

A synchronization-free method for estimating TDOA: technique and proof-of-concept

The difficulty of estimating time-difference-of-arrival (TDOA) lies in the fact that the network of receiver nodes needs to be synchronized to obtain accurate results. This paper presents a technique for estimating TDOA where explicit synchronization between nodes is not required. By forwarding the baseband signal from a first receiver node to a second receiver node, the time offset between the nodes is effectively canceled out, and the TDOA between the two nodes can be easily estimated. All that is required is to know the propagation delay between the two receiver nodes, and to ensure that the clock skew is relatively low. The proposed method is implemented on a software-defined radio testbed and validated in a controlled lab environment. The method is also tested in an outdoor line-of-sight environment with a network of four receiver nodes, and localization results and TDOA estimation errors are presented.

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