

电子技术

基于阵列天线的UWB定位方案研究

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摘要:

为实现简单而精确的定位, 提出了一种基于阵列天线的超宽带(ultra wideband, UWB)定位方案。在定位源末端设置4根阵元天线, 用于检测未知节点发射的UWB信号, 各天线接收的信号经统一的中央处理单元, 只需单个定位源就能完成未知节点的三维定位。通过UWB多径信号检测算法进行到达时间差(time difference of arrival, TDOA)估计, 无需收发两端时钟同步, 且避免了使用复杂的波束赋形技术。同时, 提出了一种UWB多径信号检测算法, 在分析误差模型对定位精度影响的基础上, 以IEEE 802.15.4a信道模型的CM1~CM8为依据, 对方案进行了误差性能仿真实验。结果表明, 所提方案可实现精确定位, 误差达厘米级。

关键词: 阵列天线 超宽带 到达时间差估计 定位

Investigation of UWB positioning based on antenna array

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Abstract:

A novel class of ultra wideband (UWB) positioning scheme based on antenna array is proposed. Four antenna arrays are settled at the tip of the positioning source to receive the UWB signal from an unknown node. One positioning source is enough for 3-D localization. The positioning information is obtained from time difference of arrival (TDOA) estimation through UWB multipath detection. Due to the design of avoiding the time synchronization for TOA and the beamforming technique for angle of arrival (AOA), the hardware complexity is reduced in the proposed positioning system. Simultaneously, a UWB multipath detection algorithm for TDOA estimation is presented. The positioning performance under the effect of the multipath error and NLOS error is discussed. In addition, the positioning performance of the proposed scheme is tested under IEEE 802.15.4a channels. The result demonstrates the effectiveness of the proposed scheme, and the centimeter level positioning precision is obtained.

Keywords: antenna array ultra wide band time difference of arrival estimation positioning

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