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Fire Douser With Live Visual Manifestation Using Raspberry Pi

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ABSTRACT

Design and development of a fire ETG RB with live visual indication and RS Pi technology is outlined in the abstract. This essentially implies creating a RB with sensors capable of recognizing BZ, mechanisms to get them out, and cameras or LED indicators that give sight in real time. The PJ integrates automation and visualization to enhance fire safety measures. The goal of this PJ is to produce a RB fire ETG which runs on a RS Pi that has fire determining sensors mounted. The RB tracks fire sources via real-time glances from a camera. Whenever it detects a fire, it makes its way to the blaze on itself and triggers a fire ETG. By presenting visual feedback in real-time, the gadget raises situational awareness and facilitates effective firefighting operations.

Keywords: RB, RS, ETG, PJ, BZ

INTRODUCTION

Modern advances in embedded systems and robotics have fundamentally altered an array of businesses, including emergency response systems. Fire safety is a major area of concern due to the fact that has the potential to avert substantial damage to property and save lives by reacting swiftly to locate and snuff out fires. Traditional firing approaches frequently rely on human intervention, which can be hazardous in unsafe circumstances. The juxtaposition of smart technologies and robotics conveys an appealing method of conquering this hurdle. In this project, we advocate creating a Fire Extinguisher Robot (FER) with live visual indication to provide greater situational awareness alongside the Raspberry Pi, an adaptable single-board computer.

In this endeavour, we develop a state-of-the-art firefighting robot by utilizing the abilities of an ESP32 camera and a Raspberry Pi. In addition to battling fires, our robot has been designed to display visual signals in real time on a cell phone, ensuring uninterrupted monitoring and control. By incorporating Raspberry Pi, we render it feasible for the robot to process data efficiently and choose sensibly relying on the data the machine receives from the ESP32 camera. This camera serves as the robot's eyes, capturing instantaneous images of the environment that will be crucial in identifying the precise location and magnitude of the fire.

Users have access to real-time updates on their devices thanks to the seamless connection made conceivable by the combination of the Raspberry Pi and ESP32 camera. Since users can keep track on the robot's motions, this feature promises a timely and knowledgeable response.

Autonomous gadgets called "fire fighting robots" are produced to help snuff out fires and carry out multiple fire-related activities. These robots can identify fires, navigate through hazardous conditions, and put extinguish fires with the use of water or other extinguishing agents thanks to their sensors, cameras, and other technological amenities. They serve in places they could be unsafe for human firefighters to enter, like toxic fume-filled regions or burning structures. Although they can save lives and save property in an emergency, firefighting robots are playing a bigger and bigger role in today's firefighting operations.

Literature Survey

These days, fire fighting is a dangerous circumstance. Multiple authors are developing various methods for , fire fighting . A number of losses are brought on by fire. The most catastrophic event is a fire that occurs close to a forest, gas station, pump, or educational facility. If the fire is not put out right away, it can cause damage to large areas and a great deal of people. Our purpose is to facilitate the advancement of the , fire fighting robot development by adding a new phase. We have created a basic domestic robot that is easily installed in homes, stores, malls, and other public but congested spaces. Three types of sensors have been used: temperature, smoke, and ultrasonic.

Previous Work:

A review of the literature on fire extinguishing robots employing a Raspberry Pi and live indications would involve looking at previous investigations on the creationism, functioning, and deployment such robots as well as their performance, design, and technological innovations. Robots that nourish burns leveraging Raspberry Pi and live symptoms have grown into helpful tools for combating fire in a broad range of scenarios. They conduct all the obligations performed by conventional firefighters with minimal risk of harm to civilians. Microprocessor expertise and sensor technology are frequently integrated to improve their performance. The intention of future research is to raise the performance, versatility, and autonomy of these robots. The sole SER output utilized in modern systems is analogy, which has sporadic values and an propensity for fluctuation with environment. Occasionally, the autonomous RB may stray from the firing line.

