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Pedestrian Navigation in the Building Using Inertial Sensors

KEYWORDS: location; wireless device; bluetooth; pedestrian; master device.

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ABSTRACT *Nowadays finding the location is becoming difficult due to dense population. To navigate a pedestrian in the building is difficult to find out. In this paper we are locating a pedestrian in the building using wireless device. The wireless device here we are using is Bluetooth. The Bluetooth which is in the transmitter part will connect to the receiver part of the device with the help of master bluetooth which is fixed on wall. When the pedestrian moves around that region the bluetooth will be connected according to the signal received by the master device based on that we are finding the location in the building.*

INTRODUCTION

Usually navigation means all will prefer GPS as a source to find the location. But GPS gives the location with respect to region, area and building where we cannot find exact location of any particular stores. Today, most application requirements are locating or real-time tracking of belongings inside buildings accurately; thus the demand for indoor localization services has become a key prerequisite. Moreover, indoor localization technologies address the inadequacy of global positioning system inside a closed environment, like buildings. Location based services are the significant permissive technology. In this era, especially in wireless communication networks, location based services broadly exists from the short-range communication to long-range telecommunication networks. Location based services refers to the applications that depend upon the user's location to provide services in various categories. So, the positioning technologies have a major influence on performance. Pedestrian have often ways in unfamiliar urban environment or in complex buildings. In these cases they need guidance to reach their targets. For example a particular store in any multistory building or mall. So here we are relating simultaneous localization and mapping principle to find the location of the pedestrian. Simultaneous localization and mapping is basically known for pedestrian's step measurements which build a probabilistic map with respect to human movements in the building. Simultaneous localization and mapping includes Bayesian derivation to find the distance between probabilities of current location with respect to probability of last location. Navigation inside buildings also has to take into account the further dimension of different floors. The calculated routes are displayed within the maps. The basic criteria are connection of bluetooth devices. This project is focusing on the information of location-based services i.e. on the user's task and the support of user's decisions by information provided by such a services. The idea is to design a bluetooth transmitter that can be used to broadcast information to anyone carrying a bluetooth-enabled cell phone. The goal is to provide users with correct position and to guide them within the environment, allowing the development of mass-market and security-relevant applications.

LITERATURE SURVEY

In simultaneous Localization and mapping for pedestrian using distortions of the local magnetic field intensity in large indoor environments, it presents a simultaneous localization and mapping algorithm based on measurements of the ambient magnetic field strength, that allows quasi-real-time mapping and localization in buildings, where pedestrian with foot-mounted sensors are the subjects to be localized. We assume two components to be present: firstly a source of odometry, secondly a sensor of local magnetic field intensity. This implementation follows fast SLAM factorization using practical filter. It performs extensive experiments in a number of different buildings and present the result for five data sets for which it makes use of ground truth location information.

WIRELESS DEVICE CONNECTION

One of the efficient methods for navigation of pedestrian in the building is locating position. This can be achieved from the block diagram which is as shown in the figure 2.1 and figure 2.2. It consists of

Bluetooth

Bluetooth is a wireless standard for wireless personal area networks (WPANs). Almost every Wi-Fi enabled mobile device, such as mobile phone or computer, also has an embedded bluetooth module. The Bluetooth protocol operates at 2.4GHz ISM Band. The benefit of using bluetooth is exchanging information between devices. Bluetooth networks (commonly referred to as piconets) use a master/slave model to control when and where devices can send data. In this model, a single master device can be connected to up to seven different slave devices. Any slave device in the piconet can only be connected to a single master. The master coordinates communication throughout the piconet. It can send data to any of its slaves and request data from them as well. Slaves are only allowed to

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transmit to and receive from their master. They can't talk to other slaves in the piconet. Every single Bluetooth device has a unique 48-bit address. The most-significant half (24 bits) of the address is an organization unique identifier (OUI), which identifies the manufacturer. The lower 24-bits are the more unique part of the address. For example, on this RN-42 Bluetooth Module, the address printed next to "MAC NO." is 000666422152. The "000666" portion of that address is the OUI of Roving Networks, the manufacturer of the module. The "422152" portion of the module is the more unique ID of the device.

