localization using TOA from Multipath (Ramot)

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The Technology

Our expert team has succeeded to develop a unique algorithm for location estimation that attains optimal performance in multipath conditions. The novel estimator advantage is that it attains accuracy which is significantly better than other leading methods and that its computational complexity is low. Meaning the algorithm is well suited for implementation in systems with limited real time, memory and power resources and still yields location estimation with best accuracy.

Today's existing practical methods for position estimation in the presence of multipath are suboptimal and suffer from a high probability of large estimation error which limits the attractiveness of indoor positioning in many applications. Furthermore, the location estimation algorithms that attain best performance are very complex and hence in most cases are impractical for implementation.

The Need

Positioning methods based on time of arrival (TOA) measurements are attractive since their accuracy increases with the used bandwidth. In an indoor environment the transmitted signal is reflected by objects, walls and peoples thus multipath arrivals are received. For the position estimation the TOA of the first arrival path needs to be measured, however it is often attenuated significantly due to destructive superposition with multipath reflections, or blocked by obstacles. In the presence of additive thermal noise, robust and accurate position estimation based on TOA is a considerable challenge especially when the signal to noise ratio (SNR) is low.

Recent WiFi and Cellular standards have been upgraded to support localization of devices. With the proliferation of Smart Phones it is expected that in the near future wireless indoor positioning will play a significant roll enabling navigation inside public areas such as shopping centers, airports, parking lots and also enabling commercialization based on location.

Potential Application

Precise and robust positioning estimation of a target by base stations in an indoor wireless system is important in many applications such as indoor navigation, inventory tracking, public safety, rescue, military, traffic management, home automation and patient monitoring.

Stage of Development

The algorithm has been developed and compared to other reference methods with a computer simulation using IEEE standards of statistical multipath channel models and with measurements taken from real indoor multipath environments.

Patents

The novel location algorithm is patent pending.

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