



OPEN ACCESS INTERNATIONAL JOURNAL OF SCIENCE & ENGINEERING

IoT BASED FIRE DETECTION AND ONLINE MONITORING SYSTEM

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Abstract- IoT based fire detection and online monitoring system best suited for industrial and home applications. Fire is the major cause of accidents claiming valuable lives and property. The chemical reaction between carbon-based materials in presence of oxygen generates flammable vapour causing unsteady rise in temperature and results in a fire.

IoT Based fire detection and online monitoring system is the solution to this problem. In this project we have built fire detector using Raspberry Pi which is interfaced with a temperature sensor, smoke sensor and buzzer. Whenever fire triggered, it burns objects nearby and produces smoke, smoke sensor senses any smoke generated due to burning or fire.. Buzzer connected to Raspberry pi gives us an alarm indication. The temperature sensor senses the heat and notification send to user. Whenever heat intensity is high then also the alarm goes on. We have tried to make it smarter by connecting the whole monitoring process to the web page naming- Fire Security System.

IoT Based fire detection and online monitoring system serves for industrial purpose as well as for household purpose. Whenever it detects fire or smoke then it instantly alerts the user about the fire through the mail indication system.

Keyword- *IoT, Raspberry Pi, Buzzer, Temperature sensor*

I INTRODUCTION

A fire is a chemical reaction of carbon based material that mixes with oxygen and is heated to a point where flammable vapours are produced. These vapours then come in contact with something that is hot enough to cause vapour ignition and results in a fire and its occurrence is random.

Industry, home offices, hospitals etc. are very much vulnerable to fire that has the potential to cause harm to its occupants and severe damage to property. The National Crime Records Bureau indicates that there have been a total of 113961 fatalities due to fire accidents during the years 2010 to 2014. Fire accidents claim roughly 65 victims every day. A total of 1.21 lakh fire accidents occurred between the years 2010 and 2014.[2]

Early warning and immediate response to a fire breakout are the only ways to avoid great losses and environmental and cultural heritage damages. Hence, the most important goals in fire surveillance are quick and reliable

detection and localization of the fire.[1] The estimate of property loss due to fire crosses about 1000 cores rupees every year.

The major characteristics of fire are it extends exponentially with time. Hence, timely detection of fire is critical for avoiding a major accident. Hence, the essence of having a sophisticated fire alarm and monitoring system is quite obvious. The early detection of fire can be made with the rise of temperature, the presence of smoke .Hence appropriate sensors have to be installed at the vulnerable places to detect the mentioned physical quantities. The alarm information is generated by comparing them with predefined threshold values and send to a central processor. The central processor decides the operation of water sprinkler motors.

The major setback of traditional fire alarm system is the remote location of fire initiation points. It may be machinery inside the industry, unattended home appliances etc. Hence, the information generated by the sensors need to be conveyed a long distance, may be through transmission line

followed by instrumental amplifiers. Some places, the deployment of such lines are not feasible.

The low cost solution to such problem is to introduce wireless link. The present development of IoT platform would best suit for it. IoT is a complete embedded system where sensors and actuator are being monitored and controlled remotely across existing network infrastructure. It allows sophisticated computer-based control for more efficient and accurate operation.

II. PROPOSED SYSTEM AND RESULTS

Fires cause serious damage and disrupts in daily life in a devastating manner .Hence preventing them reducing their effects is a top priority. The early detection of fire can be made with the rise of temperature, the presence of smoke. Hence appropriate sensors have to be installed at the vulnerable places to detect the mentioned physical quantities. The alarm information is generated by comparing them with predefined threshold values and send to a central processor that may be a microcontroller. The central processor decides the operation of water sprinkler motors.

III. RASPBERRY PI

The Raspberry Pi is a series of small single board computer developed in the United Kingdom by the Raspberry Pi foundation to promote teaching of basic computer science in schools and in developing countries.

The original model became far more popular than anticipated, selling outside its target market for uses such as robotics. It does not include peripherals (such as keyboards and mice) or cases. However, some accessories have been included in several official and unofficial bundles



Fig 1. Raspberry Pi

Raspberry Pi is mini-computer, can be easily connected to internet using Ethernet port. Raspberry Pi is use different operating system although Linux is prefferd android can also be installed.

Raspberry Pi is faster than Arduino by 40 times in clock speed .Raspberry Pi has 12800 times more powerful than android. Raspberry Pi is good for performing multiple tasks. It comes with fully functional operating system.

Software description

Raspbian-

Raspbian is a Debian-based computer operating system for Raspberry Pi. There are several versions of Raspbian including Raspbian Buster and Raspbian Stretch. Since 2015 it has been officially provided by the Raspberry Pi Foundation as the primary operating system for the family of Raspberry Pi single-board computers.

Raspbian comes pre-installed with plenty of software for education , programming and general use. It has Python, scratch, sonic Pi, Java and more language.

Features -

The various features of Raspbian are as following-

- i. Setup wizard.
- ii. Backwards compatibility.
- iii. Recommended software tool.
- iv. Chromium update and web-based help files.
- v. Screen resolution and pixel doubling.
- vi. Network booting (PXE)

IV. HP CAMERA MODULE



Fig 2. HP Camera Module

HP Camera Module Webcam is a compact digital camera which works same as conventional digital camera but is designed to interact with the web pages and other internet pages. It captures the real time images through a tiny grid of light-detectors, known as charge-coupled device (CCD) from the location where it is placed.