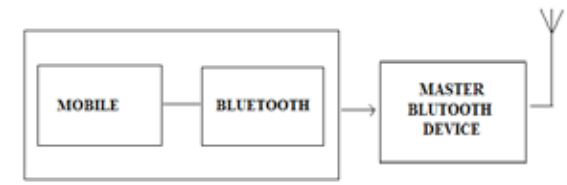

Figure 1: Transmitter

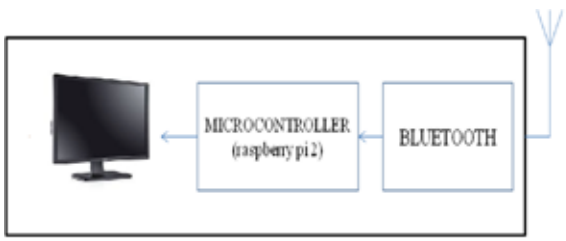

Figure 2: Receiver

The rules for device names are less stringent. They can be up to 248 bytes long, and two devices can share the same name. If two Bluetooth devices know absolutely nothing about each other, one must run an inquiry to try to discover the other. One device sends out the inquiry request, and any device listening for such a request will respond with its address, and possibly its name and other information. Paging is the process of forming a connection between two Bluetooth devices. Before this connection can be initiated, each device needs to know the address of the other (found in the inquiry process). After a device has completed the paging process, it enters the connection state. While connected, a device can either be actively participating or it can be put into a low power sleep mode.

Raspberry Pi

The Raspberry pi is a series of single board computers developed in UK by the Raspberry Pi Foundation with the intention of promoting the teaching of basic computer science in schools. The original Raspberry Pi and Raspberry Pi 2 are manufactured in several board configurations through licensed manufacturing agreements with Network element14(Premier Farnell)RS Components and Egoman. These companies sell the RaspberryPi online. Egoman produces a version for distribution solely in China and Taiwan, which can be distinguished from other Pis by their red coloring and lack of FCC/CE marks. The hardware is the same across all manufacturers. The Pi will be available in two flavors named Model A and Model B. Model A is a bit cheaper and does not have as many connectors as Model B. The basic Raspberry Pi is based on the BroadcomBCM2835 system on a chip(Soc) which includes ARM-1176JZF-S700MHz processor, 256 megabytes of RAM.The heart and brain of the Raspberry Pi is system on a chip.it is a cheap and powerful. It consumes less power. It has a five status LEDs which indicates different conditions o Pi.

Wireless-Fidelity(Wi-fi)

Wi-Fi is a popular technology that allows sharing data using radio waves over a computer networks. Many devices can use Wi-Fi example personal computer, mobile devices. These can connect to a network resource such as the internet via a wireless network access point. The range of hotspot is 20 meters in indoors and a greater range in outdoors.

TRACKING MODEL

The tracking model of pedestrian navigation is the outlook of the block diagram which explains its working. This is shown in figure 3.

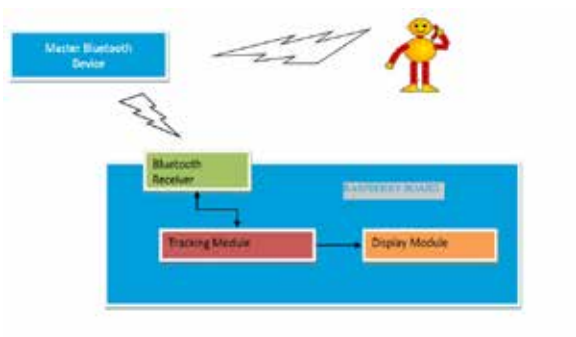

Figure 3: Tracking model

The Master Bluetooth devices are mounted on the walls of the building at various rooms that needs to be tracked. When a person walks in to the room with Bluetooth device, it will be connected to Master Bluetooth device and the person location will be identified. All the master devices are connected to central ARM based board which will track the persons based on master devices location. The building plan is displayed and all the master Bluetooth devices are identified on the building plan. As the person moves and connects to various master devices the person location is displayed on the building plan accordingly and movements are tracked.

