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Infinite-Term Memory Classifier for Wi-Fi Localization based on Dynamic Wi-Fi Simulator

A. S. AL-Khaleefa[a] , M. R. Ahmad[a] , A. A. M. Isa[a] , (Member, IEEE), M. R. M. Esa[b] , Ahmed ALSaffar[c] and Y. Aljeroudi[d]

[a] Broadband and Networking (BBNET) Research Group, Centre for Telecommunication and Research Innovation (CeTRI), Fakulti Kejuruteraan Elektronik dan Kejuruteraan Komputer (FKEKK), Universiti Teknikal Malaysia Melaka (UTeM), Hang Tuah Jaya, 76100 Durian Tunggal, Melaka, Malaysia.

[b] Institute of High Voltage and High Current (IVAT), School of Electrical Engineering, Faculty of Engineering, Universiti Teknologi Malaysia (UTM), 81310 Skudai, Johor Bharu, Malaysia.

[c] Faculty of Computer System and Software Engineering, University Malaysia Pahang (UMP), 26300 Gambang, Pahang, Malaysia.

[d] Department of Mechanical Engineering, International Islamic University of Malaysia (IIUM), 53100 Gombak, Malaysia.

ABSTRACT

Wi-Fi localization is an active research topic, and various challenges are not yet resolved in this field. Researchers develop models and use benchmark datasets for Wi-Fi or fingerprinting to create a quantitative comparative evaluation. These benchmarking datasets are limited by their failure to support dynamical navigation. As a result, Wi-Fi models are only evaluated as usual classifiers without including actual navigation maneuvers in the evaluation, which makes the models incapable of handling the actual navigation behavior and its impact on the performance. One common navigation behavior is the cyclic dynamic behavior, which occurs frequently in the indoor environment when a person visits the same place or location multiple times or repeats the same trajectory or similar one more than once. For this purpose, we developed two models: a simulation model for generating time series data to support actual conducted navigation scenarios and a Wi-Fi classification model to handle dynamical scenarios generated by the simulator under cyclic dynamic behavior. Various testing scenarios were conducted for evaluation, and a comparison with benchmarks was performed. Results show the superiority of our developed model which is Infinite-Term Memory Online Sequential Extreme Learning Machine (ITM-OSELM) to the benchmarks with a percentage of 173% over Feature Adaptive Online Sequential Extreme Learning Machine (FA-OSELM) and 1638% over Online Sequential Extreme Learning Machine (OSELM).

KEYWORDS:

indoor localization, extreme learning machine, Wi-Fi cyclic dynamics, feature adaptive.