University of Technology Sydney

Faculty of Engineering & Information Technology

Development of Indoor Positioning System Using RSSI and Beacon Weight Approach in iBeacon Networks

A thesis submitted for degree of

Master (Computer Science)

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Certificate

I certify that the work in this thesis has not previously been submitted for a degree nor has it been submitted as part of requirements for a degree except as part of the collaborative doctoral degree and/or fully acknowledged within the text.

I also certify that the thesis has been written by me. Any help that I have received in my research work and the preparation of the thesis itself has been acknowledged. In addition, I certify that all information sources and literature used are indicated in the thesis. This research is supported by the Australian Government Research Training Program.

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List of Abbreviation

AoA	Angel of Arrival
AWBCL	Averaged Weighted Based Centroid Localization
BLE	Bluetooth Low Energy
EKF	Extended Kalman Filter
FRBW	Filtered RSSI Based Weight
GIS	Geographic Information System
GPS	Global Positioning System
INS	Inertial Navigation System
IOC	Initial Operational Capability
IPS	Indoor Positioning System
LAN	Local Area Network
LBS	Location Based Services
LOS	Line Of Sight
MAC	Media Access Control
NLOS	Non Line Of Sight
RFID	Radio-Frequency Identification
RSSI	Received Signal Strength Indicator
SIG	Special Interest Group
TDoA	Time Difference of Arrival
ToA	Time of Arrival
ToF	Time of Flight
UKF	Unscented Kalman Filter
UWB	Ultra Wide Band
WCL	Weight Centroid Localization
WLAN	Wireless Local Area Network

Abstract

Increasing the location accuracy of the Indoor Positioning System (IPS) is an important research area in localization. Utilizing mobile beacons in IPS environment has made localization more accurate and cost-effective. This research developed a Filtered RSSI and Beacon Weight Approach (FRBW) based on improved Received Signal Strength Indicator (RSSI) using Kalman filter. This approach takes both the distance and improved RSSI measurements between beacon nodes into consideration. Kalman filter is applied on the RSSI measurements that eliminate noise of the signal and then applied on FRBW positioning algorithm. The developed approach was applied and validated in IPS experiments using Bluetooth Low Energy beacons. The results show that this FRBW approach has better positioning accuracy and minimum location error, and can be applied in IoT applications in smart city.

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