A TWO−STEP TIME OF ARRIVAL ESTIMATION ALGORITHM FOR IMPULSE RADIO ULTRA WIDEBAND SYSTEMS (ThuPmOR12)

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Abstract :

High time resolution of ultra wideband (UWB) signals facilitates very precise positioning capabilities based on time−of−arrival (TOA) measurements. Although the theoretical lower bound for TOA estimation can be achieved by the maximum likelihood principle, it is impractical due to the need for extremely high−rate sampling and the presence of large number of multipath components. On the other hand, the conventional correlation−based algorithm, which serially searches possible signal delays, takes a very long time to estimate the TOA of a received UWB signal. Moreover, the first signal path does not always have the strongest correlation output. Therefore, first path detection algorithms need to be considered. In this paper, a data−aided two−step TOA estimation algorithm is proposed. In order to speed up the estimation process, the first step estimates the rough TOA of the received signal based on received signal energy.
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Abstract : (cont.)

Then, in the second step, the arrival time of the first signal path is estimated by considering a hypothesis testing approach. The proposed scheme uses low−rate correlation outputs, and is able to perform accurate TOA estimation in reasonable time intervals.

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Abstract : (cont.)

The simulation results are presented to analyze the performance of the estimator.