VISION REHABILITATION ASSISTANCE DEVICE FOR VISUALLY IMPAIRED INDIVIDUAL

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***Abstract*—** This paper is developed to make the life of blind people easy. This is a camera-based application in which the Quick Response Code (QR Code) behind the image is used to read the description of the product details in the cloud with the help of Id stored in the QR Code. With the help of speech synthesizer, the application understands the product's name to categorize the product. The application also uses nearby routing algorithm to navigate safely using map and ultrasonic sensor. The main aim of the application being developed is to enable the blind people to distinguish between packaged and other goods. In order to use the proposed application, all the user need to perform the scanning of the QR-code on their mobile phones. It will retrieve the data and price about the product. This application will also suggest other products under same category. Therefore, this application benefits blind and visually challenged people and making their work of identifying products easy. This paper can be put into use in any shopping mall, supermarket, Book stores, Medical stores etc.

Keywords—*QR Code, Cloud-computing, Internet of things, ultrasonic sensor, GPS localization, mobile computing, navigation system and Camera.*

INTRODUCTION

According to our research on internet world health organization says that, visually impaired 285 million people whom 39 million are blind uncertainties 10 to 20 People 50 years and older represent 65% and 82% of visually impaired and blind, respectively. [1] Blind Persons face so many problems in their life, one of the problems is detection of obstacles while walking and finding the product details while shopping. We all have an idea about what kind of contents are most important to every customer while purchasing anything this content are such that actual prize of product, manufacture and expiry date of the product. While purchasing medicines it is most important to know expiry date because it is harmful to every living thing. And for the blind people are usually depends on others for shopping to daily life products. To make it easy for blind people while shopping we developed this paper. This paper gives the details of how an application is developed. We are using camera-based system which is mobile phone or smart phone which is now available to buy every person through this mobile phone camera our developed application scans the QR Code which is stick on the stand in shopping malls and D-Marts it will read the information which is stored in the cloud. We will also use speech synthesizer in navigation of product in nearby malls or D-Marts.

Navigation assistive technology for visually impaired and blind people has been an active subject of study for decades. Two different processes of human mobility have been identified for navigation assistive system design: sensing of the immediate environment and orientation during travel [2]. While the former refers to the gathering of spatial information for obstacle (or any other travel obstruction) detection, the latter involves the update of the traveler's location in a route and the continuous guidance to reach a destination.

Examples of obstacle detection systems can be tracked back to the 1970s when sonar technology was at its peak [3,4]. A short while later, sonar systems evolved to ultrasonic sensors, improving the measurement accuracy of the distance to an obstacle [5,6]. Laser telemeters have also been explored to detect obstacles ahead of a user [7,8]. More recently, video cameras and image sensors together with computer vision techniques have been employed to find obstacles and clear paths in images from the nearby space [8].

RELATED WORK

The idea of exploiting GPS to assist the navigation of blind pedestrians was first introduced in the mid-1980s by Collins [9] and Loomis [10]. In these works, conceptual designs of navigation assistive systems based on GPS were independently proposed. In particular, the latter work established the functional modules of such systems (see Figure 1): a GPS receiver that calculates the traveler's position (longitude/latitude/altitude); a geographic information system (GIS) comprised of the system software that captures, stores, manipulates, and analyses the GPS coordinates; and the interface for presenting the information to the user.

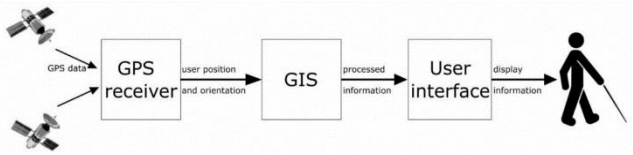


Fig 1:Depicts the Functional modules of a global positioning system (GPS)-based navigation assistive system

Brusnighan conducted the first experimental evaluation of GPS for assisting localization of blind pedestrians [11]. Guidance was provided via verbal instructions. However, poor positioning due to nascent GPS technology inhibited any

practical application. Commercial products exploiting GPS and verbal instructions through speech synthesizers also appeared upon the development of GPS. The Strider (1994), the Atlas (1995), the GPS-talk (2000), and the Braille Note (2001), all Sendero Group products, included in their GISs detailed digital maps of United States (US) cities with streets and points of interests and provided verbal instructions for traveling to desired destinations [12]. Improvement upon Sendero GPS technology has continued over the past decade. The most recent product, the Seeing Eye GPS, is a GPS/GIS application for mobile phones. A similar product from Human Ware Group is the Trekker Breeze [13], a handheld talking GPS/GIS, which includes information on street names, landmarks, points of interest, and public services around the pedestrian's location.

