

Fire Extinguishing and Monitoring using Multi-Sensor with Auto Turn On/Off Water Motor Using Blynk Server

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Abstract— Fire alarm systems are very common nowadays and commonly installed in Banks, shops, offices, home etc. They detect the fire and trigger a loud alarm to aware everybody. But what if nobody is there to hear that alarm, like in night time or when nobody is at home. So to inform the authority about any fire incident we are building an IoT based Fire Alarm system which not only trigger an alarm but also sends notification on IOT application with Email alert to concern persons and Turn ON water motor pump for fire extinguishing. This method can also be used to inform fire department automatically in case of fire. Here we will use Flame Sensor to detect the flame produced by fire, Smoke Sensor for detecting smoke and temperature sensor for detecting warm and ESP8266 NodeMCU to trigger the alarm and send notification on IOT Application by using blynk cloud and used relays to Turn ON/OFF water motor.

Keywords: NodeMcu, Temperature Sensor, Flame Sensor, Smoke Sensor, IoT, Relay

I. INTRODUCTION

Fire Detectors play a very important role in Industries, Shops, Malls, Residential complexes, parking areas, forest etc. They help in detecting fire or smoke at an early stage and can help in saving lives. Commercial Fire detecting systems usually have an alarm signaling, with the help of a buzzer or Siren. We have designed an IOT based Fire Alerting System using Temperature, smoke and flame sensor which would not only signal the presence of fire in a particular premise but will also send related information through IOT. Internet of Things (IoT) is basically the network of 'Internet of things' by which physical things can exchange data with the help of sensors, electronics, software, and connectivity. These systems do not require any human interaction.

In this fire alarm system we used temperature, smoke and flame sensor with IOT platform, so we can monitor live information like Temperature, Smoke and flame detected by a particular sensor through IOT Application also get alert and email notification when any sensor detect fire and it Turns ON water motor for extinguish fire. Our System designed for detecting fire as well as provide primary solution if there is any fire detect by Turning ON water motor for extinguish fire.

II. LITERATURE SURVEY

Fire detection is very crucial parameter in many fields of industrial area, forest area, etc. Numerous answers for identification of out-of-control fire are displayed and executed in recent years. Video closed-circuit television is most generally utilized for the identification of untamed fire [1]. it's isolated into four classifications video Cameras delicate in unmistakable point light of acknowledgment of smoke amid sunlight and fire blazes at nighttime, Infrared

(IR) Thermal Imaging cameras insight of discovery of heat transition from the fire, IR Spectrometer which distinguishes unearthly attributes of smoke gases and light-weight Detection and Ranging (LIDAR) system which measures the laser light backscattered by smoke particles. The limitation of those systems was a high false alert rate as a result of climatic con-ditions, for example, the proximity of fog, shadows, clean particles, etc. Another strategy is the use of Visual Cameras that take depictions of the forest to spot the fire. These cameras were mounted on the highest point of correspondence towers [2, 3]. A turning engine is introduced to relinquish a full round perspective of the forest the photographs got from the camera are prepared utilizing project or MATLAB code and are contrasted and therefore the reference pictures taken at introductory stage. This framework additionally had impediment of high false caution rate. Additionally the value of firm of visual cameras on correspondence towers was high [4]. We designed a fire detection system with three different sensors for improving the efficiency of fire detection and this system also capable to take the required action for the primary solution for auto turn ON water motor for extinguishing a fire. This system very useful when no person is available for takes action after the detection of fire. We designed an autonomous system that capable to detect fire and take the desired action by auto turn ON water motor also we used IoT technology for sending an alert message of fire so it sends an alert message in real-time.

III. SYSTEM ARCHITECTURE

To detect the forest fire as early as possible by measuring the level of temperature, smoke and flame.

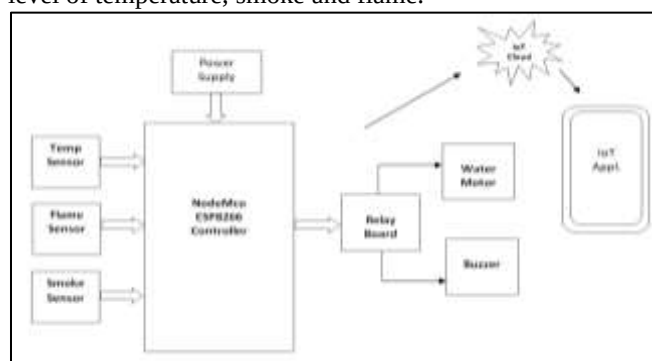


Fig. 1: Block Diagram

A. Hardware

- NodeMcu Esp8266 Controller
- Flame Sensor
- Temperature Sensor(DS18B20)
- Smoke Sensor(MQ-2)
- Adaptor Power Supply
- Relay Board

