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Editorial

Advanced Sensors and Sensing Technologies for Indoor Localization

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Accurate information concerning the position of users, devices, mobile robots, or systems is crucial for the safe and efficient operation of applications in the industrial, commercial, and consumer fields. High-accuracy, short-range localization is also important for specialized applications such as hand and finger tracking for biomedical or telemanipulation scenarios. Particular research interest is devoted to those environments where the availability and accuracy of global navigation satellite systems is challenging, such as indoor environments. In such environments, positioning typically requires ad hoc solutions and strategies and may be achieved using a wide array of sensor technologies and processing methods.

Applications of sensors for localization include, but are not limited to, radio-frequency, magnetic-field, imaging, inertial, acoustic, and ultrasound sensors. Current research in the field also covers sensing and processing methods applied to the positioning problem. These include robust numerical methods, optimization strategies, tracking algorithms, Bayesian estimators, machine learning, and performance characterization and validation methods.

This Special Issue is composed of five research papers that explore very different technologies, methods, and applications, which also include specific solutions for gesture recognition, localization inside industrial facilities, and positioning systems that exploit radio frequencies, ultrasound, and Bluetooth wireless technologies. In detail, the covered topics are: the localization of a forklift inside a warehouse by means of inertial, optical, and ultra-wideband sensors [1]; the evaluation of sensor fusion approaches for a 3D ultrasound positioning system [2]; a Bluetooth-low-energy-based positioning system aimed at localizing visitors in museums [3]; the recognition of sign language alphabet by means of a magnetic positioning system and machine learning [4]; a localization platform based on radio-frequency identification (RFID) for fast-moving carts in large distribution facilities [5].

Furthermore, this issue is notably completed by a review paper that summarizes the current state of the art of indoor localization solutions and presents a case study of a localization system designed to support people with sensory disabilities in indoor environments [6].

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References

1. Motroni, A.; Buffi, A.; Nepa, P. Forklift Tracking: Industry 4.0 Implementation in Large-Scale Warehouses through UWB Sensor Fusion. *Appl. Sci.* **2021**, *11*, 10607. [CrossRef]
2. Mannay, K.; Ureña, J.; Hernández, Á.; Villadangos, J.M.; Machhout, M.; Aguili, T. Evaluation of Multi-Sensor Fusion Methods for Ultrasonic Indoor Positioning. *Appl. Sci.* **2021**, *11*, 6805. [CrossRef]
3. Jérémy, R.; Karell, B.; Cyril, F. Ble Based Indoor Positioning System and Minimal Zone Searching Algorithm (MZS) Applied to Visitor Trajectories within a Museum. *Appl. Sci.* **2021**, *11*, 6107. [CrossRef]
4. Rinalduzzi, M.; De Angelis, A.; Santoni, F.; Buchicchio, E.; Moschitta, A.; Carbone, P.; Bellitti, P.; Serpelloni, M. Gesture Recognition of Sign Language Alphabet Using a Magnetic Positioning System. *Appl. Sci.* **2021**, *11*, 5594. [CrossRef]
5. Cheng, C.-H.; Kuo, Y.-H.; Lam, H.; Petering, M. Real-Time Location-Positioning Technologies for Managing Cart Operations at a Distribution Facility. *Appl. Sci.* **2021**, *11*, 4049. [CrossRef]
6. Andò, B.; Baglio, S.; Crispino, R.; Marletta, V. An Introduction to Indoor Localization Techniques. Case of Study: A Multi-Trilateration-Based Localization System with User–Environment Interaction Feature. *Appl. Sci.* **2021**, *11*, 7392. [CrossRef]