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Smart Shopping of Product Identification with Advanced Blind Stick Using Raspberry Pi

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Abstract-*It is very difficult for the blind to shop. In this paper we design a system for blind persons to recognize the hand held objects or products using camera and also read messages which are texted from the android mobile. In this project, we design and develop a system to find products or objects with voice announcements. We can also alert the person through voice when he is close to the obstacle or when the stick comes into contact with water on the road. And RF technology is used to find the stick where it is placed.*

Keywords: Raspberry pi, RF tx, rx, pi camera, ultrasonic sensor, buzzer, water sensor.

I. INTRODUCTION

Although many advanced electronic navigation aids are available these days for visually impaired and blind people, very few of them are in use. Therefore user acceptability assessment of such systems is very important. The most influencing parameters in this regard are size, portability, reliability, useful functionalities, simple user interface, training time, system robustness and affordability in terms of cost. Considering all these user expectations and requirements, this paper is proposed for visually impaired and blind people. The portable system which captures the images and text written which are placed in front of the camera can be read out or announced out using speakers. These details were verified using Raspberry Pi processor for authentication. The Raspberry Pi processor system alerts the blind person through voice messages using speakers or head phones.

Ultrasonic sensor used for the obstacle detection and instruction is received from voice. Water level sensor is used for detecting water on road while walking. if the stick is missed it will be find by using RF technology.

II. LITERATURE SURVEY

Technologies and resources

1) S.Chew (2012) proposed the smart white cane, called Blindspot that combines GPS technology, social networking and ultrasonic sensors to help visually impaired people to navigate public spaces. The GPS detects the location of the obstacle and alerts the blind to avoid them hitting the obstacle using ultra-sonic sensors. But GPS did not show the efficiency in tracing the location of the obstacles since ultra-sonic tells the distance of the obstacle [9].

2) Benjamin etal (2011) had developed a smart stick using laser sensors to detect the obstacle detection was signalized by a high pitch "BEEP" using a microphone. The design of the laser cane is very simple and intuitive. The stick can only detect obstacle, but cannot provide cognitive and psychological support. There exists only beep sound that triggers any obstacle and there is no any assistance to direct them.

3) Central Michigan University (2009) developed an electronic cane for blind people that would provide contextual information on the environment around the user. They used RFID chips which are implanted into street signs, store fronts, similar locations, and the cane reads those and feeds the information back to the user. The device also features an ultrasound sensor to help to detect objects ahead of the cane tip. The Smart Cane, which has an ultrasonic sensor mounted on it, is paired with a messenger style bag that is worn across the shoulder. A speaker located on the bag strap voice alerts when an obstacle is detected and also directs the user to move in different direction.

I. IMPLEMENTATION

This project presents a prototype system for recognition of text present in image using Raspberry pi.. Firstly, by using camera, images are stored in the SD card of Raspberry pi. When a product is placed in front of the Pi camera, then the Pi camera captures the image placed in front of it. Then the image is fed to the Raspberry pi. Pi compares the stored images and captured image in open CV. After the authentication, the text of the image is extracted. The extracted text is announced through espeak. For the 3.5mm audio jack present on the Raspberry Pi, the recognized text is announced out using earphones or speakers. When a message is sent from an Android phone, is also read

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out using raspberry pi. The ultrasonic sensor echo is fed as input to raspberry pi when ever echo is detected it alerts the blind using voice. when water sensor comes in contact with water it gives voice alert. When the stick is misplaced, on pressing the remote the RF signals are transmitted from keypad to encoder then to RF transmitter. In receiver section the signals are received by RF receiver then it is send to decoder from decoder to buzzer and the buzzer beeps.

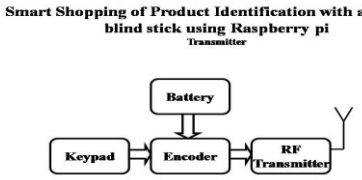

Figure1-Transmitter Section

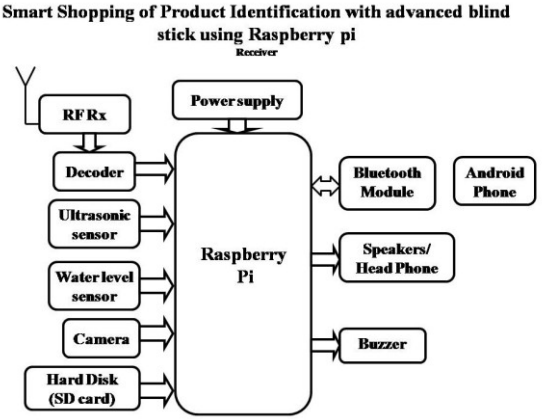

Figure 2- Receiver Section and other modules

II.RELATED WORK

The different modules used in this project are discussed below:

a. Raspberry pi processer (ARM-11):

The Raspberry Pi has a Broadcom BCM2835 system on a chip (SoC), which includes an ARM1176JZF-S 700 MHz processor, VideoCore IV GPU, and was originally shipped with 256 megabytes of RAM, later upgraded to 512 MB.