Methodology:

Hardware requirements:

A Raspberry PI computer is necessary for this project's hardware in order to sustain the robot's complete operation. The computer-camera interface will examine the real-time snaps and decide assuming a nearby fire erupted based on that information. Consequently, this computer will harness the robot's built-in water pump to put out the fire automatically. For the intent of spraying water swiftly a diaphragm type water pump will be employed. Four wheels, two geared motors, two dummy wheels, an L298 motor driver, and a 5 volt relay are needed for the Relay, battery robot.

Software requirement:

The Raspberry Pi is coded via Python. After switching on, the raspberry pi transmits a control signal to the ultrasonic sensor, that subsequently pulses in line with the time it takes for an ultrasonic wave to travel from the sensor to any object and back. In order to detect fire using OpenCV for image processing, we establish the typical hues of fire through applying the upper and lower bounds of the HSV spectrum of red, orange, and yellow. The wiper motor and the DC motor (which is situated on the front side) acquire a signal to turn off the fire when it appears. Until the fire is extinguished, the pattern will keep repeating. Making usage of this technology.

Initially the single device producing the Wi-Fi hotspot joins a local ad hoc network that the Raspberry Pi is an element of after the link is established, the robot can be switched on through manual or automatic mode. Two Python scripts, one for motor control and one for recognizing colours, undergo execution simultaneously in order to start the robot in auto mode. Additionally, this main GPIO program offers access to a different additional ultrasonic sensing program. Once the Python application has been initiated and the camera or ultrasonic sensor discovered anything, the corresponding arguments appear in the terminal.

The clarifications we offered are:

The statements "FIRE detected" and "Obstacle detected" will pop up if a certain color ingredient has been identified. The phrases "MANUAL MODE" and "AUTO MODE" designate manual and automatic mode operation, accordingly.

Manual Mode:

In manual mode, we can utilize the Raspberry Pi's GPIO pins to send commands to the motor driver via a PHP webpage, allowing it to pivot in the appropriate direction. The robot has two wheels that are supplied with power by four 12V 100 rpm DC motors.

The PHP website includes the following controls: - Left, Right, Forward, Reverse, and Pause.

A control for switching between automated and manual mode is also present.

Automatic Mode:

When the USB camera is in automatic mode, it begins taking images. The Raspberry Pi examines for the Red, Yellow, and Orange hues that we specified in the Open Cv coding when an image is captured. The color is identified by identifying its

range in the HSV colour space. Whenever the lower and upper boundary values for the shades have been set stated that the detected shade will match the range between the thresholds. Raspberry Pi orders the motor driver to accelerate the motors to flames for a short period of duration. The water storage tank's water is drained via the pump and solenoid valve. The water spraying mechanism continues functioning as long as a fire occurs till it has been totally quenched.

Block Diagram:

