IOSR Journal of Computer Engineering (IOSR-JCE)
e-ISSN: 2278-0661,p-ISSN: 2278-8727
PP 58-62
www.iosrjournals.org

A Shopping Environment for Blind People Using RFID

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Abstract: *Visual impairments, as well as other physical and cognitive disabilities, imply a certain degree of dependency in ordinary task performance, such as shopping in a retail store. Ambient assisted living (AAL) technologies have tried to encourage the independence of impaired or elderly people. IN addition to home assistance, daily activities such as shopping are of interest in any AAL scenario that attempts to solve open problems such as navigation or unassisted indications. Visually impaired people might have problems identifying the object with which they want to interact. Traditionally, assistance from a third person is essential in such cases, which deprives the user of independence. By using IOT technology, have tried to encourage the independence of impaired. When the person stands in front of a shelf the RFID detector will detect the tag, play the information about the item and also give navigation assistance to him enabling him to shop independently.*

Keywords: *AAL, IOT, RFID Tag, RFID Reader.*

I. Introduction

The Internet of Things is the technology in which network of internet-connected objects also able to collect and exchange data using embedded sensors and which also connect the physical objects which are embedded with electronics, software, sensors and network connectivity, which enables these objects to collect and exchange data.

RFID stands for Radio-Frequency Identification. The acronym refers to small electronic devices that consist of a small chip and an antenna. The chip can carry 2,000 bytes of data or less. RFID device provides a unique identifier for that object. The advantage of RFID device is that, the RFID device does not need to be positioned precisely relative to the scanner. RFID Devices will work within 20 feet for high frequency device.

It is very difficult for the blind people to shop themselves or detect household stuffs by themselves. So in this paper we have proposed a scheme based on RFID that will help blind people for shopping without the help of anyone.

Today, roughly 285 million people worldwide are visually impaired, with 82 percent of those afflicted being aged 50 and above. Visual impairments, as well as other physical and cognitive disabilities, imply a certain degree of dependency in ordinary task performance, such as shopping in a retail store. Ambient assisted living (AAL) technologies have tried to encourage the independence of impaired or elderly people by enabling them to stay active longer.

The remainder of the paper is organized as follows: Section 2 discusses existing system and section 3 describes proposed system and section 4 presents system architecture and section 5 presents implementation, and section methodology. Section 6 describes expected outcome and conclusion is presented in section 7.

II. Existing System

Barcode technology [3] works on a principle called symbology. Barcode is optical representation of data which machine can read. Barcode number is just like binary representation.

Existing works use barcode technology for the same purpose, but this has drawbacks in ambient assisted living environments because of device requirements and scan precision. It also has the disadvantage that the blind person's need some human interaction to detect object and its position. In addition to navigating a retail environment, people with disabilities need assistance with object interaction (such as finding products on a shelf). Object interaction detection is a well-known research problem in computer vision, but its implementation complexity and cost make its deployment unfeasible in real environments. Barcode system does not provide the navigation assistance.

Fig: Barcode Technology

2.1 Disadvantages of Existing Systems

i. Require more development to support navigation for the visually impaired users.
ii. The physical sensors instrumented in the environment do not provide complete coverage of hazardous events.

III. Proposed System

We have implemented RFID based object placement for blind people. Our goal is to enable a store-based AAL scenario that lets users interact with objects in a device less intelligent system, thus improving independence and the shopping experience for impaired people. User-object interaction detection in AAL can benefit both users and retailers. Once a customer passes near the garment or any product in the shelf, for examle, the interaction system detects this event and can provide information to the customer about the given garment or related complements, or, if necessary, send a signal for employee assistance; blind people could obtain audio information about the object.

IV. System Design

The system design is as follows:

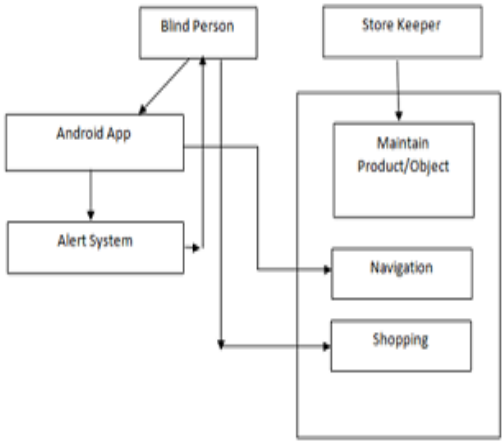

Fig: System Design

This architecture will provide total design plan and provide how all framework will communicate. Shopkeeper will maintain store details in their server. Blind persons will communicate with server through android application. All the output will convert to voice message; this is called "Alert System".

