International Journal of Scientific Research in Computer Science, Engineering and Information Technology
© 2018 IJSRCSEIT | Volume 3 | Issue 4 | ISSN : 2456-3307

Accessible Smart Home System for the Deaf and Hard of Hearing using PiCam

N. Sudharshan Kumar[1], K.Sankara[2]

[1]MCA Student,Department of MCA, Sree Vidyanikethan Institute of Management, Sri Venkateswara University, Tirupati, Andhra Pradesh, India

[2]Assistant Professor Department of MCA, Sree Vidyanikethan Institute of Management, Tirupati, Andhra Pradesh, India

ABSTRACT

Deaf and individuals with hearing impedance confront ordinary difficulties in distinguishing the event of family unit sounds like door bell, tyke crying or telephone ringing. The target of this paper is to outline and actualize a minimal effort remain solitary device for deaf individuals to inform doorbell ringing who live alone in their home. The framework depends on Raspberry pi which incorporates camera, vibrator, wireless GSM and Bluetooth. At the point when the visitor presses the doorbell, caught image is exchanged to the wearable device which knows the perfect individual at the entryway or gatecrasher. In the wake of exchanging image, wearable device vibrates to tell. Additionally, the message is sent to the proprietor through GSM. Visitor's image alongside the date and time is sent to the server for retrieving data later. The framework is dependable, powerful, and simple to utilize and furthermore upgrades the security of the client.

Keywords : Alert System, Server,Bluetooth, Raspberry Pi Camera, Global System for Mobile Communication(GSM), Vibrator, TFT.

I. INTRODUCTION

Hearing loss presents numerous regular difficulties. Communication might be the greatest test of all getting and giving data, trading thoughts, sharing sentiments whether in coordinated contact or in gatherings. At times there are little disturbances of day by day life that outcome from decreased hearing. For instance, how would you know when there would someone say someone is at the entryway? Or on the other hand the telephone is ringing? Or then again the child is crying? With the present arrangement of idea of hearing inability, the Census of India, 2001 included 1,261,722 individuals whom hearing incapacity existed (Males 53.4% and Females 46.59%).Many devices and frameworks are accessible to enable deaf and nearly deaf individuals to enhance communication, adjust to their condition, and capacity in the public eye all the more viably. Ready frameworks, or just signalers, are intended to help inform distinctive occasions, for example, the telephone ringing, the doorbell, an infant's cry, movement, climate cautions, or smoke alerts. It for the most part happensthat the deaf individuals are unconscious of the visitor to the home and furthermore the seniority individuals experience issues in strolling or moving to go and see who is at the entryway. So it would be of incredible help for those individuals on the off chance that they have alarm about the visitor to home and can know who is at the entryway. This paper depicts the investigation of different frameworks and innovations accessible for deaf and maturity individuals. The proposed framework here is intended to caution the hearing weakened and maturity individuals about the visitor. The framework comprises of two modules-a

transmitter and a beneficiary. The transmitter is the deviceintroduced at the entryway. The transmitter comprises of Raspberry Pi, RPi camera, switch or doorbell, GSM, and Bluetooth. The recipient is the wearable device which incorporates Raspberry Pi, Bluetooth, LCD or screen to show the image and message and vibrator to alarm. Visitor's image alongside date and time will be sent to the server for retrieving data later. The real preferred standpoint of the framework is that it decreases the visitor's holding up time and can likewise help in the security of the deaf/elderly.

