What is the Pedestrian Dead Reckoning Accuracy that Can be Achieved with Today's MEMS Sensors in Mobile Phones and Why is it Important?

ABSTRACT

The Indoor Navigation market is forecasted to grow from $30 million in 2013 to $12.9 billion in 2018.[1] While there are many technologies being leveraged to provide indoor navigation, each has barriers that hinder wide scale adoption of a highly accurate solution. As such, there is a shift towards using multiple technologies together to provide a hybrid solution. The most promising of these is the combination of Wi-Fi, Bluetooth, Cellular, and motion MEMS sensors, namely sensor fusion of gyroscopes, accelerometers, and magnetic sensors.

The accuracy one can achieve with today's MEMS sensors found in mobile phones will be presented along with what effect this accuracy has on integration with other RF signals.

INTRODUCTION

Indoor navigation will eventually be more important for indoors than GPS is for outdoors. The list of potential future indoor navigation applications includes: navigation apps for large venues, social apps with location sharing, micro-fencing (a geo-fence on a smaller scale), shopping list routing, location-based offers/coupons, location games such as Ingress (Note: future games could also use orientation to aim at targets, such as virtual laser tag), targeted advertisements, asset/workforce tracking, defense/intelligence, fire and police…

The structure of this paper is as follows: Section II reviews related work from literature, and Section III reviews the impact on PDR accuracy from the most critical error sources, making a case that PDR orientation initialization is a critical error source needing a new solution. Section IV reviews work we did with blending PDR with RF using a particle filter to attempt to improve the errors that result from PDR initialization errors. Lastly, in Section V, we present conclusions and future improvements for indoor location.

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