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Wireless sensor networks in rescue operations using 3-D localization.

Abstract

Wireless sensor networks have a great impact on long time monitoring applications (environment monitoring, security surveillance, habitat monitoring etc.) but its potential is yet to be discovered, where it can be deployed in time critical situations when disaster happens.

There is a significant gap between existing applications of sensor networks and the requirement of applications supporting rescue operations that involves the catastrophe of human lives.

As we are dealing with the human lives here, we can't just rely on the localization schemes that depend upon the connectivity information (range-free) algorithms only. Further, rescue operations are carried out in highly noisy environments, so distance based (range-based) localization algorithms generate high error in distance measurements. An efficient algorithm is needed that can measure the location of the sensor nodes near to the living being or being attached to them in 3-D space with a high accuracy. To achieve such kind of accuracy a combination of both the strategies is required.

As the sensor networks are highly application specific, no algorithm can be generalized that suits to all the conditions. Further, the algorithms should be efficient and less resource consuming for getting executed on sensor nodes with low processing power.

This thesis proposes an algorithm which incorporates both the range-based and range-free strategies. The proposed algorithm is compared with an existing algorithm namely, Center of gravity (COG) extended to the 3-D space. An extensive simulation is done in the MATLAB environment. Performance evaluation is also done for both the algorithms to depict the accuracy in highly noisy environments.