OBJECTIVE

According to a recent survey by a national organization for eye doctors India accounts for 20 percent of the total blind population of the world, so our main aim is that make those peoples life better. Not only for blind peoples but also this system is useful for (usual/ commonly and regular/ healthy) people because system Recommend the best alternate product

PURPOSE

Main purpose is to make the life of blind people easy. So that they can independently buy any product without depending on others to purchase right product. This is very useful to blind persons because it helps to identify what they are purchasing, also this gives detail of the product such as manufacturing and expiry date of the product this will be very helpful while purchasing medical product which are harmful to humans if expired products are used.

PROPOSED SYSTEM

The Proposed System is developed to make the life of blind people easy. This is a camera based system in which the Quick Response Code (QR Code) behind the image and read the description of the product details in the cloud through the help of Id stored in the QR Code, Through the help of speech synthesizer the system understands the product name to categorize the product and nearby routing algorithm to navigate safely through the help of map and ultrasonic Sensor. This is because it becomes very difficult it becomes very difficult for the blind people to distinguish between the packaged goods. In order to use this system, all the user needs to do is scan the QR-code in the mobile phone. It will retrieve the data and price about the product. This application will also suggest other products under same category. So, this application benefits blind and visually damaged/weakened peoples and so making their work of identifying products easy. This paper can be put into use in any shopping mall, supermarket, Book stores, Medical stores etc.

Proposed System Consists of 3 Main Module:

1) Product Identification using QR-Code

2) Outdoor Navigation System for Blind Pedestrians Using GPS.

3) Blind Assistive device using Ultrasonic Sensor.

A. Product Identification Using QR Code

Identification of products can be done with the QR codes which is printed on the cover of the product it's captured as an image through the camera attached with the mobile phone. The image is then decoded with the QR Code decoder module to extract the product identification number provided the QR Code to fetch the product details from the cloud through web services. Then the data extracted in feed to speech synthesizer so that the customer can hear the details of that product.

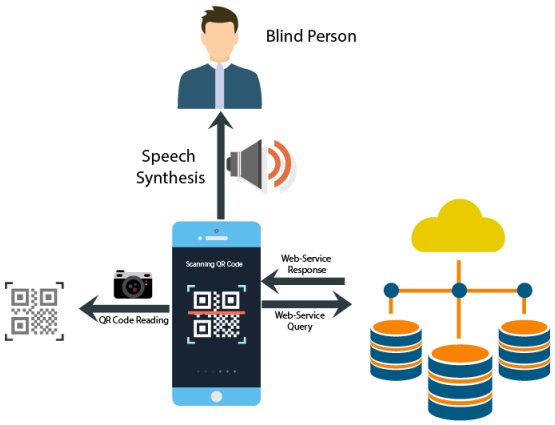


Fig 2: Depicts the Product Identification using QR Code Architecture

B. Outdoor Navigation System for Blind Pedestrians Using GPS

The Modern smartphones containing GPS, a digital compass, accelerometers, inertial sensors, and connectivity capabilities have become ideal candidates for portable computing applications. Nowadays, they are the simplest and most common solutions for GPS receiver modules. In this current prototype, a smartphone was used for user GPS coordinate and orientation acquisition.

When the user gives the product name to the System through MIC which is then sent to voice synthesizer and then the categorized the product detail is checked in nearby store through routing algorithm.

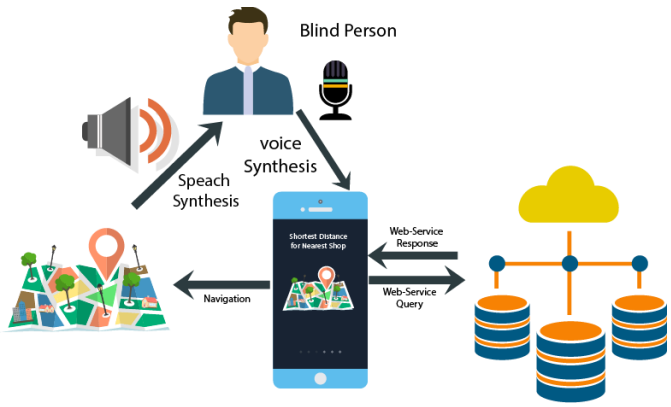


Fig 3: Depicts the Outdoor Navigation for product in nearby mart.

