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Smart Home with Fire Management System and Protection

Poornima Gugale[1], Vilaskumar Patil[2]
[1]*PG Student, VLSI & ES, Sharnbasva University, Kalaburagi, Karnataka*
[2]*Asst. Professor, ECE, Sharnbasva University, Kalaburagi, Karnataka*

Abstract: ***The smart fire management system needs an observation system to sense and control the fire automatically and this prerequisite has been consummate in this projected work by retaining a fire detection system and the fire controlling system using the Raspberry Pi. The fire finding system requires fire detectors with a temperature sensor which decreases the false fire finding level. The system informs the user by emailing the image of the fire affected area and gives updates of room temperature by sending a message. A gas sensor has been active to detect various types of gases like methane, LPG, ethane, etc. A GSM module sends the message when sensors detect fire and gas. The proposed system achieves several functions on the finding of fire or gas. Some of the main functions like switch off the power supply, turn on the pump motor. The water sprinkler has been working which will be activated on the finding of fire by the using fire sensors in the system. If the temperature increases above the threshold temperature and sends the message, then the proposed system will send the mail to fire brigade alongside with the image and inform the user to inform the fire brigade with live video link on the Raspberry Pi IP address with: 8080 in the search box.***

Keywords: Raspberry pi, LCD display, camera module, exhaust fan, gas leakage detector, IR flame sensor, GSM module, temperature sensor, water motor with sprinkler, monitor.

I. INTRODUCTION

The smart home automation with fire management involves important following systems to sense and control fire and fire causing agents automatically. This obligation has been gifted in this system by using fire finding system and fire adjusting system using Raspberry pi. This systems are measured as one of the most main and vital monitoring systems. So the fire finding systems want to need greater precision and cleverer ways of fire finding. The fire control services such as reflex fire reduce system, smoke control system, messing and live streaming system. The fire decrease system is a real-time intensive care system that identifies the occurrence of smoke in air due to fire and captures images over a camera fixed inside a room when a fire happens. The system has ability to remotely send alert when fire is detected. The embedded structures used to improve this fire fright system are Raspberry Pi. The self-starting of an automatic water sprinkler system be determined by the faces of an early fire. It sprigs the water efficiently to the burning area, thus controlling the fire dispersion and extinguishing it.

II. FUNCTIONAL BLOCK DIAGRAM AND DECRIPTION

The proposed smart home with fire management system and protection devises in below Fig. 4.1 shown. Its consists of many modules, those are camera module, Raspberry pi, power supply (+5V, +9V and +12V), GSM module. The explanation of several module working in the proposed system as shown in below.

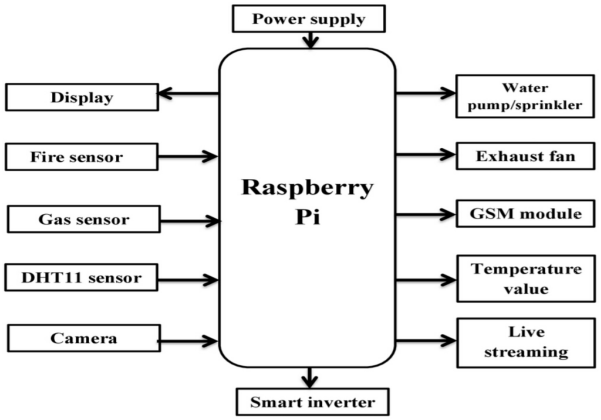


Fig 1: Functional block diagram

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A. Components Required

Components required and materials for smart home fire management system and protection using some components as required in below (table 1) listed as detail.

Table 1: Components required

COMPONENT	QUANTITY
Raspberry Pi module B	1
LCD display 16x2	1
Fire sensor	1
Gas sensor	1
DHT11 sensor	1
SPDT relay	2
Web camera	2
Water pump (AC motor)	1
GSM module SIM 800L	1
Exhaust fan	1
Resistor	As required 10kb and 100kb
Connecting wires	As required
Power supply	230v, 9v, 5v.
Small inverter	1

B. Raspberry Pi Microcontroller

The raspberry pi comes in two models those are model A and model B. The standard capacity in between these two models as USB port and Ethernet. Model A board consume a less power and that does not have an Ethernet port. But, the model B board includes an Ethernet port.

