

Effective System for Forest Fire Detection with Alert Mechanism using IoT

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ABSTRACT

Forest fire is a real threat to human lives, ecological systems, and infrastructures. It has been founded in a survey that 80% of losses caused due to fire would have been avoided if the fire was detected immediately. There are several commercial fire detection devices, but they are all hard to use in big open areas such as forests due to their delay in reaction. In the paper, created a Raspberry pi platform based IoT enabled fire detection & monitoring system to overcome the problem. In this project, we have built a fire detector using Raspberry-pi which is interfaced with a temperature sensor, fire sensor, PIR sensor. The temperature sensor senses the temperature and heat sensor sense the heat of burning fire and makes an alarm connected with Raspberry-pi. PIR sensor senses the object surrounding the fire and also introduced the LCD to Raspberry-pi with help of "IoT Technology". We have tried to smatter by connecting the whole monitoring process.

Keywords : SNS (Simple Notification Service), IoT Technology, Raspberry Pi 2, Passive InfraRed, Resistance Temperature Detector

I. INTRODUCTION

Owing to a paradigm shift toward the Internet of Things (IoT), researches into IoT things has been conducted in a wide range of fields. As a major application of the field of IoT, Forest fire detection has become one big issue in the current generation. The forest fire caused one of the big problems in the flora and fauna. In this 21st generation many turbulent global economic, demographic, social and ecological context, government, local administrative authorities, and commercial companies have to recognize the importance of the resources contained in the forest environment – not only for the perspective of the biodiversity, but also the from the point of economic resources which forest enclose.

One of the most dangerous phenomena, which Amazon Forest, is represented by forest fires. A forest fire has proven to be a massive form of destruction for humankind, especially when not countered through appropriate measures and strategies. Recently, Amazon forest fire is one of the big and most terrific events in 2k19, Amazon Forest gives 50% of the pure form of an Oxygen over the world. Hundreds of millions of hectares and destroyed by wildfires each year and over 2,00,000 forest fires happen every year in the world.

Therefore, an IoT – based Forest Fire detection system is proposed to detect the fire by monitoring the values of CO2 level and temperature. In this project, we have built a fire detector using R Raspberry - pi which is interfaced with the temperature sensor, fire sensor. The temperature

sensor senses the temperature and the fire sensor senses the fire and it has a buffer default with it so it connected with the raspberry – pi gives an alarm indication. Whenever fire occurred, it burns an object near it produces smoke. In this project, we have built a fire detector using Raspberry-pi which is interfaced with the temperature sensor, fire sensor. We have also combined with LCD to the Raspberry-pi platform. With the help of IoT technology.

II. SYSTEM IMPLEMENTATION

2.1 Architecture

An architecture of a Smart IoT based system for forest fire detection with an effective alert mechanism is shown in Fig 2.1. Forest Fire sensed using the Raspberry-pi which is connected with the breadboard which in turn is connected with the cloud server module. The Raspberry-pi code is remotely connected to the cloud using Python/Scratch code. This enables a secure connection with the Raspberry-pi. Data that is received for the threshold value. If it is greater than the threshold value then it is noticed to the users by providing SNS.

Following components are needed for smart IoT based system for forest fire detection with effective alert mechanism,

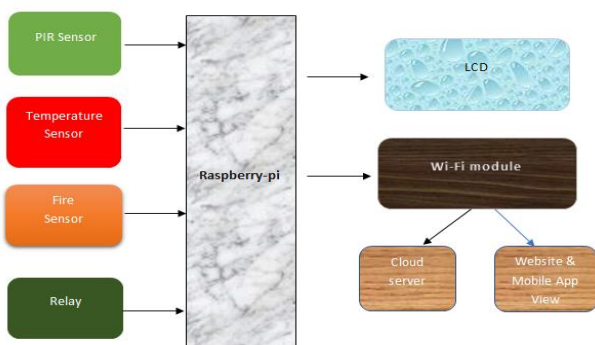


Figure 1. An architecture of smart IoT based system for Forest Fire detection with effective alert mechanism.

2.1.1 Raspberry-Pi 2 Model B

The Raspberry Pi is an inexpensive, credit-card sized computer that connects into the monitor of a computer or TV, and uses a standard keyboard and mouse. It is a liable device that enables people of all ages to explore computing and to gain an understanding of how to program in languages like Python and Scratch.

Raspberry Pi 2 Model B is the next generation of Raspberry Pi. It is a replacement for the original Raspberry pi 1 Model B+ in Feb 2015. It has A 900 MHz quad-core ARM cortex-A7 CPU 1GB RAM as compared to Raspberry-Pi model 1.

Raspberry-Pi is a dynamic microcontroller that is capable of just about anything like a computer. It runs with the Python, Scratch programming language, and it can connect with Ethernet. Which helps to store the sensed information.

2.1.2 PIR Sensor

PIR (Passive InfraRed), is an electronic sensor that measures infrared (IR) light radiating from objects in its field of view. They are most often used in PIR-based motion detectors. PIR sensors are commonly used in security alarms and automatic lighting applications. PIR sensor detects the general movement, but not give information on who or what moved. The plastic window covering may have multiple facets molded into it, to focus the infrared energy onto the sensor. Each facet is a “Fresnel Lens”.

2.1.3 Temperature Sensor

Temperature Sensor is a device, usually an RTD (Resistance Temperature Detector) or a thermocouple, that collects the data about temperature from a particular source and converts the data into an understandable form for a device or an observer. Temperature Sensor uses a thermistor to sense the atmospheric temperature. The detectable

range of temperature sensors is -40 to 125°C, and the accuracy is -1.5 to 1.5°C.

2.1.4 Fire Sensor

A fire sensor is a sensor designed to detect and respond to the response of a fire or flame, allowing fire detection. Responses to detect the fire depend on the installation but can include sounding an alarm, deactivating a fuel line (such as propane or a natural gas line), and activating a fire suppression system. Heat detector has two main classification of operation, "rate-of-rise" and "fixed temperature". It is triggered when the temperature increases.

2.1.5 Relay

A relay is an electromagnetic switch that is used to turn on and turn off a circuit by a low power signal, or where several circuits must be controlled by one signal.

2.1.6 Wi-Fi Module

The ESP8266 Wi-Fi Module is a self-contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your Wi-Fi network. The ESP8266 is capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor.

2.1.7 Cloud server

Cloud server means a virtual server that runs on a cloud computing platform over the internet. A web hosting service is a type of Internet hosting service that allows the user to make their website accessible via the internet. Cloud servers possess and exhibit similar functionalities to a typical server but are accessed remotely from a cloud service provider.

III. CONCLUSION

It is implementing a system for early detection of forest fires with a collection of temperature sensors placed at different places in the forest. Because the

burning of forest trees increases the content in the atmosphere which in turn global warming. The collected data passed to Raspberry-Pi is well programmed using Python to send the pieces of information to the secure server. The server collects all the information and store the data for further analysis. There is an effective alert system that gives alerts to the authorities through SMS at biased conditions.

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