II. LITERATURE REVIEW

A robot utilizing dog– propelled visual communicational signs to impart expectation is planned by K. L. Koay et al. Robot could lead members to the microwave entryway and front entryway sound source. Head developments and look bearings were essential for conveying the robot's expectation utilizing visual communication signals. Gopinath Shanmuga Sundaram endeavored to fabricate a minimal effort independent device which transmits information utilizing the Raspberry Pi with Bluetooth and has a resistive touch screen show giving a UI. Blunder dealing with systems were utilized to get the exemptions and could retransmit till the affirmation was gotten. Chao-Huang Wei and Shin-A Chenutilized a novel electrical cable communication chip to build up an arranged computerized video entryway telephone framework to supplant the ordinary ones. Entryway Phone is utilized to distinguish visitor or for basic voice interlocution. They exchange varying media data and improve the passageway guarding capacities moreover. Mahdi Safaa A. et al. designed the handheld device for snag discovery utilizing ultrasonic sensor and create voice alarm for visually impaired and vibration caution for deaf individual by keeping his finger on the catch at the highest point of the device. The device is appropriate and simple for daze and deaf with 40-150cm territory and can be utilized as a part of three measurements. Huiping Huang, et al. exhibited an answer for setting up a low power utilization wireless home security caution framework created by applying WSN and GSM innovation is displayed. It can recognize the burglary, spilling of crude gas and fire, and send alert message wirelessly. The framework incorporates three sorts of wireless security sensor hubs that are entryway security hubs, infrared security hubs and fire alert hubs with simple introducing hubs. It has a benevolent UI including a LCD and a capacitive sensor console. Jayashri Bangali1 and Arvind Shaligram propose two techniques for home security framework. The primary framework utilizes web camera. At whatever point there is a movement before the camera, it gives security alarm as far as sound and a mail is conveyed to the proprietor. The second strategy sends SMS which utilizes GSMGPS Module (sim548c) and Atmega644p microcontroller, sensors, transfers and bells. The web camera based security framework is simple, easy to understand and programming has numerous highlights.

III. PROPOSED WORK

This paper proposes a minimal effort, dependable and productive framework to caution the deaf or hearing impeded individual comprising of two modules-a transmitter introduced at the entryway and another is the recipient, a wearable device.When the visitor presses the doorbell, RPi Camera catches the image and exchanges it to the wearable device through Bluetooth. In the wake of sending the image, the GSM Modem communicates something specific that there is a visitor at the way to the proprietor. The database is likewise made which is sent to the server.Figure1 demonstrates tneering graph of the framework.

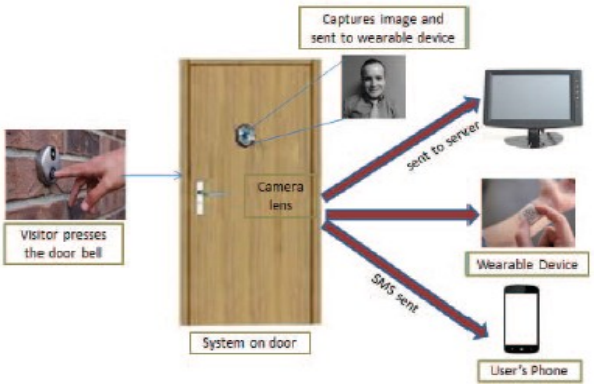

Figure 1. Structural Diagram

When the image is gotten on the wearable device through Bluetooth, the vibrator vibrates to caution that there is a visitor at the entryway. The image of the visitor is shown on the device alongside a message on the LCD/Screen. The image alongside the date and time is sent to the server for later recovery. The framework essentially comprises of:

A. Raspberry Pi Board Model B The Raspberry Pi is a charge card measured singleboard PC created in the UK by the Raspberry Pi Foundation. The Raspberry Pi has a Broadcom BCM2835 framework on a chip (SOC), which incorporates an ARM1176JZF-S 700 MHz processor, Video Core IV GPU, and was initially transported with 256 megabytes of RAM, later updated (Model B and Model B+) to 512 MB.

B. Bluetooth HC-05HC-05 module is a simple to utilize Bluetooth SPP (Serial Port Protocol) module, intended for straightforward wireless serial association setup. Serial port Bluetooth module is completely qualified Bluetooth V2.0+EDR (Enhanced Data Rate) 3Mbps Modulation with finishes 2.4GHz radio handset and baseband. It utilizes CSR Blue center 04-External single chip Bluetooth framework with CMOS innovation and with AFH (Adaptive Frequency Hopping Feature). It has the impression as little as 12.7mmx27mm. Expectation it will rearrange your general outline/improvement cycle.

C. SIMCOM SIM 900A GSM Module GSM/GPRS Modem-RS232 is worked with Dual Band GSM/GPRS motor SIM900A, deals with frequencies 900/1800MHz. The Modem is accompanying RS232 interface, which permits you associate PC and also microcontroller with RS232 Chip (MAX232). The baud rate is configurable from 9600-115200 through AT summon. The GSM/GPRS Modem is having inside TCP/IP stack to empower you to interface with web by means of GPRS. It is appropriate for SMS, Voice and in addition DATA move application in M2M interface. The on board Regulated Power supply enables you to interface wide range unregulated power supply. Utilizing this modem, you can make sound calls, SMS, Read SMS; go to the approaching calls and web and so forth through straightforward AT orders.

