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GuideMe
A Networked Application for Indoor Orientation and Guidance

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Short resume of Professor Christos Bouras

- Christos Bouras is Professor in the University of Patras, Department of Computer Engineering and Informatics. Also he is a scientific advisor of Research Unit 6 in Computer Technology Institute and Press - Diophantus, Patras, Greece. His research interests include 5G and Beyond Networks, Analysis of Performance of Networking and Computer Systems, Computer Networks and Protocols, Mobile and Wireless Communications, Telematics and New Services, QoS and Pricing for Networks and Services, e-learning, Networked Virtual Environments and WWW Issues. He has extended professional experience in Design and Analysis of Networks, Protocols, Telematics and New Services. He has published more than 450 papers in various well-known refereed books, conferences and journals. He is a co-author of 9 books in Greek and editor of 2 in English. He has been member of editorial board for international journals and PC member and referee in various international journals and conferences. He has participated in R&D projects.

Outline

- Introduction
- Motivation
- Related Work
- System Architecture
- Proposed System
- Conclusion and Future Work
- Acknowledgment

Introduction

- There is an increasing demand for efficient indoor navigation systems, demand that mainly derive from smart cities, robots and visually impaired people.
- As far as outdoor navigation and pathfinding are concerned, the Global Positioning System (GPS) is still considered among the most commonly used technologies but the inability to use the GPS technology inside buildings makes indoor navigation more complicated.
- Indoor navigation is very important to us and has many applications for humans and robots. Two of the most common issues that arise are a) the fact that physical obstacles inside building that have cannot be labeled as obstacles from the GPS and b) the fact that signals cannot be absorbed by walls inside buildings.
- The direct need for new applications and technologies that can efficiently tackle such issues .

Motivation

- Globally, at least 2.2 Billion people have a vision impairment or blindness
- They can’t move easily one place to another without helping
- We need to make people feel more comfortable visiting public places
- Paper aims on providing security in case of emergencies
- It targets at designing and developing a tracking and navigation system aimed at people that experience difficulties in indoor orientation using a wearable device
- The user takes direction from the wearable device for the indoor orientation through voice commands helping him to avoid obstacles.

The motivation of this paper is designing a device that provides the ability to navigate and route by voice commands, based on the device's location and orientation capabilities.

Related Work

- Location estimation on Low Power Wide Area Networks (LPWAN) presenting Multilateration, Trilateration and PSO algorithms to calculate the location
- Evaluating performance in interior scenario gathering all existing algorithms for UWB positioning
- Overview of indoor positioning using UWB
- SWOT of UWB in indoor positioning
- Various positioning enabled wireless technologies for indoor navigation

System Architecture [1/2]

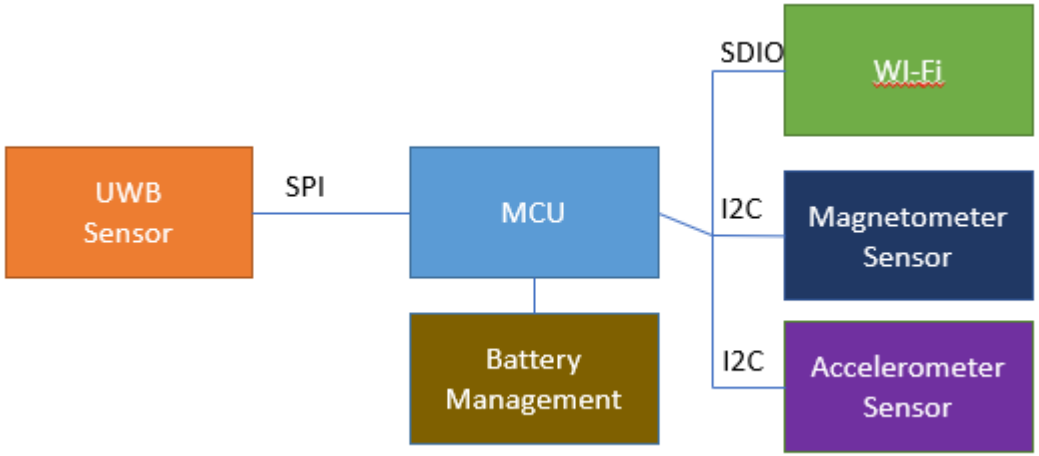
The main component is a small wearable using UltraWide Band technology

System has the ability to locate the user

It determines the orientation of the user

The device receives voice commands

It transmits voice instructions to guide the visually impaired people.



System Architecture [2/2]

Smart devices communicated to anchors through UWB

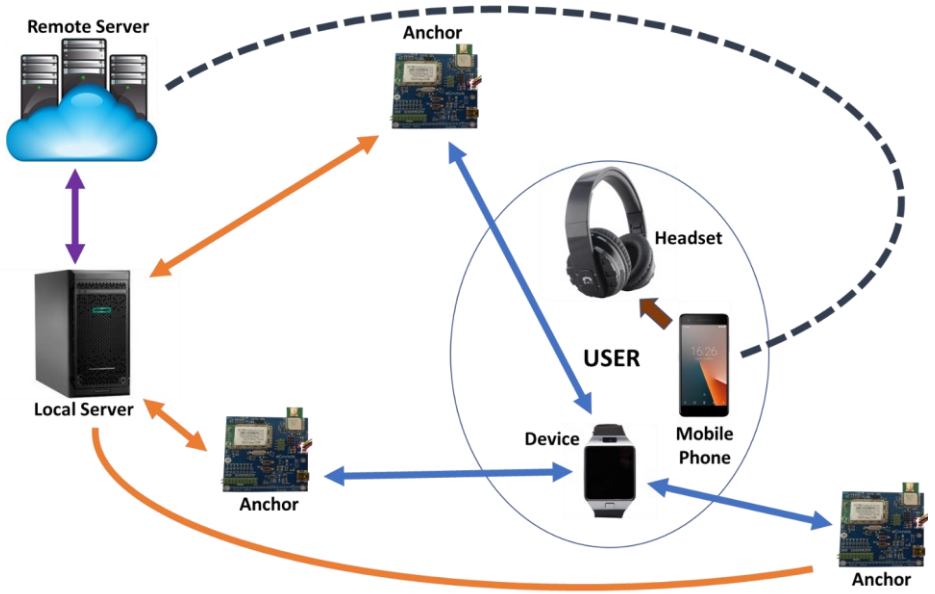
The device routes and navigates the user by voice commands