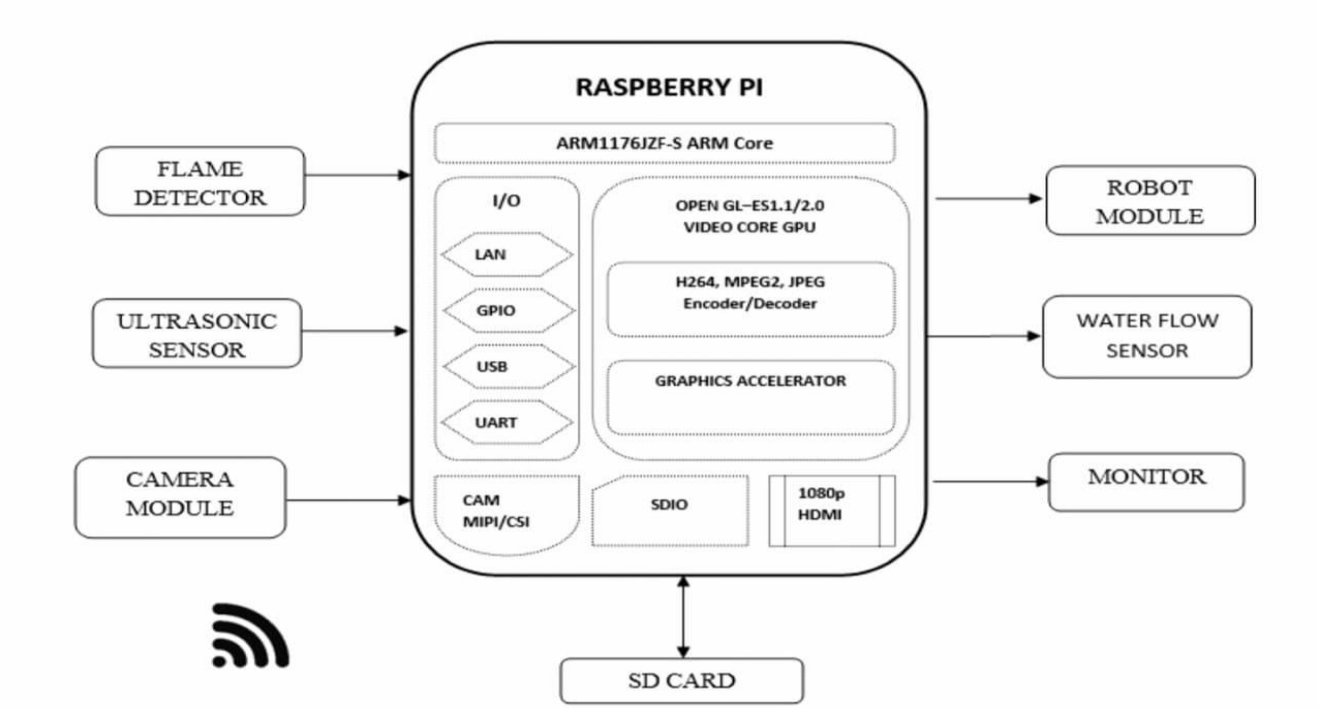


Table (Comparison)

Sr.no	Title	Author	Methodology	Future Scope
1	Automated fire robot	H. P. Singh	It transforms analog data into digital signals.	High Density of flame sensor
2	Intelligent Water tank	E. Marry Sartika	The robot is capable of detecting fire and adjusting its water spray to match the intensity and need of the fire.	Co2 booster
3	Wireless Fire Robot	Karishma Mate	The ability to move the robot left, right, and forward is provided by the wireless version.	Robots can fly in ventilated areas
4	Cell Phone Controlled Robot	Prof. Amol Joglekar	Using the cell phone gives you time to control the robot and avoid the fire area.	Smart phone controller
5	Bluetooth Controlled Robot	Sourav Gupta	One notable benefit of Bluetooth connectivity is provided by the robot.	Gps Module

Experimental Result:

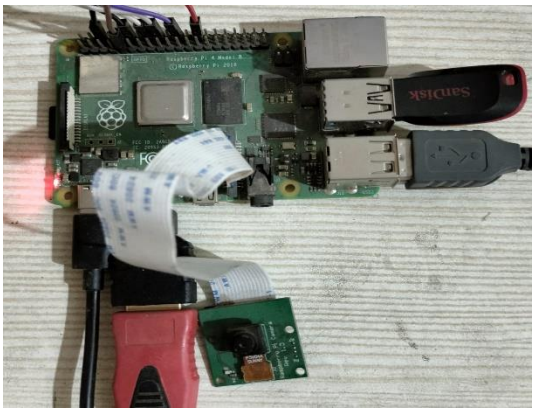


Fig.1 Raspberry PI 4

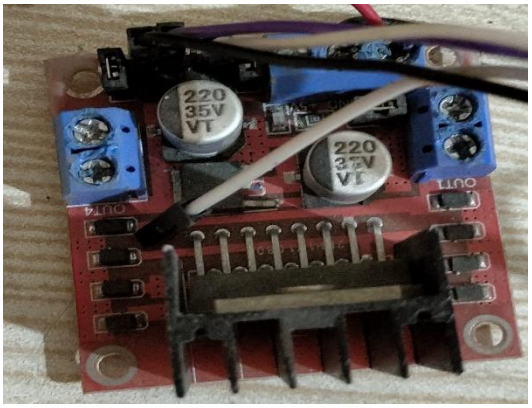


Fig.2 DC Motor

Fig.3 Fire Douser Robot

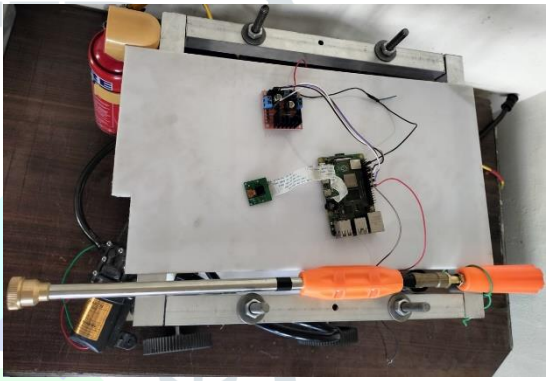
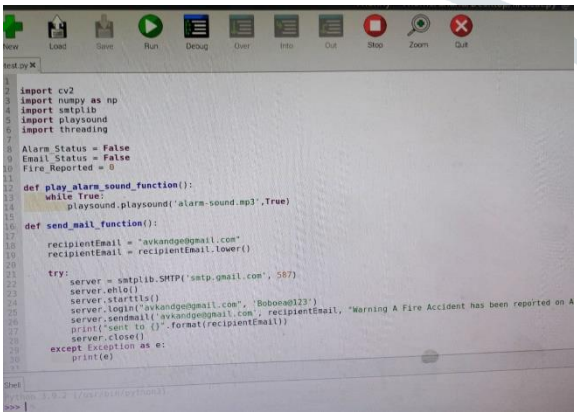


Fig.4 FDR (Top view)

Screenshots:



```
import cv2
import numpy as np
import smtplib
import playsound
import threading

Alarm_Status = False
Email_Status = False
Fire_Reported = 0

def play_alarm_sound_function():
    while True:
        playsound.playsound('alarm-sound.mp3',True)

def send_mail_function():

    recipientEmail = "avkandge@gmail.com"
    recipientEmail = recipientEmail.lower()

    try:
        server = smtplib.SMTP('smtp.gmail.com', 587)
        server.ehlo()
        server.starttls()
        server.login("avkandge@gmail.com", 'Boboea@123')
        server.sendmail('avkandge@gmail.com', recipientEmail, "Warning A Fire Accident has been reported on A
        print("sent to {}".format(recipientEmail))
        server.close()
    except Exception as e:
        print(e)
```

Fig.5 Python IDE

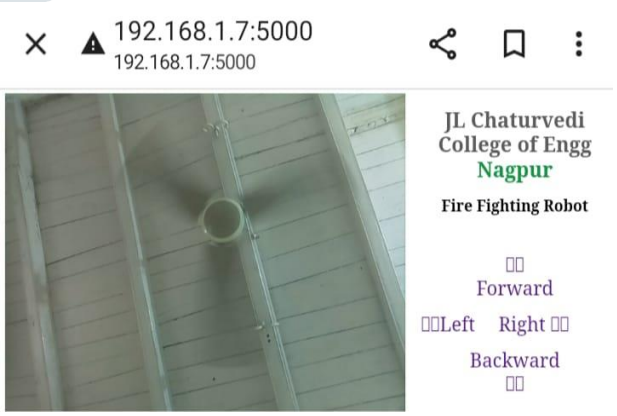


Fig.6 Live Visuals

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