C. LCD display

LCD (Liquid Crystal Display) is electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs.

D. Power Supply

In this system power supply is required +5V +9V and +230V given to sensors, GSM module, water pump and inverter, individually. For sensors +5V power supply is required, +9V for GSM module and +230V is required to inverter and water pump.

E. Inverter

This system is operates in online inverter, the proposed system on the finding of fire switch off the power supply to hole building.

F. Raspberry pi

It is active in the system to control many sensors over GP-IO pins and camera module also is interfaced with USB cable.

G. Fire/Flame sensor ,Gas sensor and DHT11 sensor

The fire\flame detector is working in the system to sense the flame. The gas leakage device/sensor (MQ-2) for gas leakage and DHT11 temperature sensors is active to measure the value of room temperature.

H. Water pump and sprinkler

The water sprinkler is installed in the system. When the fire detected water is flow throw water pump with sprinkler.

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I. Gas sensor and exhaust fan

The exhaust fan and gas sensor connected to Raspberry pi module 3 through relay when gas is detected exhaust fan turned on.

J. GSM module and live monitoring/streaming

If fire and gas is detected in system the text message is send to user through GSM module and live monitoring/streaming through web camera.

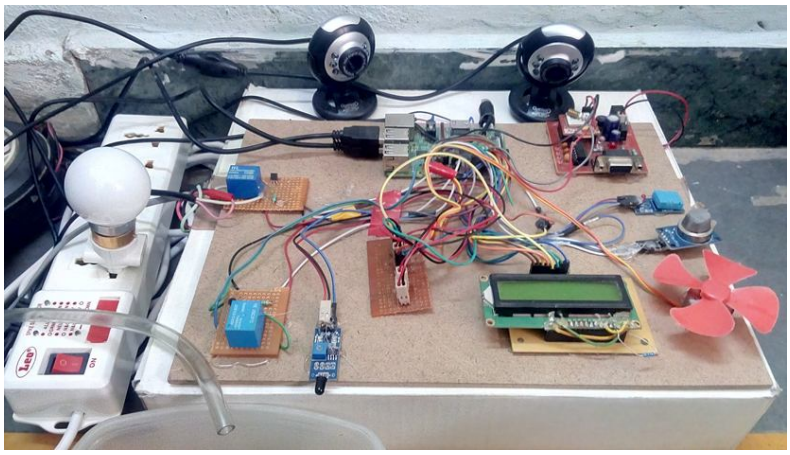


Fig 2: Picture of Implemented proposed system

III.PROPOSED SYSTEM FLOWCHART

The proposed system flow chart as shown in below figure 5.1 in the proposed smart home with fire management and protection this controller raspberry pi module 3 always monitor the status of all three sensors. The system starts gas sensor is detected toxic gases exhaust fan on and send mail and message to user if no means no action. If fire sensor is detected the fire temperature is greater than 25℃ switch of power supply, active the water pump/sprinkler and send the message and mail to user with fire affected area photo with live monitoring or live streaming video of affected area, the fire is out of control the user want to send a message/call and mail with live streaming video link to fire brigade if no fire is detected no action this process is continuous in proposed system.