C. Blind Assistive device using Ultrasonic Sensor

we introduce a smart stick system for assisting blind people. The smart stick comes as a proposed solution to enable visually impaired people to find difficulties in detecting obstacles and dangers in front of them during walking and to identify the world around. The system is designed to act like an artificial vision and alarm unit The system consists of five sensors: ultrasonic sensor, IR sensor, water sensor, fire sensor, and light (LDR) sensor, microcontroller (Arduino Uno R3) to receive the sensor signals and process them to short pulses to the Arduino pins where buzzers, vibrator and voice alarms are connected. GPS navigation in the Mobile can be used to guide the blind for new places and unfamiliar places. The blind man uses an earphone to listen to the navigation directions that are coming from the GPS and buzzer alarm to warn by sound. We seek in our project to provide a smart stick affordable and suitable for most blind people, and also it is light in weight. It can be made available to all segments of the society and their families who need them.

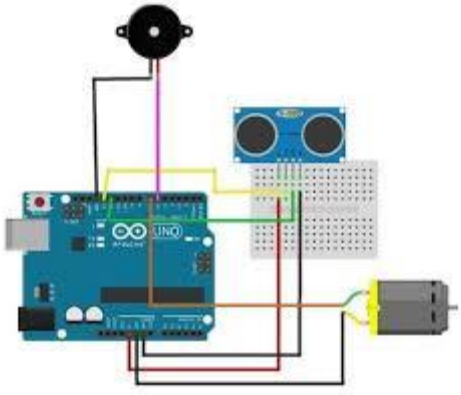


Fig 4:Depicts Blind Assistive device using Ultrasonic Sensor.

METHODOLOGY

The mobile phone is the important device which is used in our proposal as the user needs a device to send the data and receive a reply from the web server. So the same can be used for our process rather than buying a new device for authentication process. The mobile phones service providers have also reduced the cost charged for data transaction. which reduces the cost for the data transfer when using a mobile phone. The most important advantage in this model by using the mobile phone is; the user can send the data and get the reply without anybody's help or intervention thus the privacy is maintained and the speed of transfer is also high because of technology improvement such as 4G.

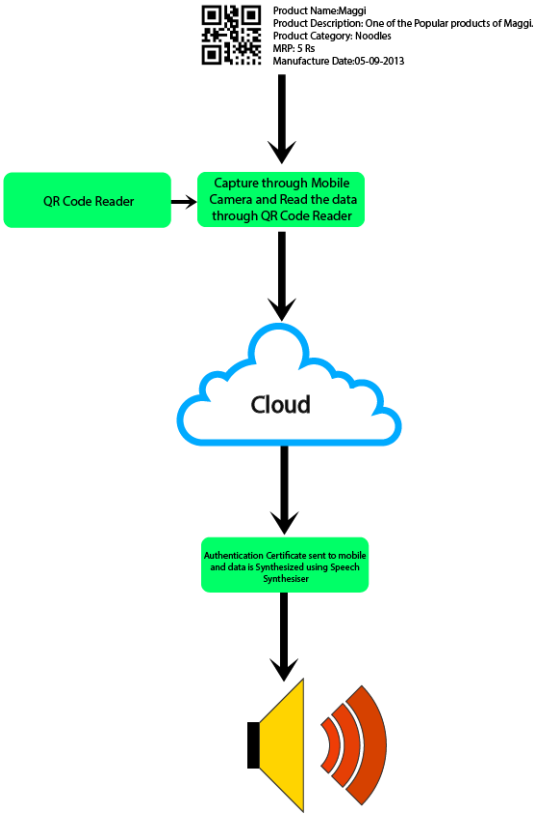


Fig 5: Depicts the Method of Extracting QR-Code from an Image and sending the data fetched from cloud to synthesizer.

Cloud computing has now come into the mobile world as "Mobile Cloud Computing", the cloud computing provides general applications online which can be accessed through a web browser while all the software and data resides in the server and the client can access those applications and data without the complete knowledge about the infrastructure.

