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GUEST EDITORIAL

Guest Editorial: Special issue on explainable AI empowered for indoor positioning and indoor navigation

The convergence of Internet of Things (IoT), vehicularad hoc network (VANET), and mobile ad hoc network relies on sensor networks to gather data from nodes or objects. These networks involve nodes, gateways, and anchors, operating on limited battery power, mainly used in broadcasting. IoT applications, like healthcare, smart cities, and transportation, often need position data and face challenges in delay sensitivity. Localisation is important in ITS and VANETs, influencing autonomous vehicles, collision warning systems, and road information dissemination. A robust localisation system, often combining GPS with techniques like Dead Reckoning and Image/Video Localisation, is essential for accuracy and security. Artificial intelligence (AI) integration, particularly in machine learning, enhances indoor wireless localisation effectiveness. Advancements in wireless communication (WSN, IoT, and massive MIMO) transform dense environments into programmable entities, but pose challenges in aligning self-learning AI with sensor tech for accuracy and budget considerations. We seek original research on sensor localisation, fusion, protocols, and positioning algorithms, inviting contributions from industry and academia to address these evolving challenges.

This special issue titled 'Sensing, Communication, and Localization in WSN, IoT & VANET' appears in the CAAI Transactions on Intelligence Technology. We encourage contributions addressing localisation accuracy, network coverage, upper and lower bounding, lane and vehicle detection, and related topics.

In the first paper, (Hamil et al.) explore how smartphone sensors and IoT devices aid in rescuing individuals during emergencies like fires in tall buildings. It introduces a pioneering Sensor Management and Data Fusion-Wireless Data Exchange fusion scheme, leveraging an evolutionary algorithm within complex multi-storey buildings. This scheme aims to diversify particle sets effectively, capturing the user's real-time state using wearable device sensors. The authors further explore how smartphones sensors utilise data for object movement alongside Bluetooth Low Energy beacon based localisation with the help of Sensor Management security and Data Fusion-Wireless Data Exchange scheme. The effectiveness of this scheme and its impact on a smartphone user's real-time state within indoor settings were assessed through various experiments in controlled environments.

In the second paper, (Khan J et al.) proposed a novel method to fine-tune alpha-beta filter parameters using a feed-forward backpropagation neural network. This model, comprising the alpha-beta filter as the core predictor and a feedforward artificial neural network as the learning element, uses temperature and humidity sensor data for precise predictions from noisy readings. By integrating the feed-forward backpropagation neural network significantly boosts prediction accuracy, slashing both roots mean square error (RMSE) and mean absolute error (MAE). In experiments against traditional methods like alpha-beta and Kalman filters, the proposed model outperformed, showcasing a 35.1% improvement in MAE and 38.2% in RMSE.

In the third paper, (Imtiaz et al.) proposed a localisation scheme for industrial IoT in the presence of flipping ambiguities. The author proposed a novel greedy anchor selection strategy known as GSAP to reduce the localisation error estimation in IIoT networks. The author presents the whole idea using multidimensional scalling for initial position estimation that can reduce the convergence time of the algorithm. The expression of the Cramer Rao lower bound is derived for the proposed algorithm to test its optimality and compare the results with the state of the art.

In the fourth paper (Ismail et al.) derived the NOMA Narrow Band IoT network under a single EH relay. However, the growth of Narrow Band IoT devices also leads to a rise in co-channel interference, which impacts NOMA's performance enhancement. In the uplink EH relay NOMA Narrow Band IoT network, authors aim to optimise Narrow Band IoT device data rates while meeting their minimum requirements. Considering equipment energy, EH relay energy, and data cache constraints, the proposed model creates a complex indoor localisation framework involving power, data, and time slot scheduling. This model poses a non-convex optimisation challenge without a straightforward analytical solution. Through simulation, the proposed approach is successfully shown. These improvements have boosted the network's

energy efficiency by 44.1%, data rate proportional fairness by 11.9%, and spectrum efficiency by 55.4%.

We thank all authors for their submissions and reviewers for their valuable feedback. We hope this Special Issue sparks new outcomes in recurrent dynamic neural networks for the research community.

KEYWORDS

anchor, artificial intelligence, GPS, localisation, mobile communication, RSSI, vehicle

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DATA AVAILABILITY STATEMENT

Data sharing is not applicable to this article as no new data were created or analysed in this study.

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