V. Implementation

Implementation is the phase which will start after design phase is completed. This system is developed into two parts. To develop storekeeper module design, Java programming language is used and to develop blind

user mobile application Android studio is used. All product details are stored in the server, along with that RFID Tag details and, and also the store layout information is stored in the server. To convert text to voice message, Google text to speech has been used.
Implementation is an essential stage in the improvement of the task where the product configuration is acknowledged as a situation of the system units.
The implementation has many stages which include:
• Methodical planning.
• Examination of constraints in system.
• Assessment of methods and changes in the system.
• Platform selection.

The proposed system consists of following modules:

1.1 Item Registration

The store keeper adds the product item available in the store into the server using the web portal. The item details contain item id, description, manufacturer, price etc.

1.2 Assign RFID

The store keeper sets the RFID tag based on two categories, one is Item category, another is Direction category. The Item category tags will be used to detect the items in the racks and the direction category tags will be used for the navigation purpose. The store keeper keeps the RFID tag in each shelf and updates the item id associated with that racks.

1.3 Shopping

Once the blind person enters the store, the store keeper installs the application into the blind person's smart phone and along with this, the store keeper provides the RFID detector to the blind person. When the person walks in the departmental stores, the RFID detector detects the RFID tags placed in the racks and sends the tag number to the server.

1.4 Item Details And TTS

Once the server receives the request from the blind person's device, it checks the RFID tag category and if it is under item category, it fetches the details of the product from the database and sends the information as a text to the user phone. The App installed in the blind person phone receives the information and converts into speech and plays the audio.

1.5 Seeking Help

If the blind person is looking for any particular item, he gives the audio command ("smart App 'item name' "). The App converts the speech into text and sends to the server. Server finds the item details and sends the information to user's phone and the App converts it into audio and tells in which shelf or rack the item is present.

1.6 Billing

Whichever the item the blind person has selected, to be stored in the list, once he will approach the billing counter, the counter men can check the list and make the billing.

VI. Methodology

The overall system works as follows:

1.7 Impaired person will be holding an RFID detector, as soon he reaches the wrack where products are placed, RFID detector detects the RFID tag and sends the tag number to the server.
1.8 In the server there will be two types to tag table, item tag and the direction tag. The tag number is mapped to one of these tables.
1.9 RFID tag is attached to each and every item in the shopping complex. Each tag contains information about the particular item and is stored in the server.
1.10 When the detector detects the RFID tag, android phone will play the audio message about the item for the impaired person.
1.11 RFID detector is used to detect the RFID tag attached with each item. Detector detects the RFID tag and information about the item is played as an audio message.

Fig.: RFID detector detecting the RFID tags

VII. Expected Outcome

We have implemented RFID based object placement for blind people. Our goal is to enable a store-based AAL scenario that lets users interact with objects in a device less intelligent system, thus improving independence and the shopping experience for impaired people. User-object interaction detection in AAL can benefit both users and retailers. Once a customer passes near the garment or any product in the shelf, for example, the interaction system detects this event and can provide information to the customer about the given garment or related complements, or, if necessary, send a signal for employee assistance; blind people could obtain audio information about the object.

VIII. Conclusion

Our hypothesis is that an empirical method, adjusted to the RFID user object interaction detection problem, should return better performance than standard state-of-the-art algorithms. We also included a baseline to evaluate an object's presence or absence (within the same interaction period of one second) to determine if the object was interacted with. (This technique is used in current commercial implementations as a user-object interaction trigger.)

The capability of the visually impaired people to be independent and to carry out their day to day activity without any additional aid from a third person is the direct result of the use of the present-day technology for object detection and navigation.

The proposed system has major scope in helping as it holds up morals of helping those who need help the most and makes use of enhancements in technology that not only helps them but everyone else who would make use of such a system.

The technology that implements the RFID tags makes use of frequencies in MHz but the advancement in present day technology has made available the millimetre waves that have propagation of frequencies in GHz and have a larger bandwidth which can be used for transmitting larger amounts of data. The technology of speech to text and vice versa can itself be enhanced further for providing the better security through voice recognition. It makes use of the android platform to ensure that open source platform for easy modifications and to carry out any further updates. The reason for the latest android operating system is to ensure optimal processor utilization and efficient computing. The basic necessity of a human being is to carry out whatever task is required through an independent effort with a sense of completion of the task and ensuring self-satisfaction

IX. Future Enhancement

The areas of improvement are:

1. Smart Phone can be replaced by any other device is available.
2. The information of items above and below the wrack with currently detected item will be played in the user's smart phone.
3. We can add some GPS system, so blind person can reach from home to departmental store easily.
4. Software should not be store specific, we can make it for any store.

Acknowledgement

The authors would like to thank Prof. Rajesh Kamath, and Prof. G. B. Janardhana Swamy, Department of CSE, GSIT Engineering College for their encouragement and support.

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