

# Shopping Assistance for Blind

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**Abstract:** People with physical and cognitive disabilities such as visual impairment lack independence in their individual activities such as shopping in retail stores. This system use RFID for identification of the items and its details in the store by user-object interaction and convey it to the blind people through audio. The location of rack in the shopping mall is stored as a grid. The visually impaired person will give their desired product as audio input. The shortest path to the product is identified and the user is navigated to the item through verbal instructions. After reaching the rack of the product the user uses the rfid reader mounted on the gloves to identify the specified product in the rack. The reader detects the rfid tag and the tag id is sent to the server and the product details are retrieved and given as audio output to the user.

**Index Terms**—Route Guidance System; Mobile Computing; Android Operating System; RFID; Information Technology; Navigation.

## I. INTRODUCTION

At present, trade and shopping malls are growing, leading to an increase in commercial competition not only on a global

basis but also within regional communities. Besides unique selling positions, other competitive advantages can be enabled with the help of technology by business competitors and can help build profitability and survival of their businesses. The key factors of business are to serve the customers of the mall impressively and to suggest and help them find products quickly. The malls typically use labels to signpost the type or category of products in each block, but it is not useful for the blind people to find the category of their needed item.

Customers in the mall usually search for products by category or tags and categories to recognize the product position and location. As a result, customers sometimes find it difficult and confusing to locate the products they need because the products in a mall consist of a lot of items and each block has its different types and sizes. In this, we have developed a shopping navigation assistance as an android application using rfid for product identification and navigation for identifying the category of the item.

## II. LITERATURE REVIEW

In recent years, several indoor navigation systems applying different technologies have been developed. In most cases RFID powered navigation systems focused on

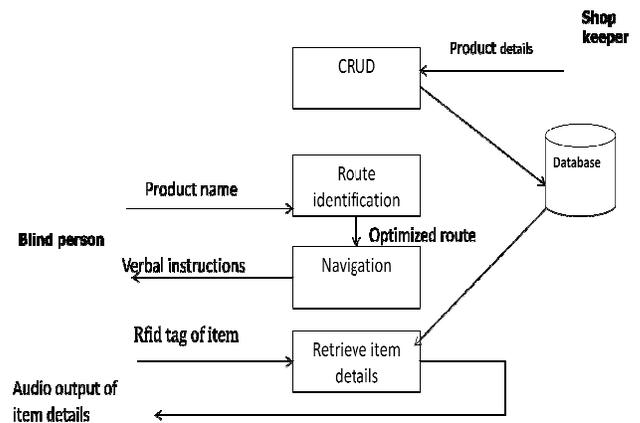
providing assistance to visually impaired people[1][2][3].

A navigation system for a patient in the hospital with RFID [6] has helped the blind and deaf to navigate paths within the hospital. As usual, navigation systems in hospitals are a signpost to various locations. The way using the labels is not easily accessible to the visually impaired who cannot read the text. RFID has been applied as a tool to tell the coordinates of the location. The system is divided into two parts: the software and the device with RFID. The software supports interaction with the database used to calculate the best route from source to destination and displays a map to indicate the current position of the stick RFID Tag. Also, part of the display can be presented in the form of voice or text along with the map. To create a network of individual RFID Readers are used together with a microcontroller system that interprets the signals coming from the sensors and RFID. A voice recording locations by routing system is capable to tell visually impaired people how to go. Shubhangi[2] developed an shopping assistance. At the point when the individual stands before a rack the RFID identifier will recognize the tag the play the data about the thing and furthermore give route help to him empowering him to shop freely. Programmed content to Speech and discourse to content transformation helps the visually impaired individuals to be in contact with the social exercises and with their companions. Raul Parada[3] developed an ambient assistance living environment for blind shopping. Ambient Assisted Living is implemented using an RFID tag and RFID reader. RFID tag contains all the

information of the object such as product name, price, offer manufacturer etc. and stored in the store. Impaired person will be holding an RFID reader, as soon he or she reaches the wrack where products are placed, RFID detector detects the RFID tag and sends the tag number to the server. The server will send the information stored of the RFID tag to the user's smart phone through voice command. Dragan Ahmetovic[5] developed an navigational cognitive approach for navigation. It is a smart phone-based turn-by-turn navigation system for blind users.

### III.SYSTEM ARCHITECTURE

The system architecture is described as follows:



### IV. MODULES

- Item registration- To perform CRUD operation on products.
- Assign RFID tag-To assign rfid tag to the item.
- Route identification-To identify shortest path.

- Navigation-To navigate the user through verbal instruction.
- Retrieve item details-To retrieve the details of the item.

