fog-Cloud Network. *Electronics* 2021, 10, 1974.

10. Khan, M.B.; Rehman, M.; Mustafa, A.; Shah, R.A.; Yang, X. Intelligent non-contact sensing for connected health using software defined radio technology. *Electronics* 2021, 10, 1558.

11. Javaid, H.A.; Tiwana, M.I.; Alsanad, A.; Iqbal, J.; Riaz, M.T.; Ahmad, S.; Almisned, F.A. Classification of hand movements using MYO armband on an embedded platform. *Electronics* 2021, 10, 1322.

12. Imtiaz, M.S.b.; Babar Ali, C.; Kausar, Z.; Shah, S.Y.; Shah, S.A.; Ahmad, J.; Imran, M.A.; Abbasi, Q.H. Design of portable exoskeleton forearm for rehabilitation of monoparesis patients using tendon flexion sensing mechanism for health care applications. *Electronics* 2021, 10, 1279.

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