D. LCD (16 X 2)

- 5X8 specks with cursor
- 16 characters* 2 lines display
- 4-bit or 8-bit MPU interfaces
- Built-in controller (ST7066 or proportionate)
- Display mode and backdrop illumination varieties
- ROHS consistent

E. RPi Camera Module The Raspberry Pi Camera Board includes a 5MP (2592×1944 pixels) Omni vision 5647 sensor in a settled concentration module. The module appends to Raspberry Pi, by method for a 15 Pin Ribbon Cable, to the committed 15-stick MIPI Camera Serial Interface (CSI), which was planned particularly to interfacing to cameras. The CSI transport is able to do to great degree high information rates, and it only conveys pixel information to the BCM2835 processor.

F. Vibration Motor The Precision Micro drives 304-002 Pico Vibe 4mm vibrating motors depends on a coreless engine plan, with valuable metal compensation hardware and a toroidal neodymium magnet. Appraised at 3V ostensible, they are intended for alarming capacities in handheld applications fueled by either double cell basic essential/nickel based rechargeable batteries, or

single cell lithium essential/lithium rechargeable batteries.

IV. PERFORMANCE

The Raspberry Pi board is utilized to actualize the framework. Raspbian OS image is singed in 8GB SD card to boot RPi. Figure2 portrays the stream of data.The working framework wheezy Raspbian image is downloaded from the site raspberry.org/downloads.

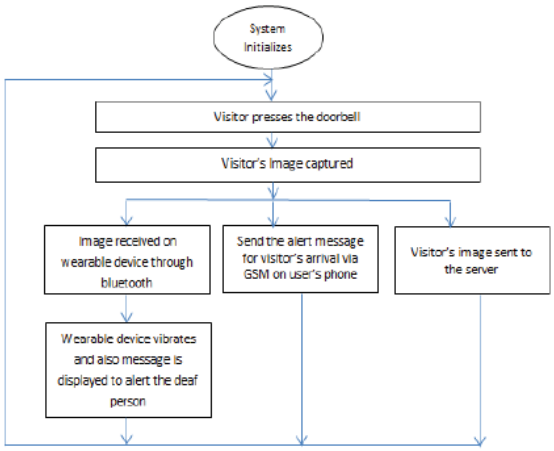

Figure 2. Flow chart

Presently, composing the image to the SD card as following

- Insert the SD card into SD card space of PC/workstation.
- Extract the executable from the compress document of downloaded image win32diskimager and run the win32diskimager utility.
- Select the image document removed previously.
- Select the drive letter of SD card in the device box. Be mindful so as to choose drive.
- Click on compose and sit tight for write to finish.

Leave the imager and discharge the SD card. Raspberry Pi is associated with the show by means of HDMI furthermore, for input, associated with the console and mouse. Figure 3 and 4 demonstrates the interfacing of the segments on the entryway framework and wearable device separately.

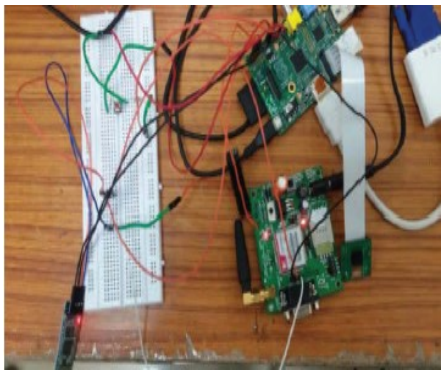

Figure 3. The door framework

In entryway framework, the camera is connected straightforwardly to the CSI connector on raspberry pi board. Switch is associated with the GPIO stick of raspberry pi. The transmitter of Bluetooth is associated with the recipient of raspberry pi and the other way around to exchange the visitor's image on wearable device.

