Compact Object Detection System for the Visually Impaired People

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Abstract— The visually impaired people feel difficulties in identifying the objects in their daily activities. They need someone to assist to find their needs. The proposed work is a compact object detection system for the visually impaired people. This system is provided with RFID technology which is designed as a support for the visually impaired in searching the objects for their use at home. This system detects the object close to them. RFID tag sends radio signal to inform the user about its localization. The acoustic signal is generated when the person moves towards the object. This signal is produced based on the RSSI (Received Strength Signal Indicator) value measuring the power of the received RF signal from the tag present in the object.

Key words: RFID (Radio Frequency Identification), RF tag, RSSI (Received Strength Signal Indicator)

I. INTRODUCTION

During the last decade, researches have been focused on visually impaired person's navigation. Visually impaired people have to play a various kind of difficulties. This includes the difficulty of recognizing objects. The work we present in this paper is based on the use of RFID technology to improve visually impaired people movement. This system focuses on object detection for the navigation of the objects simpler for visually impaired people.

This technique replaces the old technical supports. In the literature, there are several devices to help people who are visually impaired based on RFID technology. In [1], a multi-device is presented. The location aware museum mobile guide is equipped with an RFID reader, which detects nearby tagged artworks. In [2,3], different RFID devices are used ,that help the visually impaired person in both movements.(SESAMONET system, and the system vibrotactile BIGS). In [4], ETA (Electronic Travel Aid) or RTA (Robotic Travel Aids) devices were developed for blind persons. These ETAs is a portable system which gives the alarm indication via tones. GLIDEO in[5] is a system similar to the proposed system but with less compatibility. The next device to help the visually impaired person is RFIWS (Radio Frequency Identification Walking Stick), during sidewalk [6]. The limitation of this method is the visually impaired person do not came out of the border. In [7], they developed White cane system in which RFID tags are set on coloured navigation lines. Using the device the person has to choose a correct line. If wrong line means it will be indicated with vibration and this information given by pre-recorded voice.

The operating frequency used at 13.56 MHz and the designed compact device is able to detect the presence of objects which is labeled with RFID tag in home environment. This device produces beep sound as indication. The device is able to find separately labelled objects with the help of RFID reader. RFID algorithm is proportional to RSSI value to identify the RFID tag labelled objects.

II. SYSTEM DESCRIPTION

Figure 1 shows the block diagram of the RFID system. The core of the system is a portable RFID module where there is a microcontroller (ATmega 128) which handles communication with the reader and sends information to the user and, if required, to the management system via Bluetooth. Furthermore in the portable module there are:

High frequency 13.56 MHz RFID Reader /writer module board supports ISO-14443A, ISO-14443B, ISO-15693, ISO-18000- 3 protocols.

RFID module specifications are,

1) low power dissipation with single power supply(5V DC)
2) RS 232/ USB interface
3) Built-in 5 LEDs to indicate which type of protocol we are using
4) Watch dog(for reliability)
5) Two RFID tags(Philips Mifare card and TI-Taglt card)
6) Antenna –Embedded(Size : 66 mm× 56 mm)

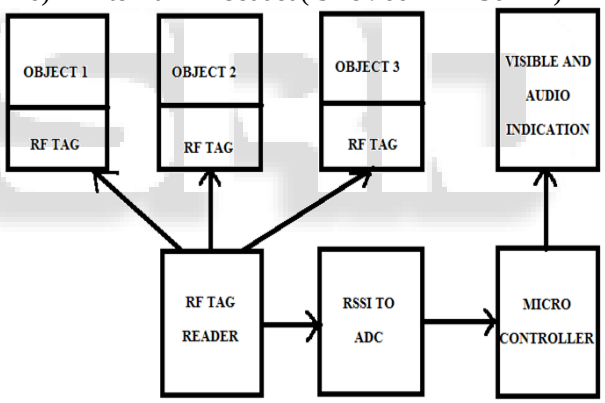

Fig. 1: Schematic of the wearable device

III. PROCESS INVOLVED

The process of designed system is following: The RF tag reads when the RFID reader emits a radio signal that activates the transponder. The RFID reader used to retrieve the data stored on tag. From the reader measuring the power of the received signal of the tag that is RSSI value. These values are converted into digital form with the help of 10 bit ADC. The purpose of ATmega 128 microcontroller is to produce pulsed audio signal. This system gives information through a beep away and also visible indication for management purpose.

IV. RSSI LEVELS

The RSSI value is associated with the received signal strength from each scanned tag. The reader having a circuit for detecting the peak of received signal. This circuit used to keeps the maximum voltage of the received signal. According to RSSI level the acoustic signal will be produce.

RSSI	1	2	3	4	5	6	7
Vin_{pp}	2mv	4mv	6mv	8mv	13mv	20mv	32mV

Table 1: RSSI Levels

V. EXPERIMENTAL SETUP

The visually person allowed to search the object which having RF tag. If the person goes near the tag the signal will increase the frequency the frequency, if the he/ she moves away from the tag the signal will be decreases and produces audio indication for the visually impaired person.

VI. RESULT

The system was tested to visually impaired person and the results obtained were highly reliable. The difference between RSSI level and voltages are shown in figure 2.

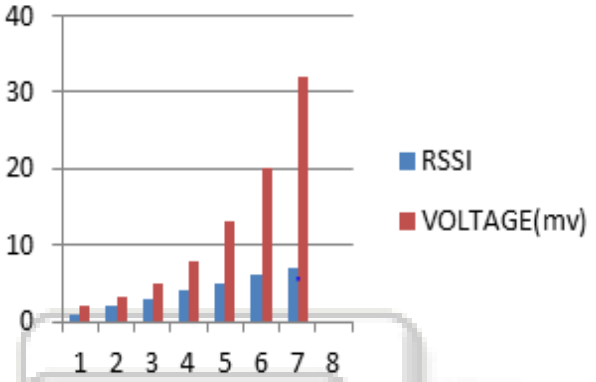

Fig. 2: RSSI level vs Voltages

VII. CONCLUSIONS AND FUTURE SCOPE

The visually impaired person is able to walk without any guide's help. The confusions are completely avoided and the user can identify an object where it is located and how much distance from them.

In future the system is integrated within the mobile phones for the obstacle detection system.

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