WORKING

As block diagram says first we have to connect the bluetooth.

Bluetooth connection is based on master and slave technology under client and the server programming in Linux. When the pedestrian walk around that master device which is mounted on walls will be connected using the parameter of pedestrian data by initializing the layout of the building. Based on the layout and the pedestrian data it will store the data base and start mapping the pedestrian in coordinates on the map. Then the master device will in turn connect to the arm board and send the collected database from the transmitter part. By this information the routing procedure undergoes and the position of the pedestrian is displayed on the monitor. .

The transmitter and receiver part device is shown in figure 4 where we will connect the bluetooth device.

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Figure 4: Master Bluetooth connecting device

ADVANTAGES AND DISADVANTAGES

The advantages are the pedestrian navigation is targeted of giving people reliable and useful walking direction and inertial sensors are those often used in conjunction such as magnetometers and altimeters have the great advantage that they are well suited to usage by pedestrians with mobile devices. Reliability is high. The disadvantage is the measurement error (drift) grows unboundedly over time and one of the drawbacks of using bluetooth is that, in each location finding, it runs it runs the device discovery procedure , due to this significantly increases the localization latency and power consumption.

APPLICATION

Data collected by traveling pedestrians are used to create navigable maps in heavily frequented areas such as airports, stations, shopping centers, and other public buildings. It can be used to find the objects which are misplaced in dense populated area.