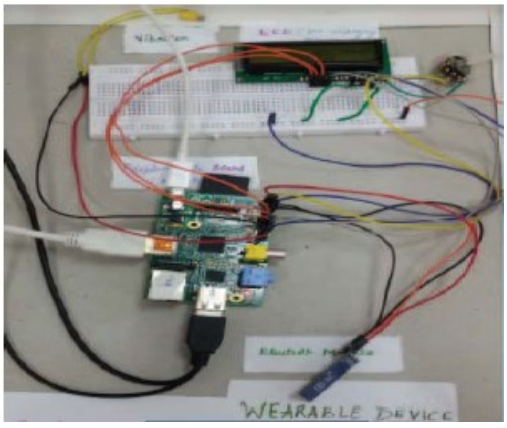

Figure 4. The wearable device

In wearable device, the LCD is associated with the raspberry pi to show the message. The vibrator is associated with the GPIO stick of raspberry pi as yield. The transmitter of Bluetooth is associated with the beneficiary of pi and the other way around to get the image through Bluetooth.

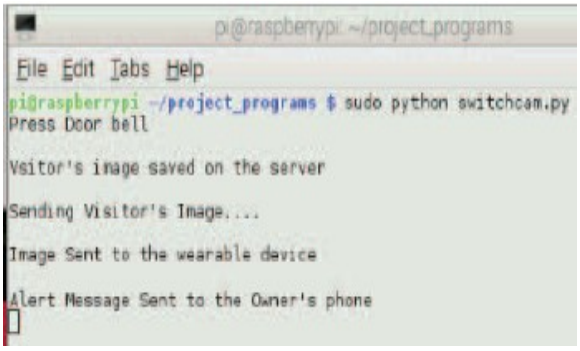

Figure 5. Image transfer on door system

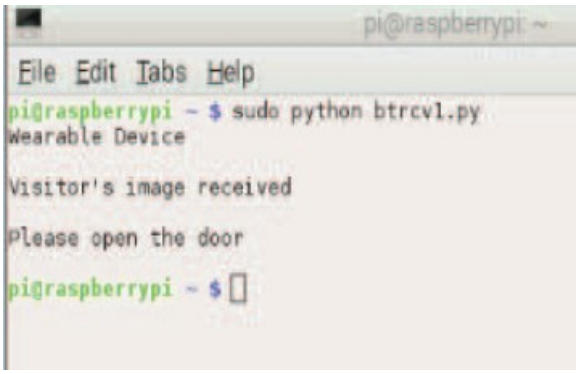

Figure 6. Image got on wearable device

At the point when the visitor presses the doorbell, RPi Camera catches the image and exchanges it to the wearable device through Bluetooth. In the wake of accepting the image on wearable device, the device vibrates to caution the individual about the visitor's entry and furthermore shows the message on screen. The message is additionally sent to the proprietor about the visitor's entry.

