

Human Detection Using Wireless Rescue Robot

Saranya J, Sushma S. Jagtap, Thamizhmalar D Thaslim Banu M, Vimala Priyadharshini K P
Yamini J

Abstract: recently, all over the world, fire accidents is increasing at higher rates and it is high time to offer safety support system for the humans residing/working at various places such as hospitals, hotels, cinemas, high-rise buildings, department stores etc. This paper focuses on implementing wireless rescue robot for every humans moving in and around the globe. However the existing systems are not powerful enough to prevent the fire accidents since there is no automatic robot system to monitor humans. Nextly the existing prototype makes use of only a flame sensor that detects the light emitted by the flames at the place of fire accident and alerts the surrounding by using fire alarms which simply detects the place of fire and does not save the life of people who are under risk. Hence to overcome this issues our proposed system includes a raspberry PI which is the heart of the system and it is attached with the following components such as flame sensor for detecting flames, Open CV camera for capturing video during fire accidents, GSM module for intimating the location at which fire accident has taken place to the registered recipient, PIR sensor to monitor the movements of human and evaluate the same to check whether it is within sensor range or not, pump motor with relay to splash water upon sensing of fire by flame sensor and lastly robot chase which holds all the above mentioned modules and it will move with its motor driver. Finally, implementation results for the proposed system are provided in this paper.

Index Terms: PIR sensor, Raspberry PI, GSM, flame sensor, robot chase, Open CV.

I. INTRODUCTION

Rescue robot can be widely used in an risky environment for the sake of helping the firefighters involved in rescuing affected persons. The proposed system includes module which captures video of risky place and intimate the same to registered recipient. It also rescues people involved in that risky environment by splashing water. Variety of conventional robot systems have been proposed for fire extinguishing purposes. One among them is terrestrial mobile robots, which are has fire hoses with it. Robots are often designed to move on a flat surface, henceforth it is difficult to access the interior portion of the building which is on fire directly. To overcome these issues, few research scholars have proposed the idea of a flying type robot, which has the

Revised Manuscript Received on December 22, 2018.

Saranya J, Department of ECE, Rajalakshmi Engineering College, Thandalam, Chennai, India.

Sushma S. Jagtap, Department of ECE, Rajalakshmi Engineering College, Thandalam, Chennai, India.

Thamizhmalar D, Department of ECE, Rajalakshmi Engineering College, Thandalam, Chennai, India.

Thaslim Banu M, Department of ECE, Rajalakshmi Engineering College, Thandalam, Chennai, India.

Vimala Priyadharshini K P, Department of ECE, Rajalakshmi Engineering College, Thandalam, Chennai, India.

Yamini J, Department of ECE, Rajalakshmi Engineering College, Thandalam, Chennai, India.

capability to access a fire source directly. Several studies have proposed a outcome received from forest or urban fires, in which large number of flying robots would approach the flames via flight formation and extinguish the fire. So, the main purpose of these robots is to prevent the spreading of fire. The spreading of fire cannot be prevented but can be minimized by supplying sufficient level of water or by alerting other people in and around target site who can perform all possible manual rescue operations to save the affected people. Hence by making use of these robots, the place of fire accident can be identified and the information can be passed to surrounding people and automatic fire rescue operations can be executed, thereby providing protection to people. This system functions as a better security and rescuing system for the society and also for the welfare of people. System developed by Faisal Saeed et.al uses fire dynamics simulator & this system is able to detect early fire even when the sensor is not working [1]. System developed by Karwan Muheden et.al involves hardware circuit supported by wireless sensor network which is targeted for premonitoring the occurrence of fire accidents using flame and gas sensors [2]. System developed by Saranya et.al explained tracking of children's position and sending the place of missed child to parent as well control room [3]. Shaik thasleem banu et.al developed vehicle tracking system wherein if the vehicle exceeds the threshold speed then signal will be transmitted to RTO office for cancelling the license of that vehicle [4]. Among all the above mentioned systems, system developed in [1] inspired me to develop rescue system by adding additional features and hereby making it a more secure compared to the existing one.

II. SYSTEM DESIGN

This section describes the conceptual design of human rescue robot (Fig.1) as shown below.

Our system detects the motion of the human beings, and transfers the message by means of videos, SMS and alerts fire station and the surrounding. The flame sensor and passive Infrared Sensor are connected to the Raspberry pi. The PIR sensor detects the motion on nearby surroundings and the data's are updated to the GSM as SMS. The flame sensor is used to detect the flames and alert the fire stations. The image processing unit helps to identify whether it is human and updates the information to the control section. The water mechanism automatically turns ON and helps the humans inside the building. Camera is used for detecting an human with the help of video processing technique. If fire will detected the fire sensor relay will be activated by the raspberry pi and pump motor will be activated.