The cloud computing has five essential characteristics:

A. On demand self-service

B. Broad network access

C. Resource pooling

D. Rapid elasticity

E. Measured service.

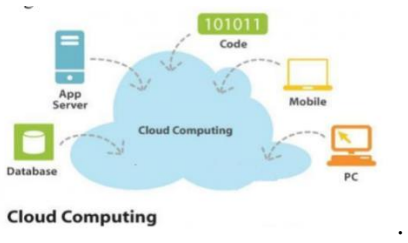


Fig 6: Depicts cloud computing

It can be explained in a simple way as it is a Client-Server architecture where the clients request a service and not a server. In general, the cloud computing users do not own their data, all the data is placed in the cloud and the user can access the data through a computer or a mobile device. In our model cloud computing is chosen because the manufacturer's server will be located in various locations and will have a huge amount of data related to the products. In normal computing technology we need to load the data in from the server and check it for the required record in the client machine. With the help of cloud computing we can directly access the data present in the manufacturer's server and get the data; this reduces the accessing time of the data and increases the speed of the process. In our model the manufacturer's server and our central server is located in the cloud and the user can access the central server from any location in the country and get the authentication information. The central web server in the cloud searches for the corresponding manufacturer's server and sends the data to it. As all the servers are in the cloud the searching process is simple.

IMPLEMENTATION

The various steps involved in the process of Identifying product and Outdoor navigation for A product are as follows. First when visually Impaired Individual scans a product QR-Code the data is decoded and corresponding product information is fetched from the cloud via web services and then the data from cloud is sent to speech synthesizer for the person.

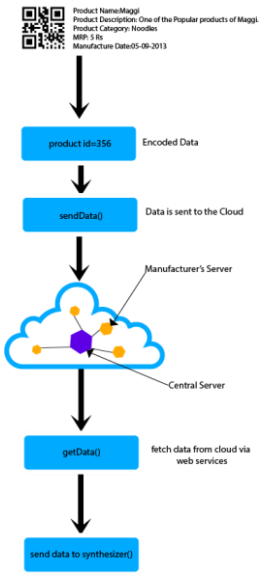


Fig 7: Depicts the process sequence

The pseudo code for the proposed mode l is shown below.

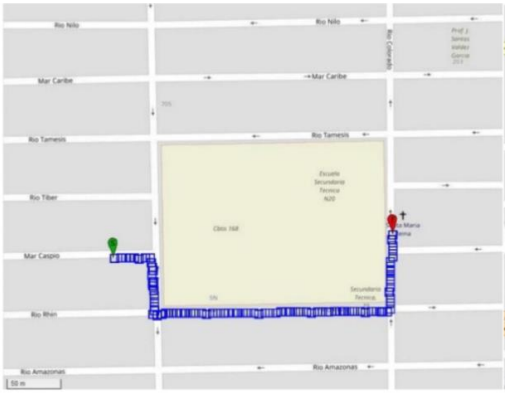
```
decode()
{
if ( image == QRcode)
        {
        decode the code and get the data;
        }
        else
                return decoding Failed;
 }
    senddecoded()
    {
        Store the decoded data in a buffer  send through web services;
        if (sending == success)
                return sending success
        else
                return sending failed
    } synthesizer(data)
    {
        synthesize the data and convert to speech;
        return speech to the speaker;
    }
```

The pseudo code for the proposed mode 2 is shown below.

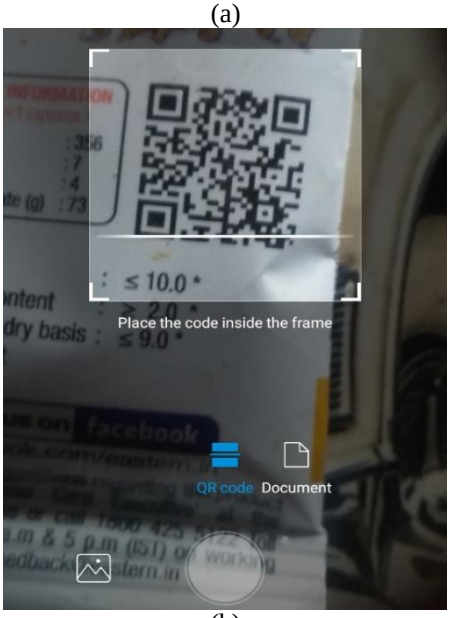
```
synthesizer(speech){
        Synthesize the speech and convert to text;
        Return text;
                //returned text(Product Name) to the cloud
}
senddata(){
        /*categorize the product and find the nearest shop or
        mart*/
        for(all shop having the product){
                latList=getlat();
                lonList=getlon();
                //from geocode();
        }
                Dijkstras(vector);
        return the shortest distance;
                //from the user current location;
}
geocode(){
        /*map latitude and longitude from google api using
        The JSON provided by google api*/
        return latitude and longitude;
}
navigate(){
//navigate to the shop via speech();
}
```

