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RFID Based Blind Navigation System for Indoor Environments

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Abstract: - In our future world of pervasive computing, where information is all around us, a location and tracking system becomes very important. Location is one of the knowledge that is most important for potential and evolving applications. Since public use of GPS satellite is permitted, several state-of - the-art devices are part of our lives, such as a car navigator and a mobile phone with an integrated GPS receiver. Location information for indoor environments, however, as mentioned in the paper, is still very limited. Many methods are introduced for collecting location information in buildings such as using a triangulation of the radio signal. A modern way to give users location information is to use Radio Frequency Identification (RFID) identifiers. RFID tags can be mounted almost anywhere without an energy source thanks to their passive contact chain. The tags store location information and provide it to any reader within a range of proximity of up to 7-10 cm.

Keywords: - Blind-Aid, GPS receiver, RFID, RFID Tags.

INTRODUCTION

The aim of the Blind-Aid [1], [2]initiative is to develop technology for the blind or visually impaired navigational assistance. Actually, we are aiming to create a portable Electronic Travel Aid (ETA) for visually impaired users in combination with the associated radio frequency identification (RFID) localization system for construction devices. Little has been achieved with respect to indoor navigation with existing assistive technologies, identified as Electronic Orientation Aids (EOA), likely due to high instrumentation costs. The aim of Blind-Aid is to break down these walls by providing a relatively inexpensive EOA scheme for both the blind and the building-equipping industries. They suggest setting up a position-tagging system inside buildings utilizing RFID tags[3], [4] so that the blind can use an RFID-equipped ETA to assess their location as well as software that can use this location data to produce vocal instructions to meet a destination. In our future world of pervasive computing, where information is all around us, a location and tracking system becomes very important. Location is one of the knowledge that is most important for potential and evolving applications. Because public use of GPS satellite is approved, many state-of - the-art gadgets are part of our lives, such as a vehicle navigator and a mobile phone with an embedded GPS unit. However, there is still very limited location information for indoor environments. Many methods are introduced to collect location information in buildings such as using a triangulation of the radio signal, a radio signal (beacon) emitter, or fingerprinting.

Navigation systems are now commonly used to find the right way between two points, or the shortest route. These systems use the Global Positioning System [5], [6](GPS) and only work well in the outdoor environment as GPS signals cannot penetrate easily and/or are highly degraded within buildings.

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Several technologies have been proposed to make it possible to navigate within buildings. Radio-frequency identification [7], [8](RFID) is one such technology. In the case of external environments, it has been suggested that some hybrid systems use GPS as the main source of information and RFID to minimize corrections and location errors.

A new way to give users location information is to use Radio Frequency Identification (RFID) tags. RFID tags can be embedded almost anywhere without an energy source due to their passive communication circuit. The tag stores positioning details and gives it to any user within a proximity range that for UHF RFID systems can be up to 10–15 meters. We are suggesting an RFID-based navigation system for blind or visually impaired citizens in a house. The system relies on the tag's location information, the destination of a user, and a routing table where the shortest path to the destination from the current location of the user.

METHODOLOGY

In this paper, the distance is about 7-10 centimeters. RFID (radio frequency identification) frequency range is low frequency range (30 KHz to 500 KHz). Keil software is used in this project, which is used in the highly efficient AT89S52 microcontroller 3 RFID TAG. The proposed blind navigation system consists of three subsystems, the track infrastructure, the navigation device, and the voice of navigation. RFID tags make up the track infrastructure. Each tag can be embedded in a block of stones and placed on a track. The RFID stone block is also used for navigating for blind people. Upon use, the type of RFID tag is selected. It is possible to install the tags along the footpath or at least at the footpath junction. The tag will contain the tag ID and the location of the device.

PCB is done following sections:

1. RFID reader is mounted on dry printed circuit board.
2. VRPB Audio Playback Module is used in this project in Fig 2.
3. Some mechanical applications like stick, plate (in which PCB is mounted), wheel etc.
4. (3.5 mm) jack ear phone is used to hear the output response.
5. 12 v supplies is provided to the circuitry to operate.
6. Connecting wires is used for the connection between VRPB board and dry PCB.