Figure 3-Raspberry pi processor

It does not include a built-in hard disk or solid-state drive, but uses an SD card for booting and long-term storage.

b. Pi camera

The Raspberry Pi camera module can be used to take high definition video, as well as stills photographs. The module has a five megapixel fixed-focus camera that supports 1080p30, 720p60 and VGA90 video modes, as well as stills capture. It attaches with a 15cm ribbon cable to the CSI port onto the Raspberry Pi Processor.

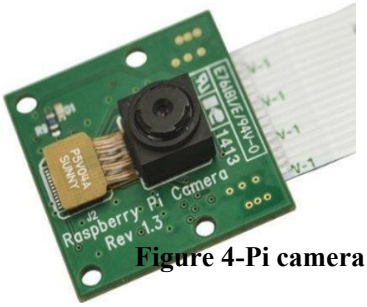

Figure 4-Pi camera

c. Bluetooth Module:

Bluetooth is a wireless technology standard for exchanging data over short distances (using short-wavelength UHF radio waves in the ISM band from 2.4 to 2.485 GHz) from fixed and mobile devices and building personal area networks (PANs). It can connect several devices, overcoming problems of synchronization.

Figure 5-Bluetooth module

d. Ultrasonic sensor:

It generates high frequency sound and calculates the time interval between the sending of signal and the receiving of echo. Therefore, ultrasonic sensor can be used to measure distance. HC-SR04 ultrasonic sensor consists of a transmitter, a receiver and a control module. The Ultrasonic Sensor sends out a high-frequency sound pulse and then times how long it takes for the echo of the sound to reflect back.

Figure 6-Ultrasound Sensor

e. RF Transmitter:

An RF transmitter receives serial data and transmits it wirelessly through RF through its antenna connected at pin4.The transmitted data is received by an RF receiver operating at the same frequency as that of the transmitter.

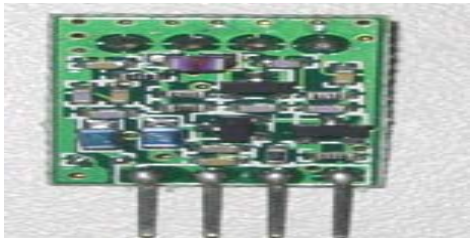

Figure 7-RF transmitter

HT12E Encoder IC will convert the 4 bit parallel data given to pins D0 – D3 to serial data and will be available at DOUT. This output serial data is given to ASK RF Transmitter. Address inputs A0 – A7 can be used to provide data security and can be connected to GND (Logic ZERO) or left open (Logic ONE). Status of these Address pins should match with status of address pins in the receiver for the transmission of the data. Data will be transmitted only when the Transmit Enable pin (TE) is LOW.

f. RF Receiver:

An **RF** module (radio frequency module) is a small electronic device used to transmit and/or receive radio signals between two devices. RF communications incorporate a transmitter and a receiver ASK RF Receiver receives the data transmitted using ASK RF Transmitter. HT12D decoder will convert the received serial data to 4 bit parallel data D0 – D3. The status of these address pins A0-A7 should match with status of address pin in the HT12E at the transmitter for the transmission of data.

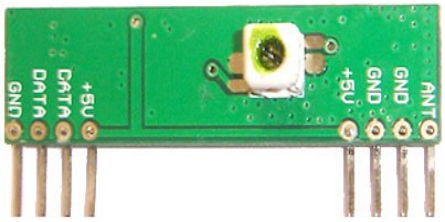

Figure 8-RF Receiver

g. Head Phones/Speakers:

The output of the proposed system is provided with the announcement using head phones or speakers. The Raspberry pi has two audio output modes: HDMI and head phone jack. In the proposed system we are using head phone jack of 3.5mm Audio Output Jack.

Figure 9-Headphones/speakers

h. Water Level Sensor:

A water level sensor is an electronic device that is designed to detect the presence of water and provide an alert in time to allow the prevention of water leakage. The principle of operation: The principal of capacitive level measurement is based on the change of capacitance. The capacitance depends on liquid level.

Figure 10-Water Level Sensor

i. Buzzer:

A buzzer or beeper is an audio signaling device, which may be mechanical, electromechanical, or piezoelectric. Typical uses of buzzers and beepers include alarm devices, timers and confirmation of user input such as a mouse click or keystroke.

