

ABSTRACT

There is a great potential of wireless sensor networks in real time monitoring of disaster prone areas. The present work focuses on specially designed communication link establishment for the first 72 hours just after disaster, highlighting the capability of wireless sensor network especially in disaster prone area. The complete network consists of wireless nodes with integrated Xbee as a sensor to establish a communication link in between the pursuit (rescue) team and trapped people post disaster. Focusing on post disaster condition, the localization is done by unilateral algorithm which has an advantage over trilateration algorithm to help in localization of trapped people. The unilateral technique uses the state of the art VPM (Vector Parameter based Mapping) protocol to track trapped people from communication deprived area. Several tests have been performed on a designed test bed to find the location of trapped node. The results obtained from network are very encouraging as the trapped nodes are fully discoverable using a hybrid model having RSSI (Remote Signal Strength Indicator) as a key component. To optimize the unilateral method hybrid TLBO – unilateral method have been used. The localization of the anchor node (fixed node) by pursuit nodes (movable node) in outdoor location has been studied by performing two experiments. The first method is based on LNSM (Log Normal Shadowing Method) technique to localize the anchor node and the second method is based on Hybrid TLBO (Teacher Learning Based Optimization Algorithm)-Unilateral technique. In the first approach the ZigBee protocol has been used to localize the node, which uses RSSI (Received Signal Strength Indicator) values in dBm. LNSM technique is implemented in the self-designed hardware node and localization is studied for outdoor location. The statistical analysis using RMSE (root mean square error) for outdoor location is done and distance error found to

be 35 mtrs. The same outdoor location has been used and statistical analysis is done for localization of nodes using Hybrid TLBO-Unilateral technique. The Hybrid-TLBO Unilateral technique significantly localizes anchor node with distance error of 0.7 mtrs. The RSSI values obtained are normally distributed and a standard deviation of 1.01 in RSSI value is observed for outdoor location. The node becomes fully discoverable after using hybrid TLBO- Unilateral technique. The nodes are capable of recognizing the traveler's location whenever they are passing by the disaster prone areas. The nodes gather RSSI values along with the estimated distances of the traveler (having anchor node) from the pursuit team (having pursuit node). The system has proven its validity by tracking the trapped people in communication deprived area by doing mock drill several times.