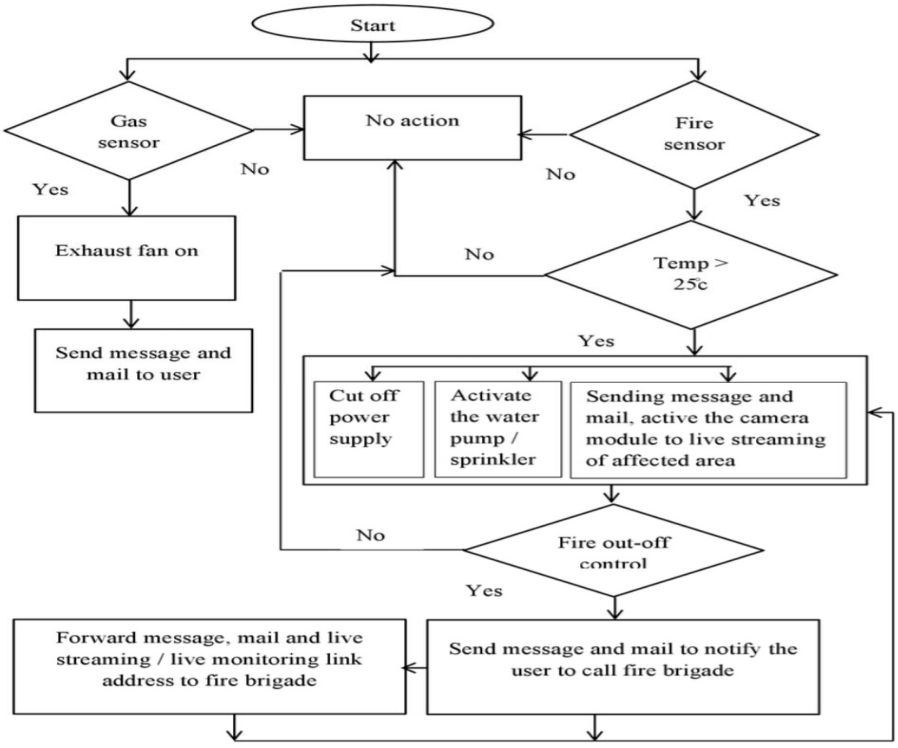


Fig 3: proposed system flowchart

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IV. STEP BY STEP WORKING

1) *Step 1:* OS installation on raspberry pi in SD (memory) card, before we start with the OS operation on the memory card required software

a) SD card formatter from SD card association we don't have to do simple format of the memory card using for windows OS need low level formatting so that proper integration of the memory card files done on memory card

b) Next we required Win32 disk imager ISO because as we know to download the ISO image of the OS is very important to transfer the ISO image hard disk to the memory card we need a software called Win32 disk imager

c) This two software are most important to prepare the memory card to get the operating system

d) Standardise website raspberry pi.org in that download the operating system file in my proposed system i used raspbian, raspbian is official OS for calling a raspberry pi model and for raspbian NOOBS is our easy installer.

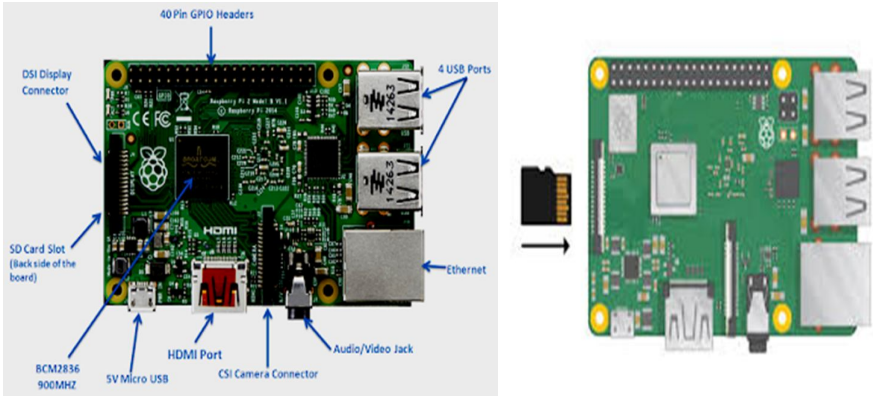


Fig 4: SD card install of raspberry pi

2) *Step 2:* Connect the wire connection and installation as refer chapter 4 in installation of the proposed fire management system and protection.

3) *Step3:* Write the working code in PYcharm EDU and execute in puTTY.

4) *Step4:* Open hotspot on mobile set host name as project and password as project1234 connect raspberry pi, laptop or desktop (monitor).

5) *Step5:* Open puTTY enter the raspberry pi IP address and login id-pi, password-rasbberry then type sudo tightvnc server press enter it will display as 1 or 2 in terminal minimize it.

6) *Step6:*Open VNC viewer and enter VNC server address it is IP address of raspberry pi with: 590X (X is 1 or 2), displayed warning message click on continue with password-tightvnc then ok, click on file manager then desktop and open home auto

7) *Step7:* Open mail with login id and password for image and phone message will sent after detected.