VIII RESULT

Figure 5:Connection on the Rsapberry Board

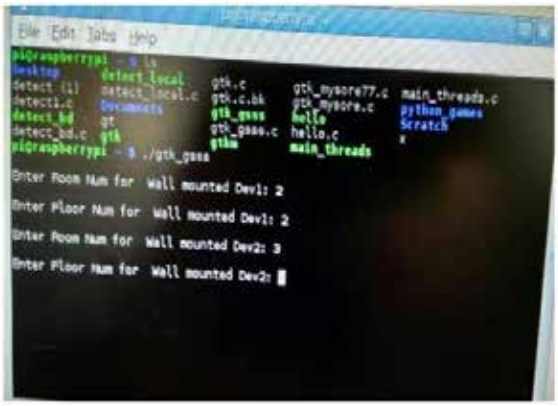

Figure 6: Initializing the values

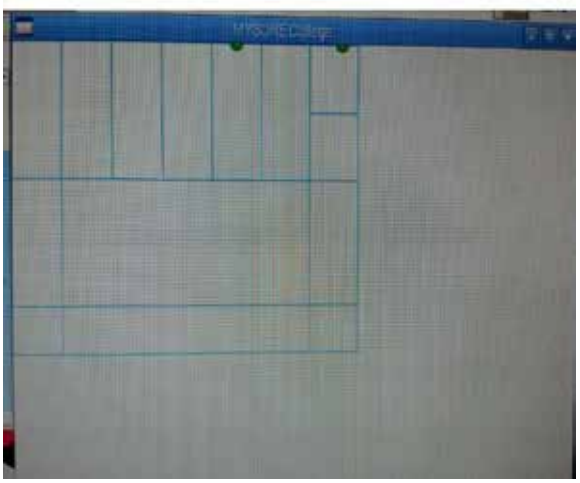

Figure 7: GTK layout

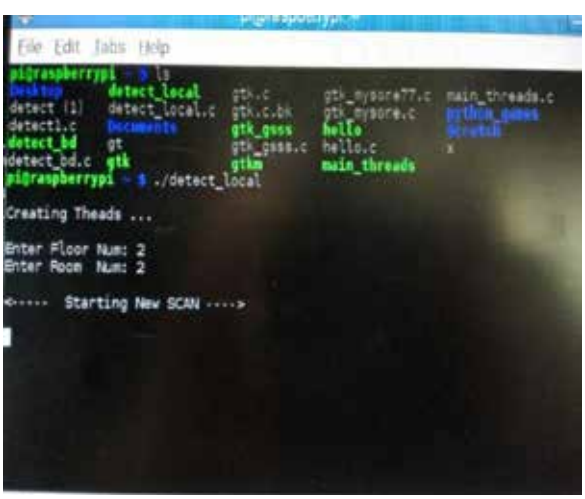

Figure 8: Starting up of scanning

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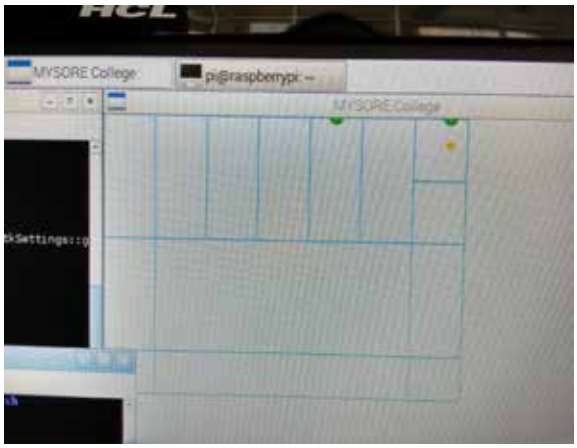

Figure 9: Display of scanned result on GTK

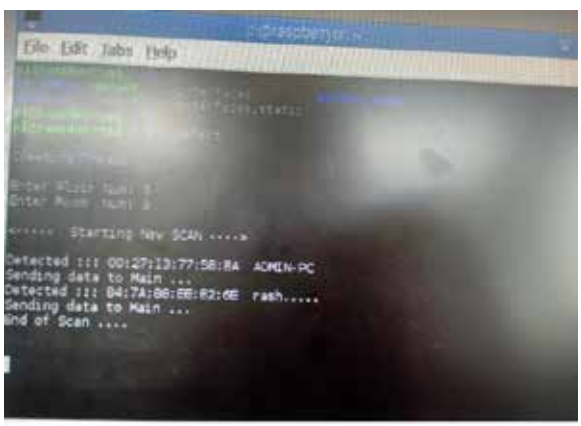

Figure 10: Scanning the Bluetooth at receiver

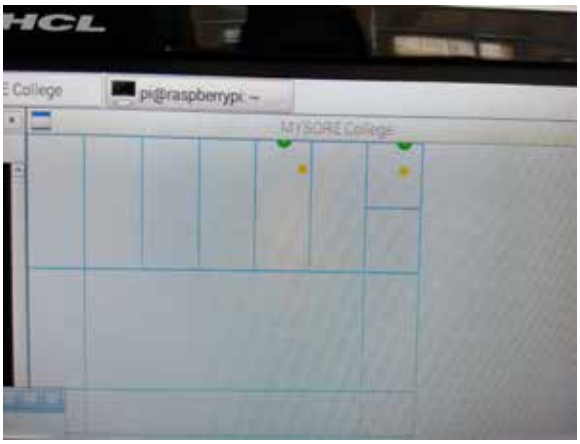

Figure 11: Recognition of pedestrian location

IX.CONCLUSION AND FUTURE WORK

While satellite positioning systems allow devices to position themselves anywhere in the world when outdoors, they do not work well in indoor environments. This has led to the development of indoor positioning technologies, however the infrastructure requirements of existing indoor location systems make them expensive and time consuming to deploy and maintain. As a result they are not well suited to certain usage scenarios, such as when emergency personnel enter a building to which they have just been called. Temporary deployments (e.g. for a few weeks) of existing indoor positioning systems are impractical due to the high cost of installation. They are also uneconomical for deployment in large, sparsely populated areas, since the cost of such systems is largely dependent on the coverage area rather than the number of tracked users. In contrast to existing absolute positioning systems, robot localization algorithms allow robots to determine and track their absolute positions in indoor environments without the need for any fixed infrastructure. Such techniques can in theory be applied to track pedestrians; however they require maps of indoor environments to be available. Until now this has not generally been the case; however increased mapping of such environments by commercial mapping companies is likely to address this problem in the future. Future work will address the mapping of much larger buildings, structures with different floor separations, and weak structural similarities across floors. Hereby, the use of other sensors such as altimeters, magnetometers, Wi-Fi signal strength, and GPS is expected to ensure the robustness of Foot SLAM.

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