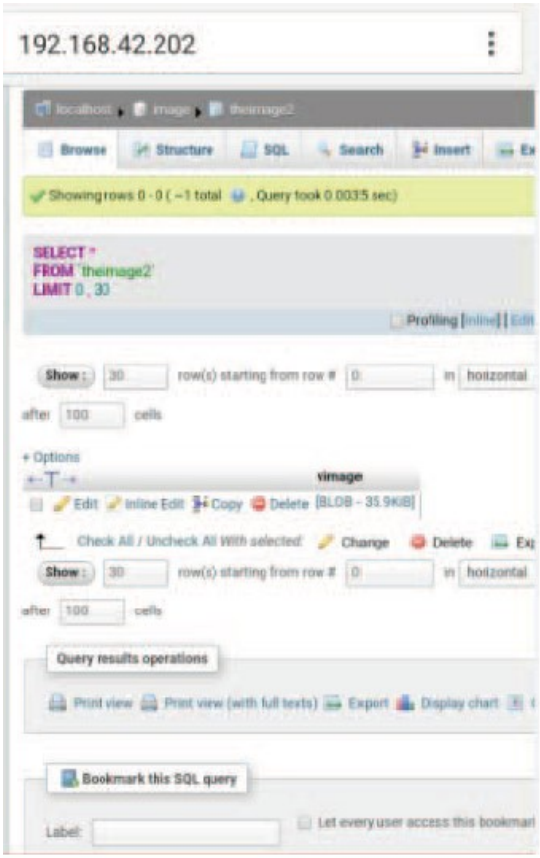

Figure 7. Image stored on server

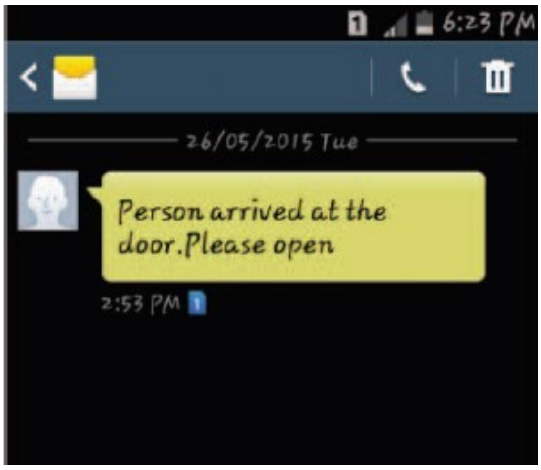

Figure 8. Message received on owner phone

5. PerformanceAnalysis and Testing

The model of framework is actualized and tried to send an alarm message of the visitor's entry along with the image of the visitor exchanged serially by means of Bluetooth. All parts on the entryway framework and wearable device are interfaced appropriately. The image is exchanged on wearable device through Bluetooth on time. The performance of the actualized framework has been dissected based on QoS parameters, for example, image exchange rate and image brilliance level.

A. Visitor's image exchange rate: The chart appeared in fig.7 delineates that as the measure of the caught image expands, the image exchange time from the entryway framework to the wearable device too increments.

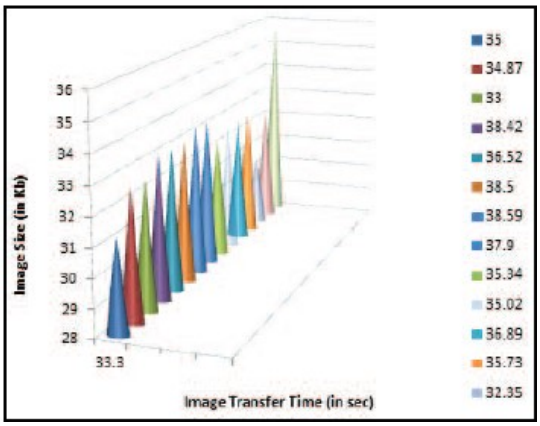

Figure 9. Image Size versus Image exchange time

B. Effect of splendor level on caught image: The diagram appeared in fig.8 is demonstrating that as the

level of splendor changes, there is variety in image measure. The brilliance level has been sorted into three; brilliant, typical and dim. In brilliant light, the caught image estimate is most elevated. In ordinary light, the image estimate is less contrasted with the image measure in brilliant light. The caught image estimate is less in dull.

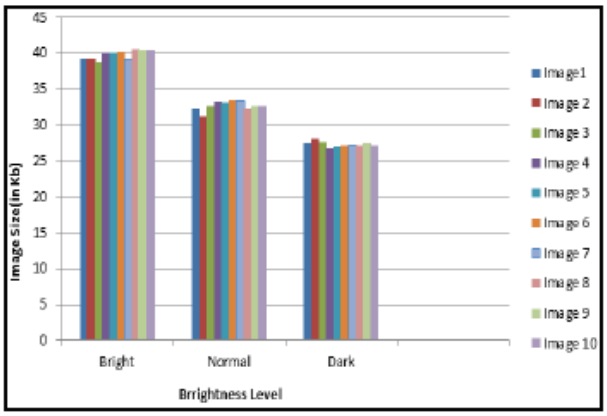

Figure 10. Image Size vs brightness level

V. RESULTS AND CONCLUSION

Different existing ready frameworks and advances have been assessed. This paper portrays performance of a minimal effort IOT based ready framework for deaf and hearing weakened individuals for their security purposes. The message is additionally gotten on client's telephone through GSM and furthermore the information is refreshed on the server. The future work incorporates retrieving the caught image put away on server and youngster crying identifier for the Deaf individuals.

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About Authors:

N.Sudharshan Kumar is currently pursuing hisMaster Of Computer Application,SreeVidyanikethan Institute of Management,Tirupati,A.P.

K.Sankarais currently working as an Assistant Professor,Departmentof MCA, Sree Vidyanikethan Institute ofManagement,Tirupati,A.P.