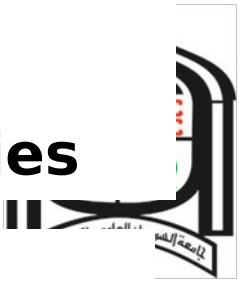
Sudan University of Science & Technology

College of Graduated Studies



Wi-Fi positioning techniques for location based services

تحديد مواقع الخدمات باستخدام

A Research Submitted in Partial Fulfillment for The Requirements Degree of MSC in Communication Engineering

Prepared By:

Mohamed Hamid Ahmed

Supervised by:

Dr.Mohammed Hussien Mohammed

اعوذ بالله من الشيطان الرجيم

وَقُلِ اعْمَلُواْ فَسَيَرَى اللّهُ عَمَلَكُمْ وَرَسُولُهُ وَالْمُؤْمِنُونَ وَسَتُرَدُّونَ إِلَى عَالِمِ الْغَيْبِ وَالشَّهَادَةِ فَيُنَبِّئُكُم بِمَا كُنتُمْ تَعْمَلُونَ }التوبة 105

صدق الله العظيم

Dedication

This work is devotedly dedicated to

ALMIGHTY GOD

TO GREATEST FATHERS

AND KIND MOTHERS.

Acknowledgement

First and Foremost we give thanks to Allah then , I would like to express my sincere gratitude to my advisor Dr. Mohammed Hussien Mohmmed for the continuous support of my Msc research, for his patience, motivation, enthusiasm, and immense knowledge. His guidance helped me in all the time of research and writing of this thesis. I could not have imagined having a better advisor and mentor for my Msc study. I thank my colleagues for stimulating discussions, for the sleepless nights we were working together before deadlines. Last but not the least I would like to thank my family my mother Nawal and my father Hamid my brothers Mazin, Moiz, Mosab and my little sister Mai at first place and supporting me spiritually throughout my life.

Abstract

Location-aware computing becomes an exciting research as recent advancements in RF circuits and wireless communication stacks. In this thesis, we present a fingerprinting based location assessment. The proposed method uses WLAN signal Strength to estimate the global position of mobile users in an indoor environments. The system uses the signal strength from several base stations rather than angle for determining the location of mobile station. The project deal with two algorithms to calibrate signals received from access points and stored it in the radio map (fingerprinting) is called calibration phase. In localization phase the stored values are compared with calibrate one to predict the user locations. Therefore a fingerprinting algorithm that was introduced is used to improvement of the presented work and with multi sensors which enhance the accuracy of fingerprinting algorithms and tracking of the users.

المستخلص:

التطور الهائـل فـى تقنيـة تحديـد المواقـع ومـا اشـتملت عليـه مـن تطبيقـات ساهمت فى تحديث البنية التحتية لسوق العمل. ومع وجود بعض القصور فـى فى بعض التقنيات تم الاستعاضه باخرى لم تكن تستخدم فى نفس النطــاق . فى هـذا المشـروع تـم اسـتخدام تقنيـة اخـز البصـمة باسـتخدام خوارزميـتين لتحديد مكان المستخدم وتعتمد التقنية على أخز قراءة الاشارات مـن اجهـزة الارسال (نقاط الوصول) فى المنطقة المخصصة للمسح فى المرحلة الاولـى لبناء الخريطة الراديويه . فى المرحلة الثانية يتم مقارنة القـراءة الـتى خصـل عليها المستخدم مع الخريطة الراديوية .وتصبح القيم التى يرجعها النظام بعـد المقارنه اكثر دقة كلما ذادت قيم الخريطة الراديوية.

Content

List of Tables

List of Figures

List of Abbreviations

MS	Mobile Station
FCC	Federal Communications Commission
4G	Forth Generation

GPS	Global Positioning System
ITS	Intelligent Transportation Systems
WLAN	Wireless Local Area Network
WI-FI	Wireless Fidelity
LBS	Location-Based Services
SS	Signal Strength
RTLS	Real-Time Locating System
API	Application Programming Interface
PDA	Personal Digital Assistance
VOIP	Voice Over IP
SSID	Service Set Identifier
MAC	Media Access Control
RF	Radio Frequency
TDOA	Time Distance Of Arrival
RFID	Radio Frequency Identification
TOA	Time Of Arrival
VHF	Very High Frequency
VOR	VHF Omni Directional Ranging
AOA	Angle Of Arrival
RSS	Received Signal Strength
IPS	Indoor Positioning System
SVM	Support Vector Machine
UWB	Ultra Wide Band
OSL	Opportunistic Seamless Localization

AP	Access Point
SS	Sum of Square