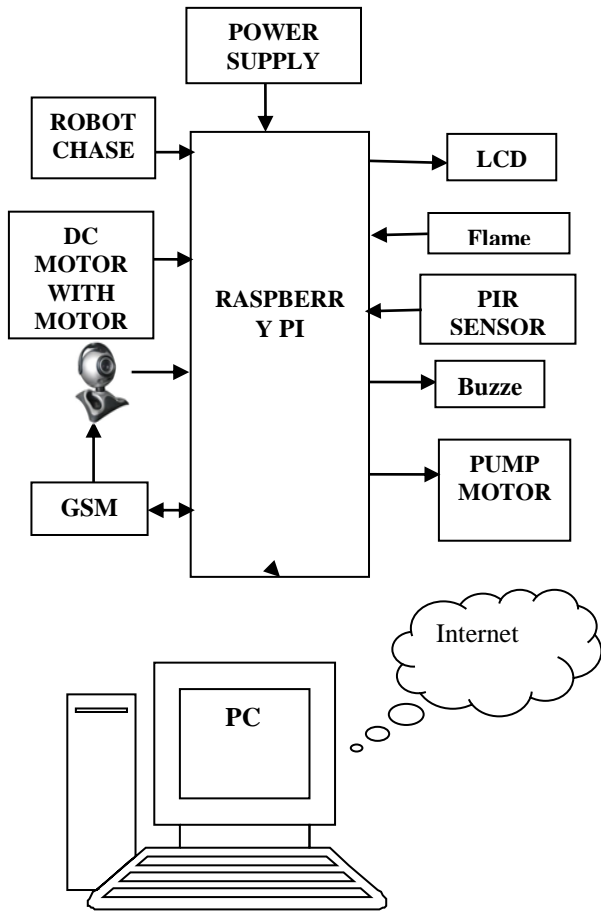
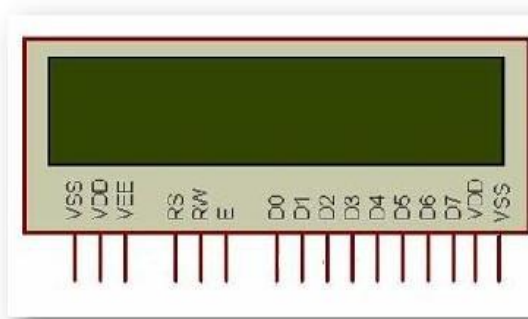


Fig. 1. Block diagram of the proposed system

III. HARDWARE SYSTEM DESIGN



RASPBERRY PI 3

The Raspberry Pi is a microcomputer which has inbuilt quad-core 64-bit ARM Cortex A53 clocked at 1.2 GHz. The Pi 3 now includes on-board 802.11n Wi-Fi and Bluetooth 4.0. Wi-Fi, wireless keyboards, and wireless mice.

The specifications are as follows:

- SoC: Broadcom BCM2837
- CPU: 4x ARM Cortex-A53, 1.2GHz
- RAM: 1GB LPDDR2 (900 MHz)
- Networking: 10/100 Ethernet, 2.4GHz 802.11n wireless
- Bluetooth: Bluetooth 4.1 Classic, Bluetooth Low Energy
- Storage: microSD
- GPIO: 40-pin header, populated
- Ports: HDMI, 3.5mm analogue audio-video jack, 4x USB 2.0, Ethernet, Camera Serial Interface (CSI), Display Serial Interface (DSI).



Fig.2. Raspberry Pi FLAME SENSOR

In general, flame sensor can be used for flame alarm purposes due to its high sensitivity towards ordinary light. Fig 3 represents module which can detect flame with its wavelength ranging from 760nm to 1100nm. Both sensor and flame should be kept at a certain distance to avoid high temperature damage to the sensor.

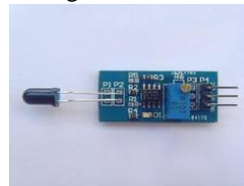


Fig.3. FLAME SENSOR

C. PASSIVE INFRA-RED SENSOR

A Passive Infrared sensor (PIR sensor) is used to measure infrared (IR)light radiating from objects in its field of view. The prominent usage of PIR sensors is the construction of motion detectors using the same. Apparent motion is detected when an IR source with one temperature, such as a human, passes in front of an infrared source with another temperature, such as wall



Fig.4. PASSIVE INFRA-RED SENSOR

D. LCD (Liquid Crystal Display):

LCD screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs. The reasons being: LCDs are economical; easily programmable; have no limitation of displaying special & even custom characters (unlike in seven segments), animations and soon.