Anchors calculating the distance between user and anchor

Distance transfers to a local server to measure all the parameters

Position of user and building map used for guidance

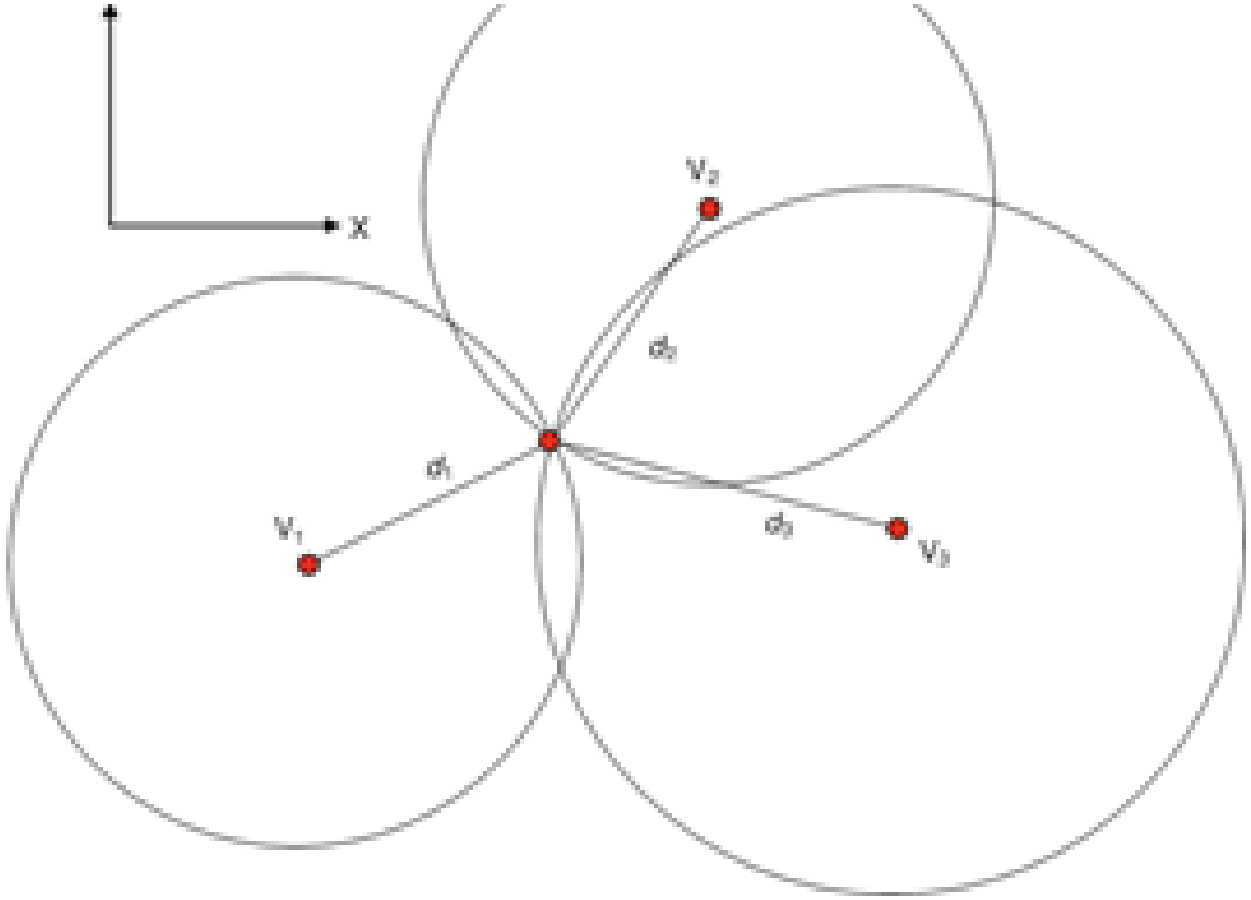
Directions are given to smart device through wireless headphones



Proposed System 1/2

Indoor Positioning - Trilateration Algorithm

- For each anchor the user communicates with a circle is created with center the position of the user and the radius the distance between the user and the anchor.
- At least 3 anchors
- The intersection is the location of the user



Proposed System 2/2

Indoor Navigation - Algorithm A*

- A path tree is constructed from the start node
- The travel cost is used and estimates the costs required to the final node
- Selects the path that minimizes $f(n) = g(n) + h(n)$
- Terminates when an acceptable extension is found

Conclusions and Future Work

- The paper is about a project contributing in indoor navigation and positioning for people with difficulties using a wearable device
- The user takes directions from the wearable device through voice commands helping him to avoid obstacles
- Extension of the current work by covering outdoor areas through the application

Acknowledgment

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Thank you!

Questions?

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