Figure 11- Picture of Buzzer

III. RESULTS

When the blind person wants to goes out. If the stick is misplaced then, when the remote key is pressed buzzer beeps

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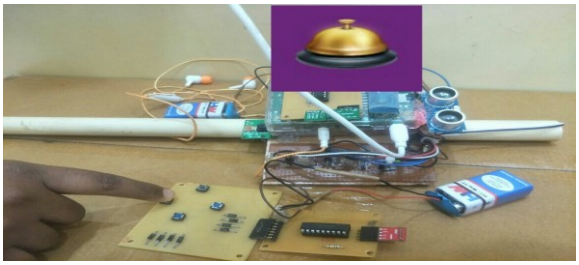

Figure 12-Result when Remote Key is Pressed

When the obstacle is detected then there is voice announcement "alert obstacle is detected, please check"

Figure 13-Result when Obstacle is Detected

when water is detected then there is voice announcement "alert water detected, please check"

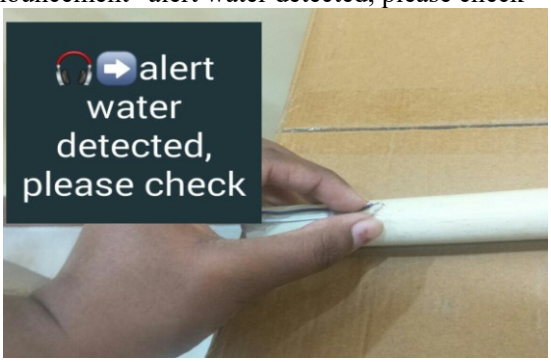

Figure 14-Result when Water is Detected

when the raspberry pi 2 product is detected then there is voice announcement that "object detected raspberry pi 2 model B with 1GB RAM"

Figure 15-Result when Raspberry pi 2 Product is Detected

When the battery cover is detected then there is voice announcement "object detected high watt 9v battery packet"

Figure 16-Result when Battery Cover is Detected

When the Raspberry pi 3 product is detected then there is voice announcement "object detected raspberry pi 3 model B with 1 GB RAM"

Figure 17-Result when Raspberry Pi 3 Product is Detected

When 9v battery is detected then there is voice announcement "object detected 9v battery"

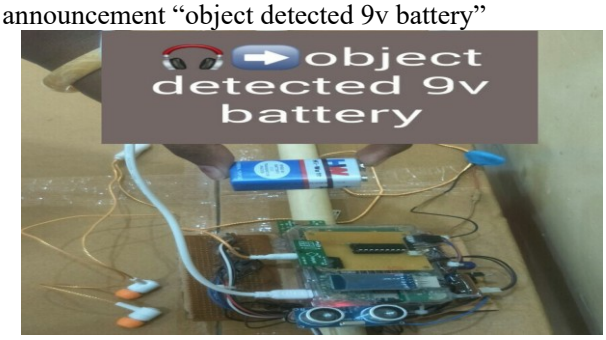

Figure 18-Result when 9v Battery is Detected

When mangaldeep sambrani packet is detected then there is voice announcement "object detected mangaldeep sambrani 15 rupees packet"

Figure 19-Result when Mangaldeep Sambrani Packet is Detected

When horlicks packet is detected then there is voice announcement "object detected horlicks 5 rupees packet"

Figure 20- Result when Horlicks Packet is Detected

When the goodday chocochips packet is detected then there is voice announcement "object detected goodday chocochips 15 rupees packet"

Figure 21-Result when Goodday Chocochips Packet is Detected

When Cello Technotip refills packet is detected then there is voice announcement "object detected Cello Technotip refills120 Rupees"

Figure 22-Result when Cello Technotip Refills packet is Detected

When hello message is sent from an android mobile phone then there is voice announcement "message from android phone–hello"

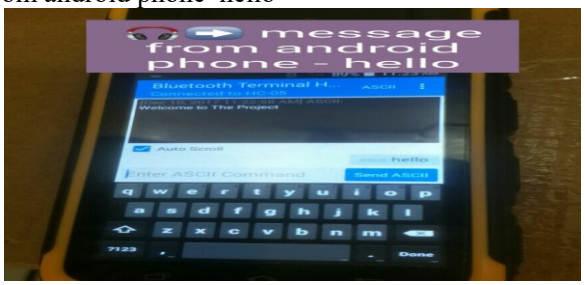

Figure 23-Result when Message is Send from an Android Phone

IV. CONCLUSION

The existing model presents an Integrating feature of all the hardware components which has been used and developed in it with Arm-11 Raspberry pi processor. The Presence of each and every module has been reasoned out and placed very carefully. Hence contributing to the best working unit for an smart shopping of product identification with advanced blind stick using raspberry pi has been designed perfectly.

V.FUTURE SCOPE

This project can be extended using GSM module for automatic messages reading system. We can add GPS system, for location identification and announcements. The GSM module gives the intimation of the product or object details to the predefined number through SMS. The Fire sensor can also be used to alert the blind using voice in the emergency situation during any fire accident.

VI . ACKNOWLEDGEMENT

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