Fig.5. LIQUID CRYSTAL DISPLAY

E. GSM MODEM

A GSM modem is a wireless modem which is serially interfaced with the controller with the help of MAX 232.. AT commands are given to the GSM modem with the help of PC or controller. It acts as a medium for sending messages from source to destination and vice versa.





Fig.6. GSM MODEM

IV. SOFTWARE SYSTEM DESIGN

A. PYTHON LANGUAGE

Python is a good programming language for beginners. It is a high-level language, which means a programmer can focus on what to do instead of how to do it. Writing programs in Python takes less time than in another language.

B. LINUX TERMINAL

The terminal on a computer allows a user a great deal of control over their system (or in this case, Pi!). Users of Windows may already have come across Command Prompt or PowerShell and Mac OS users may be familiar with Terminal. All of these tools allow a user to directly manipulate their system through the use of commands.

V. RESULTS AND DISCUSSION

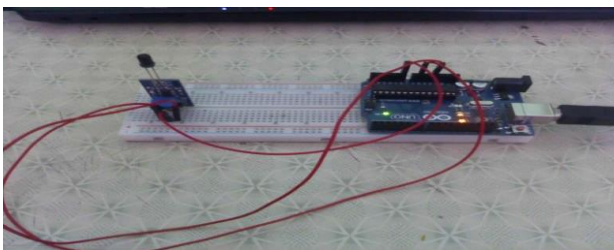


Fig 7 illustrates the output of robot chase when fire incidence does not occur. Results are displayed in monitor section (i.e.) receiver side.

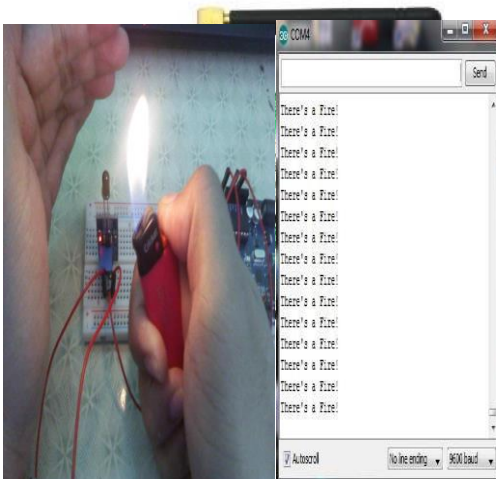


Fig.8. Output when rescue robot is exposed to fire

Fig 8 illustrates the output of robot chase when fire incidence has incurred. For implementation ignition lighter is used for creating fire around robot chase. Results are displayed in monitor section (i.e.) receiver side.

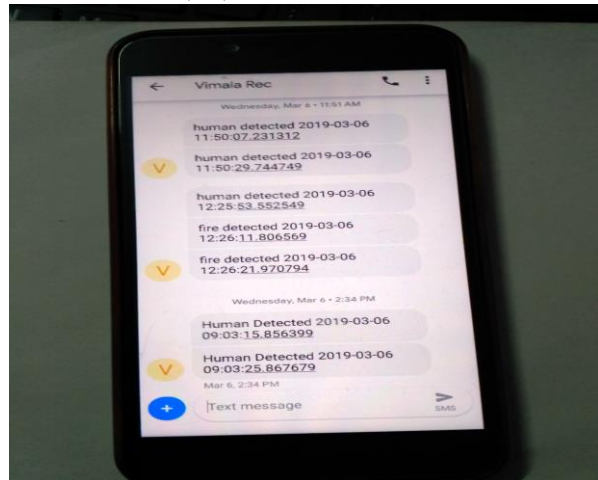


Fig.9. GSM Output

Fig 9 illustrates the indication of message sent to recipient whose phone number is registered in Raspberry Pi board.

