Calibration of Dead Reckoning with IMES for Indoor Pedestrian Navigation

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ABSTRACT

Our research goal is to realize Indoor Pedestrian Navigation. Dead Reckoning (DR), that uses integrated sensors as smart phones do, is one of key technologies because DR technology allows indoor navigation without installing any further device in order to determine position into a building or outdoor. The main concern for DR based Pedestrian Navigation is that DR presents problems due to cumulative errors. In order to improve DR's cumulative error sensitiveness, we propose a calibration with Indoor Messaging System (IMES). IMES can transmit absolute position to GPS receiver using latitude, longitude and floor data allowing the interface between outdoor and indoor navigations systems.

IMES assumes that positioning accuracy of less than ten meters will satisfy users who would like to know where they are in indoor places such as buildings, shopping areas, airports, etc. This technique is able to achieve calibration of the DR's error, and prevent accumulated large error. On the other hand, IMES systems need maintenances and installation of IMES transmitters even if combination of DR and IMES technologies allows to limit the number of minimum installed transmitters. This Pedestrian Navigation System using DR and IMES can get the location information of both, but either of information is used as position information of itself. Location information of IMES has priority than DR's. If this system can get information of both, location information of IMES is displayed on the map. In this paper, we built a prototype that implements both DR and IMES that we conducted several Pedestrian Indoor Navigation experiments. As a result, we confirmed that the accuracy of this method is improved compared to only DR systems and that the maximum error is decreased.

KEYWORDS: Dead Reckoning, IMES, Indoor Pedestrian Navigation, Calibration