Applying Rprop Neural Network for the Prediction of the Mobile Station Location

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Abstract

Wireless location is the function used to determine the mobile station (MS) location in a wireless cellular communications system. When it is very hard for the surrounding base stations (BSs) to detect a MS or the measurements contain large errors in non-line-of-sight (NLOS) environments, then one need to integrate all available heterogeneous measurements to increase the location accuracy. In this paper we propose a novel algorithm that combines both time of arrival (TOA) and angle of arrival (AOA) measurements to estimate the MS in NLOS environments. The proposed algorithm utilizes the intersections of two circles and two lines, based on the most resilient back-propagation (Rprop) neural network learning technique, to give location estimation of the MS. The traditional Taylor series algorithm (TSA) and the hybrid lines of position algorithm (HLOP) have convergence problems, and even if the measurements are fairly accurate, the performance of these algorithms depends highly on the relative position of the MS and BSs. Different NLOS models were used to evaluate the proposed methods. Numerical results demonstrate that the proposed algorithms can not only preserve the convergence solution, but obtain precise location estimations, even in severe NLOS conditions, particularly when the geometric relationship of the BSs relative to the MS is poor.

Keyword：time of arrival (TOA); angle of arrival (AOA); back-propagation nseural network (BPNN); resilient back-propagation (Rprop)