RESULT

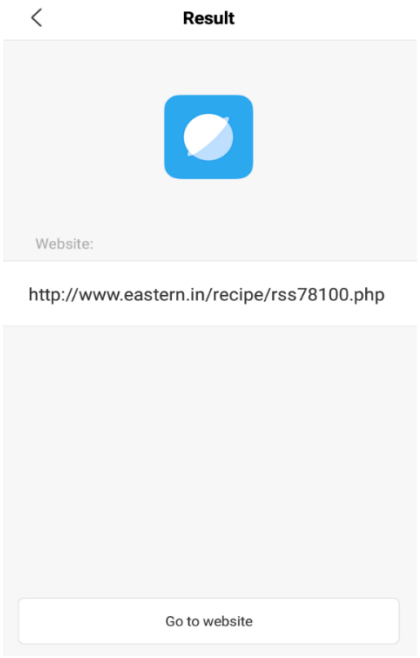
The proposed environments and the paths followed by the test subjects are shown in Figure 8. Both subjects successfully completed the task with no errors



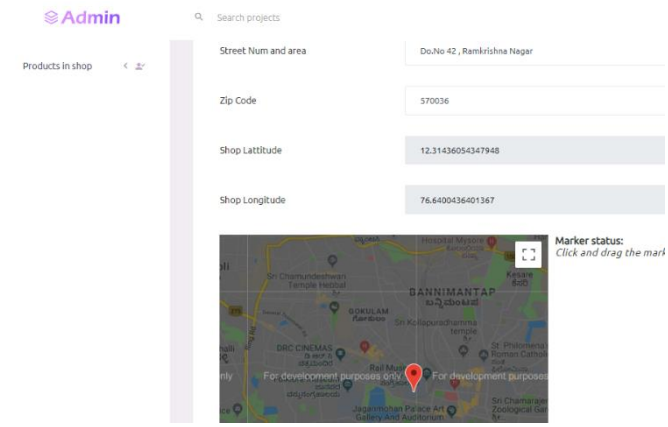
(a)



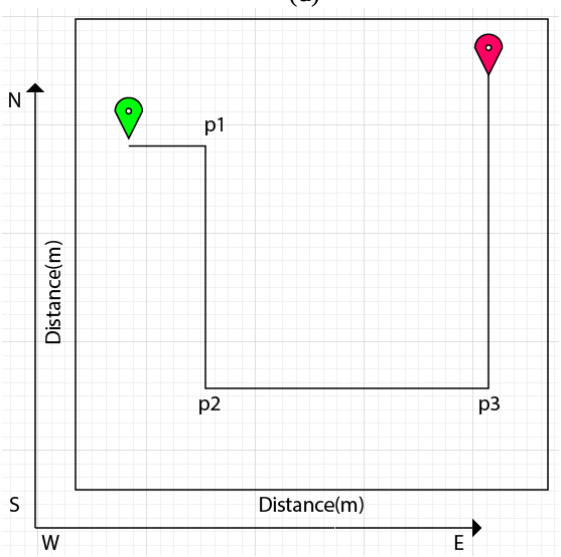
(b)



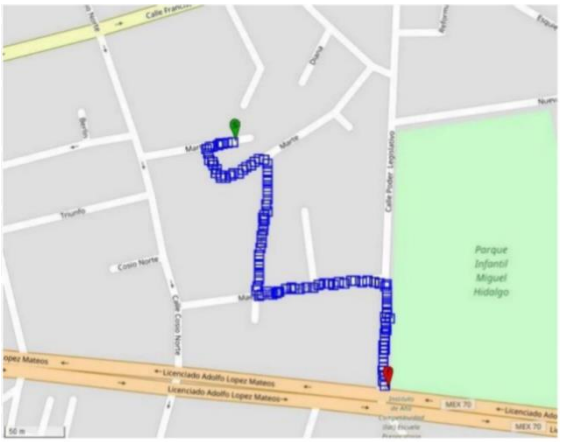
(c)



(d)



(e)



(f)

Fig 5: Examples of subject performance in the outdoor navigation task. (a) Subject A in Position 1;(b) QR Code is Captured in (c) and decoded data is showed in;(d) mark latitude and longitude from geocode; (e) Subject B in Position 2. GPS data in these plots were down sampled by a factor of 10. The corresponding walking paths and waypoints correspond to where the instructions led: (f) Position 1.

CONCLUSION

Our System aims to develop assistive technology for the visually impaired individual to provide a greater degree of independence in packed product shopping and outdoor navigation, using QR Code in our project makes us use all kinds of data in our project whereas barcode is limited to the length of numbers. We have evaluated the technology with the help of a blind user who was instrumental in developing the system.

ACKNOWLEDGMENT

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