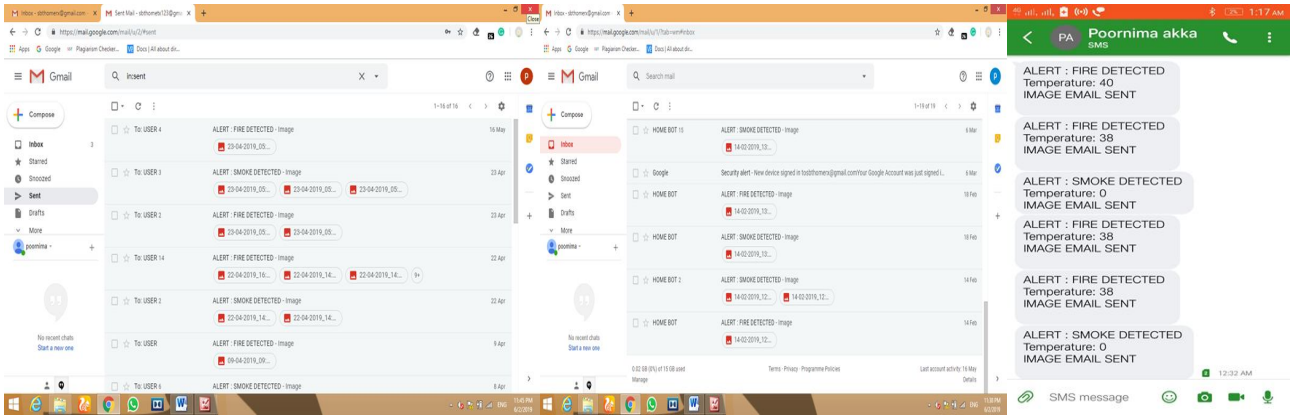


Fig 5: Gmail outbox (sent), inbox messages and mobile text message

8) *Step8:* Open browser enter IP address of raspberry pi: 8080 (example- 192.168.43.244:8080) in that static for image and stream for live video

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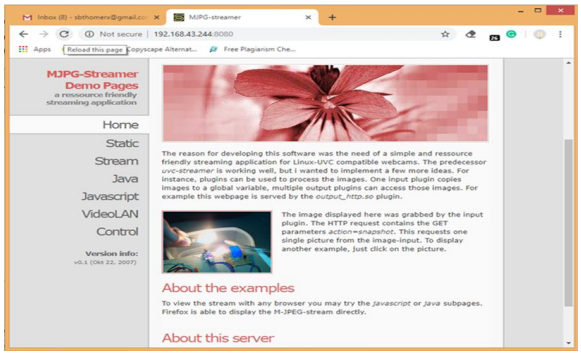


Fig 6: live image and video

V. RESULTS

The proposed system using raspberry pi entails one flame/fire sensor, gas sensor, DHT11 temperature sensor, exhaust fan, and pump motor or sprinkler, this pump is integrated with GPIO pins of raspberry pi through relay to flame\fire sensor and output pins are connected in parallel through relay. The gas sensor is installed with raspberry pi GPIO pins through relay to exhaust fan connected in parallel, DHT11 temperature sensor is also connected with GPIO pins. The current limiting 1kΩ resistor is limiting the current passing through GPIO pins of raspberry pi 3 module. The GSM module is connected through GPIO pins to all this three sensors to send message to user when sensor sensed and raspberry pi USB connection is connected to web camera hotspot to send mail and watch a live streaming or live monitoring to enter the IP address with: 8080 in web link box. Now available to watch video how much fire is detected and how it is reduce through water pump, if fire is out of control user to call and message to fire brigade.



Fig 7: proposed system outputs

VI. COCNCLUSION AND FUTURE WORK

A Raspberry Pi based smart fire management and protection system is proposed for fire finding and control. The systems have benefit of primary finding of fire and as well as fire causing agents with low-rate of due to employed flame/fire sensor and the temperature sensor. This system is a sensor based water sprinklers working in more effectual as compared to the out-dated fire sprinklers. This technic has used to inform the user and fire brigade with send message and live streaming\ live video.

