Indoor Navigation for a Supermarket Using Bluetooth low energy (BLE) Beacons and Analysis of Consumer Behavior

by
D.N.S Perera
14222P

Faculty of Information Technology
University of Moratuwa

May 2017

Indoor Navigation for a Supermarket Using Bluetooth low energy (BLE) Beacons and Analysis of Consumer Behavior

Mobile application and a Web admin panel

D.N.S Perera

149222P

(MSCIT/14/056)

Dissertation submitted to the Faculty of Information Technology, University of Moratuwa, Sri Lanka for the partial fulfillment of the requirements of the Degree of MSc in Information Technology.

Faculty of Information Technology

University of Moratuwa

May 2017

Declaration

I declare that this thesis is my own work and has not been submitted in any form for another degree or diploma at any university or other institution of tertiary education. Information derived from the published or unpublished work of others has been acknowledged in the text and a list of references is given.

Name of Student
D.N.S Perera

Signature of Student

……

Date:

Supervised by
Mr. B.H Sudantha

Signature of the supervisor

……

Date:

Dedication

This Dissertation is dedicated to my loving parents for their support and encouragement.

Acknowledgements

First I would like to express my heartfelt appreciation and gratitude to my supervisor Mr.B.H Sudantha for his most valued guidance, commitment and kind support to make this research success. He consistently allowed this paper to be my own work, but steered me in the right the direction whenever he thought I needed it.

I would also like to thank Prof. Asoka S Karunanda who taught us Research Methodology and Literature Review and Thesis Writing subjects which helped me to ease this process.

It is my great pleasure to thank all the other Lecturers and all my batch mates of the M.Sc in Information Technology batch 8 in faculty of Information Technology for their various help and support.

Abstract

Retailers typically make a variety of strategic level decisions including the type of store, the market to be served, the optimal product assortment, customer service, supporting services and the store's overall market positioning. Once the strategic retail plan is in place, retailers devise the retail mix which includes product, price, place, promotion, personnel and presentation.
In this digital age, there are many ways to analyze buying patterns. Yet retailers would like to understand consumer behavior inside stores so they can organize and place their products based on that and gather more information based on gender, age, profession etc.

Localization and navigation have been important topics in research. There are many impossibilities when trying to perform positioning within indoor environments, with the use of GPS technology. In order to overcome these limitations, we look into Bluetooth Low Energy technology based localization model.

In real time applications such as object tracking and distance estimations, continuous receptions of RSSI measurements are needed in order to estimate accurately the position of the object. In adjacent to those considerations, there are some additional constraints to be inspected such as signal attenuation, signal loss, multipath effects, temperature, reflection, a human body and other communication signals. Hence, this research work has examined the RSSI smoothing approaches in order to obtain preferable results. Although there are so many solutions, no RSSI smoothing method has been recognized as a standard method.

During experiment, we found that the fluctuation of the RSSI values are hard to handle and many techniques were used to overcome this. Kalman filter algorithm was used to smoothing the RSSI values. Many techniques were tried to get the exact position of the user and trilateration algorithms are used to estimate the position of the user.

Table of contents

List of Figures