### **1. Item registration:**

The store keeper adds the product available into the server. The product details contain product id, manufacturing details, price, quantity and the category of the particular product. The rack number of the category of the product will be maintained in the database.

The item details are entered into the server through the admin module of the android application. Mysql is used for storage and retrieval of the product details in the server.

### **2. Assign rfid tag:**

Rfid tag is given for similar items and the tag id is entered in the server by the admin through the application. Rfid is used as it is emerging in the object tracking. It can also be further extended for billing in the counter. It is cost effective and doesn't need line of sight. The rfid reader reads the tag and sends the tag information to the server and retrieve the product details. .

### **Advantages of rfid:**

Can read from greater distance compared to bar code and doesn't need line of sight which is impossible for visually impaired persons. Rfid tags can be read at faster rate than the barcode .Once the information are

set up in the rfid tag it needs only minimum human participation. The rfid contains read/write capabilities which are not available in the case of the bar code. The barcode only stores the manufacturer and the product whereas the rfid can store additional information such as manufacturing date etc.

### **3. Route identification:**

The visually impaired users sometimes needs to purchase only the needed items and doesn't wants to search the entire shop by moving through all the items. For this situation the user gives their needed item as audio input. The audio input is converted to text and the position of the category which the item belongs to can be retrieved from the database. The current position of the user is identified from the nearby rfid tag and the path to the desired item is calculated using search algorithm –A\*.The shopping mall or supermarket's infrastructure is considered as a grid and it represents the position of the rack or shelves in the mall.

**A\* search algorithm:** A\* is just like Dijkstra, the only difference is that A\* tries to look for a better path by using a heuristic function which gives priority to nodes that are supposed to be better than others. A\* tries to look for a better path by using a heuristic function which gives priority to nodes that are supposed to be better than others..It is a fastest search algorithm and provides optimal solution. It is called as informed search algorithm or best first search algorithm. The implementation of this algorithm uses a priority queue.

**Distance measure used:**

The distance measure used is **Manhattan distance**. This distance measure is chosen as only horizontal and vertical navigation is possible in a mall. It takes the sum of absolute values of difference between the coordinates. On square grid that uses 4 directions for neighborhood.

**Algorithm:**

```
Input: start node,goal node
Output: path from start node to goal node
function A*(start,goal)
    closedset:={ } //contains visited nodes
    openset:{start} //contains unvisited node
```

```
loop:while open list not empty{
    node_current=node with lowest f value
    if node_current==goalnode
        solution found and retrace the path in closed list.
    else
        Generate four successors to the node_current
        for each node_successors of node_current
            set node_successor cost as its f cost
            if node_successor is in open list
                if(node_successor cost<currentcost)
                    add node_current to closed list
                    add node_successor to open list
            else if node_successor is in closed list
                if(node_successor cost<currentcost)
                    add node_current to closed list
                    add node_successor to open list
            else
                remove node_successor from closed list
        }
    if(node_current !=goal node)
        return error
}
```

#### **4. Navigation**

Through navigation instructions the blind people will reach the rack where the item is present. When the RFID tag passes through the frequency field of the scanning antenna, it detects the activation signal and can transfer the information data in holds to be picked up by the scanning antenna.

By this technology it detects the rfid tag information and by using raspberry pi as the interface it sends the tag information to the server.

#### **5. Retrieve item details:**

Through navigation instructions the blind people will reach the rack where the item is present. When the RFID tag is detected of passing through the frequency field it detects the signal and can transfer the data which is in the rfid tag. By this technology it detects the rfid tag information and by using raspberry pi as the interface it sends the tag information to the server.

The tag information will be detected. The tag contains an unique id which is given for a product. The information about the product is retrieved from the database by using this tag information. The information includes product name, brand, manufacturing date, price and the quantity of similar product available in the shop.

The details retrieved from the server are converted to audio which is played in the application and can be heard by the visually impaired user.

The items available in the next rack of the user's position will also be informed as it

enables efficient shopping without anyone's help.

#### **V.RESULT**

In this system we have implemented the navigation algorithm and it identified the route to the desired category that the users needed. Direction guidance is used to navigate to the list of products step by step. It describes the details of the route, such as turn left, turn right, walk straight to show the distance it takes to travel. We have tested the navigation for 10 products and achieved 96% efficiency.

#### **VI. CONCLUSION AND FUTURE WORK**

In this paper, we have reported on the results of a create-and-design research aimed at providing a Blind shopping assistance on Android using RFID Applications and navigation Algorithm. This system provides customers with the guidance to locate and navigate their individual list of products, and they are able to find the shortest route to the desired products and their locations. However this system is applied only for a single mall and it will be extended for multiple shops.

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