All components are built into the PCB as shown in Fig 1 and Tags are shown in Fig.2 and Fig. 3.

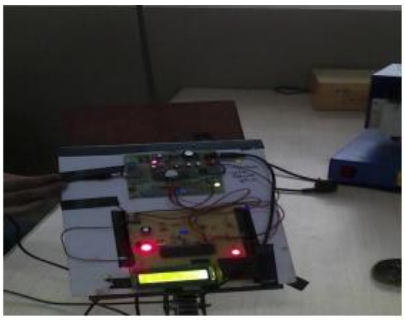

Fig.1: Representation of Electronic Blind Man Stick

RFID reader read the information of E.C lab which is pointing towards RFID reader in Fig.2.

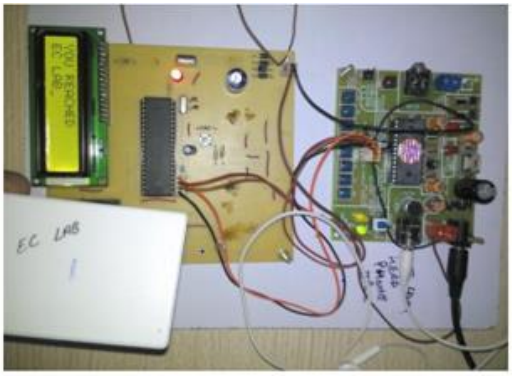

Fig.2: Representing the Tag of E.C. Lab

RFID reader read the information of HOD OFFICE which is pointing towards RFID reader in Fig. 3.

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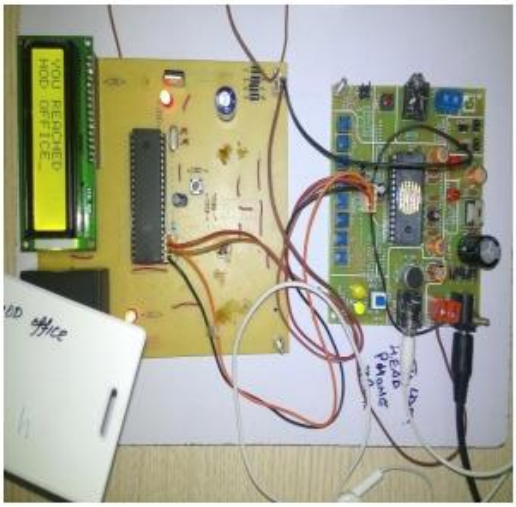

Fig.3: Representing of Tag of H.O.D Office

1. *Components of Blind Man Stick:-*

- Voice playback IC:-is used to generate voice through 3.5 mm jack.
- Regulator (7805):-is used to generate regulated current flow in the circuit
- Audio jack:-is used to hear the output response of an obstacle
- Condenser mike:-is used to generate voice input when the audio module is in recording mode.
- Capacitor: - 25 v, 1000 micro f
- Bridge rectifier:-is used to convert ac voltage to dc voltage
- Crystal oscillator:-is used to stabilize the microcontroller frequency.
- Capacitor: - 25 v, 1000 micro f
- Bridge rectifier:-is used to convert ac voltage to dc voltage.
- RFID tag :- it's like an obstacle
- RFID reader: - it's used to read the RFID tag
- LCD:- it's used to show obstacle details
- Micro Controller AT-89S52:- it's a 40 pin microcontroller that uses keil tech.

RFID

RFID is a relatively mature technology that, due to current and planned deployments, has received much attention in recent years. RFID tags are used in a variety of applications from the retail store inventory to the new U.S. passport. The price continues to decline with increasing use. The design of the tag antenna, the size of the reader antenna, and the power levels of RFID tags may have a reading range of several millimeters to tens of meters, depending on the frequency of use of the tags. Our ideal size would be about 7 centimeters long. This would make it possible to read a tag on a doorway when passing in the hall. As they are cheaper to buy in bulk quantities, our ideal design would also use passive tags. Our tags would form a user location infrastructure. Tags can be installed throughout a building with ample overlap to allow localization at all times, with special emphasis on building features such as doorways, elevators, intersections, or more local, receptionist, customer service as stated in the article.

