Pedestrian indoor navigation using foot-mounted IMU and deployable nodes

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ABSTRACT

In this paper, we are interested with indoor navigation mainly for first responders. Main navigation tool is a foot-mounted IMU. It is now well-known that an inertial navigation algorithm combined with zero velocity updating can provide accurate location information for a short time. However, the location accuracy degrades as time goes by. To compensate this growing error, wireless nodes are deployed as first responders are moving. The nodes contain a wireless module (Zigbee module) and magnetic coils. Received signal strengths (RSS) provide distance information from deployed nodes. Generated magnetic field is used to correct the location and heading in the inertial navigation algorithm. Wireless signal can be received from longer distance while magnetic field can be sensed only in a short distance. On the other hand, the location information from the magnetic field is more accurate. Since earth magnetic field can be easily disturbed indoors, only gyroscopes are used for heading computation. If a deployed node is near a person, the magnetic field is used to correct heading and location. Through simulation and experiments, the location accuracy is investigated.

KEYWORDS: foot-mounted IMU, RSS, magnetic field, extended Kalman filter.