- Water Motor
- BUZZER

B. Flow chart

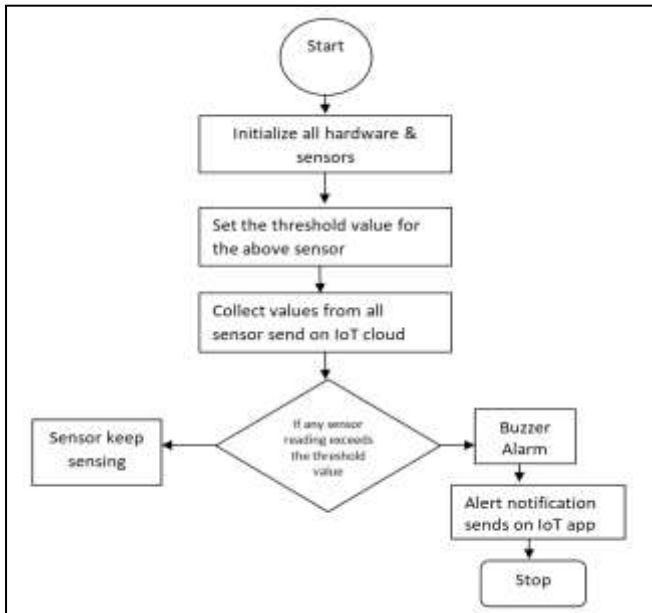


Fig. 2: Flow Chart

This Fire alarm system design to send alert notification whenever fire detects but some time no person is available to extinguish fire so this system also capable to turn on water motor that spread water on fire for extinguish fire so this helps to provide primary solution for extinguish fire.

In this system we used three different sensor for detecting fire first one is flame sensor for detecting flame of fire, second is smoke sensor to detect smoke of fire which produce from fire and third is temperature sensor to sense warm level.

Entire working of system depend upon input values of this three sensor we also used IoT (Internet of Things) for monitoring whole system from anywhere.

We used NodeMcu ESP8266 controller for handling this because we need WiFi connectivity for IoT purpose and this controller have inbuilt WiFi IC. Working of this project very simple first all sensor sense reading from environment and send this information to NodeMcu controller. All this sensor reading we send on Blynk cloud through ESP8266 WiFi controller.

We already set threshold value of each sensor if any sensor value exceeds the threshold value then alert notification send on IoT application as well as Email alert send to concern person and water motor turn ON for extinguish Fire as a primary solution.

C. NodeMcu Controller



Fig. 3: NodeMcu ESP8266 Controller

NodeMCU is an open-source Lua based firmware and development board specially targeted for IoT based Applications. It includes firmware that runs on the ESP8266 Wi-Fi SoC from Expressive Systems, and hardware which is based on the ESP-12 module.

D. Flame Sensor

Flame sensor is a device which is used to detect the presence of fire in its surrounding. In this project we will be using Infrared Flame Sensor to detect the fire [5].



Fig. 4: Flame Sensor

Infrared Flame Sensor consists of a photodiode coated with black epoxy which makes it sensitive to the infrared radiations having wavelength between 700nm to 1mm and can detect fire up to distance of 100cm within 60 degrees of angle of detection.

E. Relay

Relays are simple switches which are operated both electrically and mechanically. Relays consist of an electromagnet and also a set of contacts. The switching mechanism is carried out with the help of the electromagnet.



Fig. 5: Relay Board

F. Smoke (MQ-2) Sensor

Gas Sensor (MQ-2) module is useful for gas leakage detection (home and industry). It is suitable for detecting Methane, Butane, LPG and Smoke. 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 [5].



Fig. 6: MQ-2 Smoke Sensor

G. Temperature (DS18B20) Sensor

The DS18B20 is a 1-wire programmable Temperature sensor from maxim integrated. It is widely used to measure temperature in hard environments like in chemical solutions, mines or soil etc. The constriction of the sensor is rugged and also can be purchased with a waterproof option making the mounting process easy. It can measure a wide range of temperature from -55°C to +125°C with a decent accuracy of $\pm 5^\circ\text{C}$.



Fig. 7: DS18B20 Temperature Sensor

IV. RESULTS

We implement three different sensors in our system that are temperature sensor (DS18B20), Smoke sensor and flame sensor all this three sensor sends reading to NodeMcu controller and NodeMcu send all this information real-time on Blynk server we already set all sensor threshold value by studying and checking environmental parameter if any sensor reading exceeds threshold value it sends an alert message to concern person IoT Application and trigger buzzer also it turns on water motor for extinguishing a fire.



Fig. 8: Output on IoT Application

Fig. 2 shows the user interface of IoT application have to separate gauge for shows real-time the sensor value another gauge for showing status of flame sensor. Other two are notification widgets one for sending an alert notification and other for sending email notification to the concerned person.

V. CONCLUSION

On our system, we read three different parameters for detecting fire these three parameters are flame, smoke, and temperature this will helps to improve the accuracy of detecting fire. It will help to detect fire detection on any condition more accurately and fast.

As most of the fire detection systems sense any one parameter for detecting fire and there is a chance to take more time for detection of fire until that sensor particular parameter does not exceed above the threshold value. So we try to overcome this issue by sensing different parameters for this reason we interface different parameters for sensing detection of fire.

Also, this system is based on IoT technologies so real-time sensor data and alert messages send to the concerned person so our system detects fire faster and accurately.

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