In the proposed system will do as my expectation two things will do one is use extra sensors of fire to build a model in larger area room and another one is as possible resolve the network problem while sending mail.

VII. ACKNOWLEDGMENT

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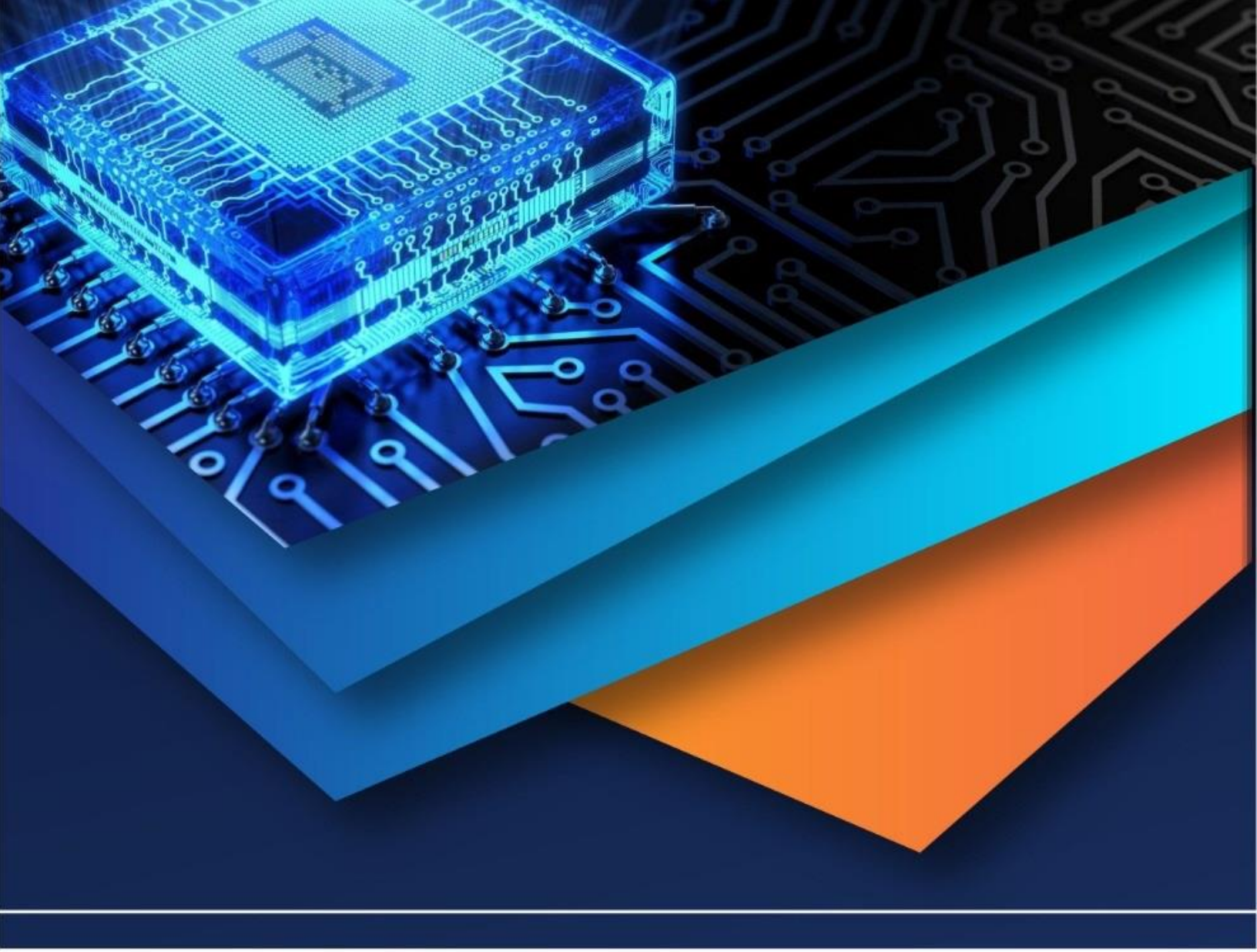
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