IoT Based Forest Fire Detection System Using Raspberry PI and GSM

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Abstract: *Internet of things (IoT) is the network of entities that consists of electronics, programmable software, sensors, and communication facility that enables these entities to gather and transfer data. Raspberry pi Microcontroller based IOT platform detects the forest fire as early as possible and takes speedy action before the fire spreads over large area. Sensors such as smoke sensors is connected with Raspberry Pi. GSM modem connected with Raspberry Pi alerts the forest monitoring control room.*

Keywords: Raspberry Pi, IoT, GSM, Fire detection, Sprinkler motor, Sensors, Motor.

I. INTRODUCTION

1.1 General

Fire is one of the most fateful threaten for mankind. Fire can be determined by light, smoke and temperature. We may resort to power failure, water spraying for alarming. However fire alarm is still a difficult problem for large space. Because there are many factors such as the height of the space, the heat barrier, the coverage, the signal transmission and so, it is difficult to control.

To detect fire, only using colour information may produce false so colour and temporal variation information should be used to get good performance of the fire detection system. Sensors are used to measure the desired parameters in most of the methods. In this project, IOT based early warning fire detection framework senses the fire as quickly as possible and save valuable lives. Detection of fire based on colour information results in false prediction. Here flame and flame coloured objects were distinguished based on colour and motion features. Raspberry Pi is used because of its high processing speed at low cost. Several sensors are used to collect the data and these data's were transferred to Raspberry Pi. GSM module alerts the fire monitoring station through SMS.
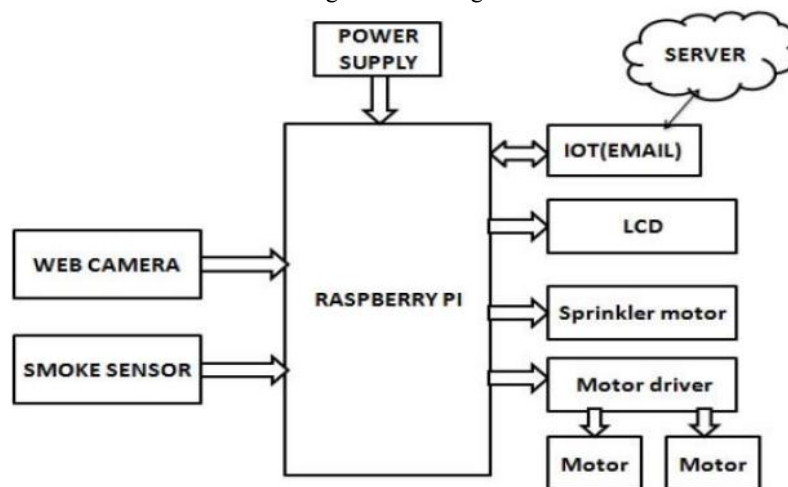

Figure 1.1: Block Diagram

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1.2 Working

In this IoT based forest fire detection using raspberry PI and GSM we have used raspberry pi, power supply, LCD camera, smoke sensor, sprinkler motor. Iot describes a system that uses wireless and wired internet connection different things in the physical world together with the sensors through the internet in which things in the physical world and sensors are connected to the Internet. Diverse local area networks like RFID, NFC, Wi-Fi, Bluetooth, and Zigbee can be exploited by these sensors. Also sensors can be interconnected to GSM, GPRS, 3G, and LTE wide area networks.

In IoT, understand the output signal from the sensor, since the mobile network support the connection of smart devices better quality of service offered to the customer will be achieved by IoT.

In this IoT based forest fire detection system using raspberry PI and GSM fire detection framework senses the fire as quickly as possible and save valuable lives. Detection of fire based on color information results in false prediction. Here flame and flame colored objects were distinguished based on color and motion features. Raspberry Pi is used because of its high processing speed at low cost. Several sensors are used to collect the data and these data's were transferred to Raspberry Pi. GSM module alerts the fire monitoring station through SMS.
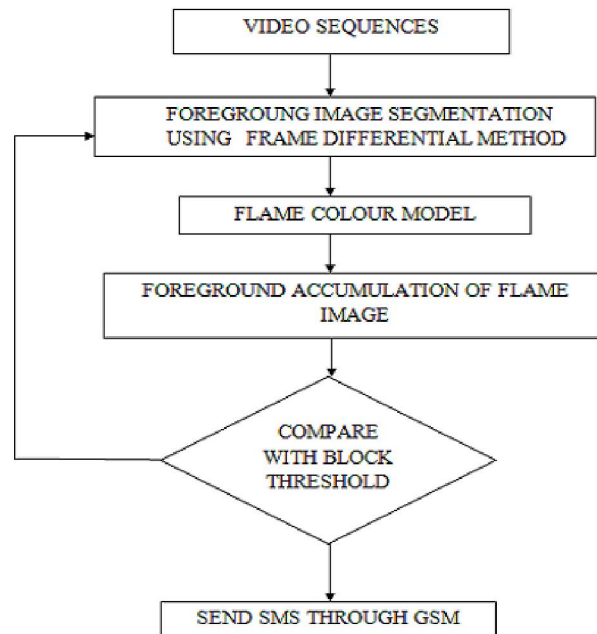

