

基于Kalman滤波器的实时拖拉机位置确定系统(英文)

Real-Time Tractor Position Estimation System Using a Kalman Filter

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英文关键词: tractor position estimation; sensor; information fusion; GPS; Kalman filter

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中文摘要:

该文提出了一个实时拖拉机位置确定系统, 该系统由一个六轴惯性测量单元(IMU)和一个Garmin全球定位系统(GPS)组成。在系统中, 设计了一个Kalman滤波器来综合两个传感器的信号, 以滤去GPS信号中的噪音, 融合冗余信息, 最后得到一个有较高更新速度的输出信号。此外该系统还能够补偿IMU的偏移误差。通过使用该系统, 低价的GPS可以替代高价的GPS, 并且保持良好的精确性。试验和融合结果表明该系统确定的拖拉机位置误差比单一使用GPS的系统的误差要大大减小: 当拖拉机速度约为1.34m/s时, 该系统东向轴的平均偏差为0.48m, 而GPS的平均偏差为1.28m; 北向轴的偏差从1.48m降为0.32m。系统的更新频率则从原有GPS的1Hz增加到9Hz

英文摘要:

A real time tractor position estimation system, which consists of a six axis inertial measurement unit (IMU) and a Garmin global positioning system (GPS) was developed. A Kalman filter was designed to integrate the signals from both sensors so that the noise in GPS signal was smoothed out, the redundant information fused and a high update rate of output signals obtained. The drift error of IMU was also compensated. By using this system, a low cost GPS can be used to replace expensive one with a high accuracy. Test and fusion results showed that the positioning error of the tractor estimated using this system was greatly reduced from a GPS only system. At a tractor speed of about 1.34 m/s, the mean bias in easting axis of the system was 0.48 m, comparing to the GPS mean bias of 1.28 m, and the mean bias in northing axis was reduced from 1.48 m to 0.32 m. The update frequency of the GPS system was increased from 1 to 9 Hz.

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