The CCD converts the image into digital format so that computer can access this data. Webcams don't have the internal memory to store the images so it transmits the data immediately to the host device through the USB or other analog cable.

Webcam does two things, capturing the image or video and to transfer it to the predestined device. Along with the digital camera these also come with the appropriate software to interact with the host device. Software allows the user to edit the images and to record the videos for particular duration. This software grabs the digital data from the camera at certain intervals of time.

Depending on the frame rate, the number of pictures or video streaming is displayed on the computer or other display systems. Software receives the image frame from digital camera, converts it into JPEG file and finally sends it to the web server using the file transfer protocol (FTP). So before using this webcam, while working with the web, we need to do some configuration steps to upload the images and videos.

V.SMOKE SENSOR

The Gas Sensor (MQ2) module is useful for gas leakage detection .It is suitable for detecting H2, LPG, CH4, CO, Alcohol, Smoke or Propane. Due to its high sensitivity and fast response time, measurement can be taken as soon as possible .The sensitivity of the sensor can be adjusted by potentiometer.

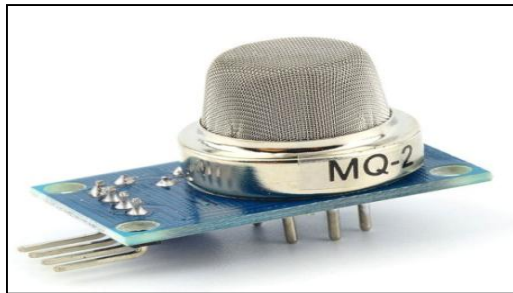


Fig..3 Smoke Sensor (MQ2)

Temperature sensor

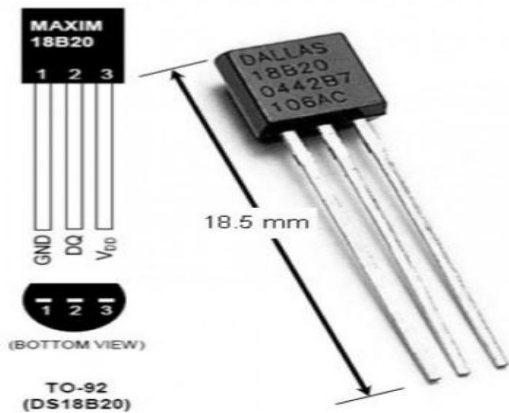


Fig 4. Temperature Sensor

The DS18B20 digital thermometer provides 9-bit to 12-bit Celsius temperature measurements and has an alarm function with nonvolatile user-programmable upper and lower trigger points.

The DS18B20 communicates over a 1-Wire bus that by definition requires only one data line (and ground) for communication with a central microprocessor. In addition, the DS18B20 can derive power directly from the data line (parasite power), eliminating the need for an external power supply. Each DS18B20 has a unique 64-bit serial code, which allows multiple DS18B20s to function on the same 1-Wirebus.

VI. WATERPUMP



Fig5.Water Pump

Micro DC 3-6V Micro Submersible mini water pump For Fountain Garden Mini water circulation System DIY project.

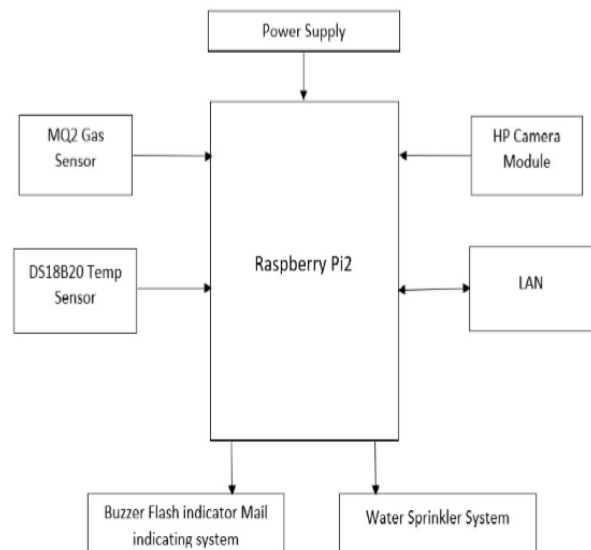
This is a low cost, small size Submersible Pump Motor which can be operated from a 3-6V power supply.

It can take up to 50 liters per hour with very low current consumption of 1A. Just connect tube pipe to the motor outlet, submerge it in water and power it. Make sure that the water level is always higher than the motor .Dry run may damage the motor due to heating and it will also produce noise.

VII. ARCHITECTURE DIAGRAM

The following system architecture of this project depicts the flow of control. The hardware device required are the sensors, the camera and raspberry Pi.

The architecture diagram is almost self-explanatory. The sensors and camera acts as input device that gives input data to the raspberry pi which is process the information and detect through unique information and deduces through the unique algorithm whether there is a fire or not .The buzzer and sprinkler acts as output device.



VIII CONCLUSION

The paper depicts the necessity and an efficient solution for fire safety. Internet of things was the main concept used .

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