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Extreme learning machine for user location prediction in mobile environment

Teddy Mantoro
Department of Computer Science, KICT, International Islamic University Malaysia, Kuala Lumpur, Malaysia

Akeem Olowolayemo
Department of Information Systems, KICT, International Islamic University Malaysia, Kuala Lumpur, Malaysia

Sunday O. Olatunji
Department of Computer Science, FICT, Universiti Teknologi Malaysia (UTM), Johor Bahru, Malaysia, and

Media A. Ayu and Abu Osman Md. Tap
Department of Information Systems, KICT, International Islamic University Malaysia, Kuala Lumpur, Malaysia

Abstract

Purpose – Prediction accuracies are usually affected by the techniques and devices used as well as the algorithms applied. This work aims to attempt to further devise a better positioning accuracy based on location fingerprinting taking advantage of two important mobile fingerprints, namely signal strength (SS) and signal quality (SQ) and subsequently building a model based on extreme learning machine (ELM), a new learning algorithm for single-hidden-layer neural networks.

Design/methodology/approach – Prediction approach to location determination based on historical data has attracted a lot of attention in recent studies, the reason being that it offers the convenience of using previously accumulated location data to subsequently determine locations using predictive algorithms. There have been various approaches to location positioning to further improve mobile user location determination accuracy. This work examines the location determination techniques by attempting to determine the location of mobile users by taking advantage of SS and SQ history data and modeling the locations using the ELM algorithm. The empirical results show that the proposed model based on the ELM algorithm noticeably outperforms k-Nearest Neighbor approaches.

Findings – WiFi's SS contributes more in accuracy to the prediction of user location than WiFi's SQ. Moreover, the new framework based on ELM has been compared with the k-Nearest Neighbor and the results have shown that the proposed model based on the extreme learning algorithm outperforms the k-Nearest Neighbor approach.

Originality/value – A new computational intelligence modeling scheme, based on the ELM has been investigated, developed and implemented, as an efficient and more accurate predictive solution for determining position of mobile users based on location fingerprint data (SS and SQ).

Keywords Location awareness, Artificial neural network, Extreme learning machines, Mobile technology, Learning

Paper type Research paper

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