

# **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)**

Student Name: Laial Alsmadi  
Supervisor: Dr Xiaoying Kong  
Co-Supervisor: A/Prof. Kumbesan Sandrasegaran

## **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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**Date:** 16 December 2019

## **Acknowledgements**

*I would like to extend my deepest gratitude to all who supported me during the last academic years and throughout the delivery of my thesis.*

*To begin with, I would like to extend a big thank you to Dr. Xiaoying Kong for her great ongoing help, support, advices, friendship and knowledge, which helped me a lot to develop and achieve great success on both academic and personal levels.*

*I am indebted to the Faculty of Engineering and Information Technology-University of Technology Sydney to provide me with all necessary tools to accomplish my thesis.*

*Finally, warm thanks you to my lovely small family; my husband and kids (Khalid, Maria and Mohammad) for their great support and encouragements during my study. In addition, I extend my big thanks to my Father, Mother, Brothers and Sisters for their ongoing encouragements and prayers.*

## List of Abbreviation

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