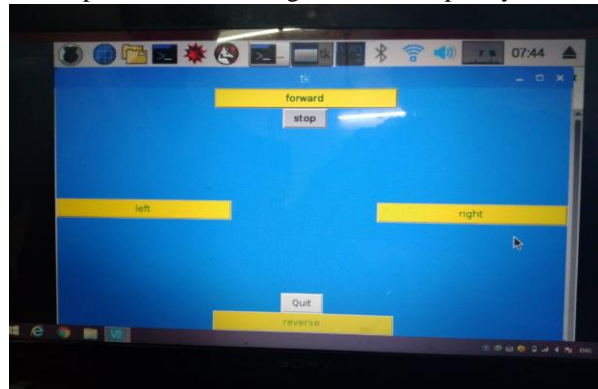
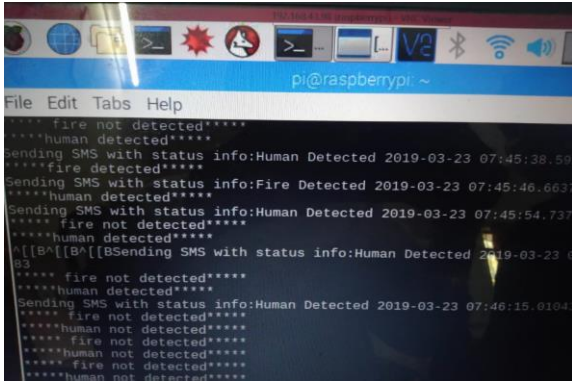


Fig.10. HTML PAGE for controlling the movement of Robot Chase

Fig.10. represents the design of webpage for controlling the direction at which robot has to move for rescuing purpose.



The above figure illustrates the output of developed system in developed system itself.

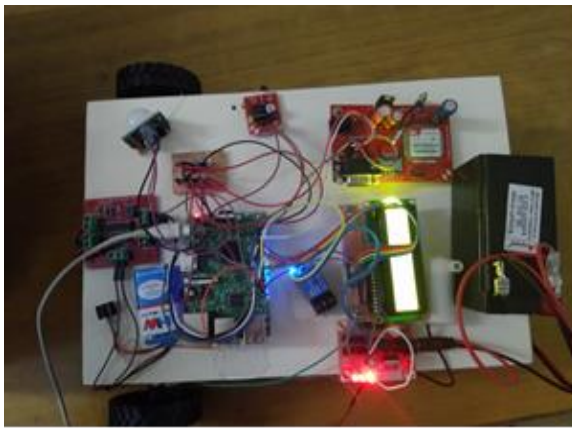


Fig.12. Overall System Module

The figure above indicates the full view of the robot module

VI. CONCLUSION

This project focuses on rescuing people from fire accidents by detecting flames and human beings present within affected area and alerting the surrounding by means of alarms and sending alert messages to registered people. It can be extended by placing voice recognizing sensors which senses the cry of all the people who are under risk inside the fire accident premises and send the information to their personal through GSM.

REFERENCES

1. Faisal Saeed, Anand Paul, Abdul Rehman, Won Hwa Hong and Hyuncheol Seo, "IoT-Based Intelligent Modeling of Smart Home Environment for Fire Prevention and Safety" Journal of Sensor & Actuators, March 2018, DOI: 10.3390/jsan7010011
2. K. Muheden, E. Erdem and S. Vançin, "Design and implementation of the mobile fire alarm system using wireless sensor networks," 2016 IEEE 17th International Symposium on Computational Intelligence and Informatics (CINTI), Budapest, 2016, pp. 000243-000246.
3. J. Saranya and J. Selvakumar, "Implementation of children tracking System on android mobile terminals," 2013 International Conference on Communication and Signal Processing, Melmaruvathur, 2013, pp. 961- 965..
5. K. Priy1, M. Yamin1, S. Pavithra, S. Shalini devi. and Shaik Thasleem Banu, " RFID BASED AUTOMATED CONTROL AND DETECTION SYSTEM FOR TRAFFIC VIOLATION", Pak. J. Biotechnol. Vol. 13 (special issue on Innovations in information Embedded and communication Systems) Pp. 379- 382 (2016).
6. J. Saranya, V. Hemananth, B. Karthic Selvamohan, T. Kumaresan, "Implementation of tracking system for mankind" Proceeding of ICFTICC- 2015.
7. Yuichiro MORI, Hideharu KOJIMA, Eitaro KOHNO, Shinji INOUE, Tomoyuki OHTA, and Yoshiaki KAKUDA, "A Self-Configurable New Generation Children Tracking System based

on Mobile Ad Hoc Networks Consisting of Android Mobile Terminals" proposed in 2011 tenth International symposium on Autonomous decentralized systems. W.-K. Chen, Linear Networks and Systems (Book style). Belmont, CA: Wadsworth, 1993, pp. 123–135.

8. C.R. Lin and M. Gerla, "Distributed clustering for adhoc networks," IEEE J. sel. Areas Common., Vol.15, no.7, pp. 1265-1275, 1997.