1. *RFID Reader:-*

Attach tags to objects in a typical RFID[9], [10] system. -tag has a certain amount of internal memory (EEPROM) in which it holds entity information, such as its specific ID (serial) number, or in some situations more data, including the date of manufacture and the composition of the component. When these tags pass through a field generated by a reader, this information is transmitted back to the reader and the object is identified. Any corresponding tag in the reader's vicinity will detect the signal and use its energy to wake up and provide its internal circuits with operating power. The tags must use the power they receive to operate their built-in circuits and return a signal to the reader with their ID. Once the Tag has decoded the signal as valid, it responds to the reader by modulating (affecting) the reader field as shown in Fig.4.

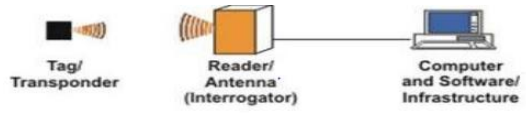

Fig.4: Working of RFID

Based on the set of tags detected, as the user moves through the building, the knowledge of the system's position and direction of travel can be determined. We choose to use low frequency (LF) tags and a

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width of up to 7 centimeters depending on the RFID reader despite our desired range of 7 centimeters. Also a possibility was Ultra High Frequency (915 MHz), as it has ranges of more than 1 meter. Nevertheless, it is also more susceptible to metal damage (i.e. when placed near metal wall beams), larger in size and more effective.

Some of the most commonly used RFID kits are as follows:

1. Low-frequency (30 KHz to 500 KHz)
2. Mid-frequencies (900 KHz to 1500MHz)
3. High-frequency (2.4GHz to 2.5GHz)

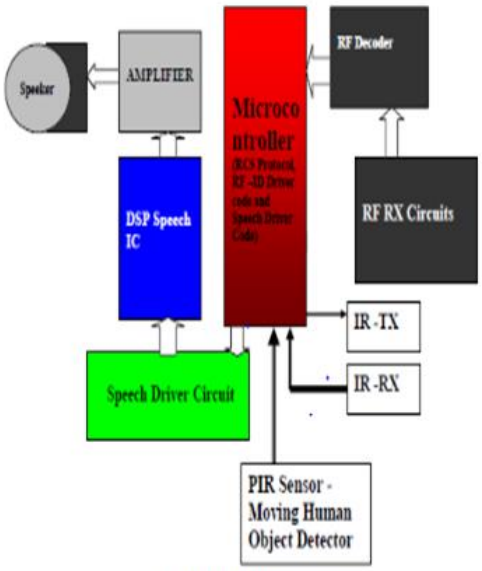

Fig.4: Block diagram

CONCLUSION

In this paper, an effective low-cost ETA for blind and low-vision users has been developed. Unobtrusive and low cost are the device and the RFID tags used to instrument the environment. The system must be a worthwhile investment for blind users in terms of cost of equipment and time spent on learning how to use it to be successful. This, in turn, depends on the system's wide deployment of RFID tags, or at least consistent deployment within a given area. We would also like to implement some of the features that were originally planned in the ETA's conceptual design. We want to migrate the program from C #to Java in particular. Today, Windows Mobile is only operating on "mobile phones"[4] with more computing power, while Android is installed on almost any mainstream cell phone. This would allow us to reach a wider audience by using Java. Not only are cell phones a cheap platform, they are also a very common convenience (especially among the blind population) and largely homogeneous in terms of capacity. The next goal is the Blind-Aid system's hands-free service. For the RFID reader and a Bluetooth headset, the Bluetooth link of the cell phone can be used. Inside the cane handle, the RFID reader can be mounted. Instead of power supply, the battery can also be connected.

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