Figure 1.2: Working Diagram

1.3 Literature Review

In this chapter, we have discussed Iot based forest fire detection system using raspberry pi and GSM. Nearly 30% of world's land area has been covered by forest which accounts for nearly four billion hectares. Due to the dense nature of forest, unseen condition fire can spread over large area rapidly spoils the entire ecological system and endangers wild animal. This fire causes greater havoc in the environment. In this iot based forest fire and early detection system using raspberry pi and gsm.

- Every year, thousands of forest fires across the globe cause disasters beyond measure and description. This issue has been the research interest for many years; there are a huge amount of very well studied solutions available out there for testing or even ready for use to resolve this problem.
- Apart from causing tragic loss of lives and valuable natural and individual properties including thousands of hectares of forest and hundreds of houses, fires are a great menace to ecologically healthy grown forests and protection of the Nearly 30% of world's land area has been covered by forest which accounts for nearly four

billion hectares. Due to the dense nature of forest, unseen condition fire can spread over large area rapidly spoils the entire ecological system and endangers wild animal. This fire causes greater havoc in the environment. Recently forest fire occurs frequently due to the drought conditions. Fire in the world is increasing in recent time's environment.

According to National Institute of Space Research (INPE) 76,000 fires were happened in Brazilian Amazon. During January-October 2019 nearly 906,000 hectares of land were burnt completely. Destruction had occurred within short interval of time. Due to the feeding of fuel by ignitable materials, the fire at the central spot has increased drastically and spreads faster over large areas. Therefore timely detection of forest fire is necessary before the fire spreads over large area. A cost effective fire fighting and monitoring system is essential.

II. PROPOSED SYSTEM

This proposed system has Raspberry pi, web camera smoke sensor, power supply, sprinkler motor, motor driver, and motor in it. This system has camera for sending frames to controller. Image processing is detected by based on flame detection method. Color model is obtained and which is used to satisfy the condition.

- In this system block image processing is used identify the flame motion. In this system half of the whole pixel values will be considered as the flame block. And after the flame is detected in the system the mail is send to the nearest fire department through the GSM module.
- And after the sensor detected the fire which is used to spread the fire over to the nearest area were the fire is caused.

2.1 Raspberry PI
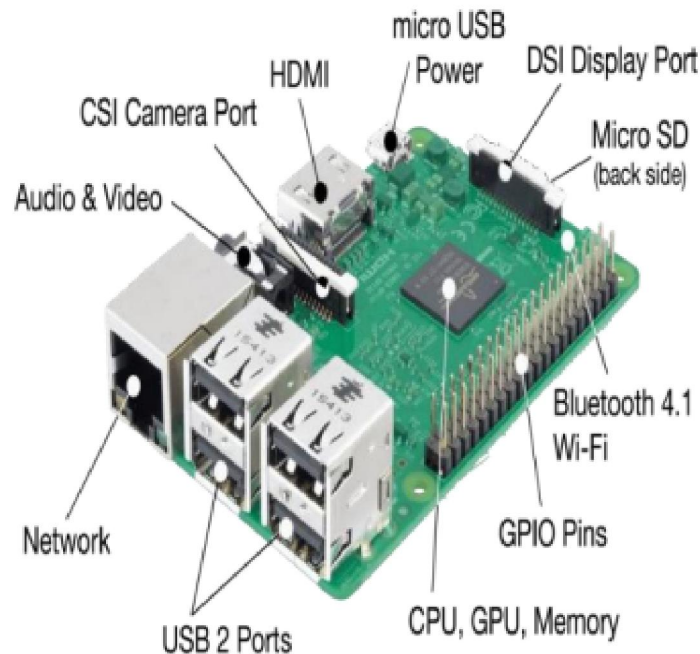
Figure 2: Raspberry Pi Module

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2.2 Python Programming Language

Python is an interpreted high-level programming language for general-purpose programming. Python has a design philosophy that emphasizes code readability, notably using significant whitespace. It provides constructs that enable clear programming on both small and large scales.

III. CONCLUSION

3.1 Conclusion

In this paper early warning and fire detection system for forest fire on IoT platform is presented to detect the fire at the early stage and prototype was developed. Furthermore the proposed platform also provides a very prompt and cheaper embedded system to detect true incident of fire. GSM module automatically sends SMS to alert the control room. In future work encryption of data for security purpose should be added.

3.2 Future Scope

Fire accidents can be controlled to a great extent in a places such as forests, homes colleges, industries, trains and some other places and fire accidents leads to death of excess of people by using this technique we can save lives easily.

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