Automated Fire Detection Surveillance System

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Abstract - A Fire Detection System is number of devices working together to detect and warn people through visual and audio appliances when smoke, fire, carbon monoxide or other emergencies are present. Development of automatic and intelligent video surveillance systems has been the core trend in the security and guard service industry. By observing and utilizing features of fire event, a fast and exact detection process is developed for early fire warning purpose thus to reduce the loss caused by fire accidents. The proposed Fire alarm system is a real-time monitoring system that detects the presence of fire and captures images via a camera installed inside a room when a fire occurs. The embedded system used to develop this fire alarm system is Raspberry Pi. The key feature of the system is the ability to remotely send an alert when a fire is detected. When the presence of fire is detected, a notification is sent through GCM to a custom app along with a URL of the webpage containing images of fire captured by the installed camera. The system will display an image of the room state in a webpage. The advantage of using this system is it will reduce the possibility of false alert reported to the administrator. The camera will only capture an image, so this system will consume a little storage and power.

Keywords - Raspberry Pi, IR Flame Sensor, Web Camera, GCM, Fire

I. INTRODUCTION

Fire is an undesirable event that could bring a great loss of social wealth and human life. To prevent these losses, various alarm systems have been developed such as smoke detectors, temperature sensor based systems etc. As technologies evolved and instruments such as temperature sensors, camera etc. became affordable, various automated fire alarm systems are now available. In conjunction with the cheaper instruments, internet based and wireless broadband technologies, have also improved and there are now various systems that enables cheap, high rate data transmission and wireless networking [1].

The availability of cheap credit card sized single board computer such as the Raspberry Pi has enabled the creation of numerous automated and monitoring system that has low power consumption, faster processing ability at a lower cost. The fire detection system proposed in this project integrates the use of affordable instruments, connectivity and wireless communication [1].

Automated security surveillance systems play an important role in providing an extra layer of security to the existing surveillance systems. High-speed data transmission and wireless networking are the common facilities available on an intelligent building or smart home. These facilities together with a camera for remote monitoring can be effectively utilized to build an event based real-time wireless security surveillance system to monitor different state information inside a building [2].

We use infrared flame sensors for the detection of fire. When fire occurs near the region of the sensor, the IR rays of the sensor detects it and the digital pin attached to it goes high and informs the Raspberry Pi board. The program coded within the Pi board executes the next steps of notifying the admin.
II. LITERATURE SURVEY

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 environment. 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[6].

In [1], author Md Saifudaullah Bin Bahrudin et.al discusses a real-time monitoring system that detects the presence of smoke in the air due to fire and captures images via a camera installed inside a room when a fire occurs. The embedded systems used to develop this fire alarm system are Raspberry Pi and Arduino Uno. The key feature of the system is the ability to remotely send an alert when a fire is detected. When the presence of smoke is detected, the system will display an image of the room state in a web page. The system will need the user confirmation to report the event to the Fire-fighter using Short Message Service (SMS).

In [2], author V. Rakesh et.al discusses the implementation of an embedded system for monitoring wireless sensor nodes and camera installed inside a building for security surveillance. Remote alerting on fire and intruder detection are the key features of the system. When smoke or intruder movement is detected, the system sends warning messages through Short Message Service (SMS) to cell phones, starts capturing real-time video for fixed duration and makes the alarm on. The captured video clip is immediately uploaded to an FTP (File Transfer Protocol) web server so that it can be retrieved later from anywhere around the world.

In [3], author Sarthak Jain et.al discusses the design of a basic home automation application on raspberry pi through reading the subject of E-mail and the algorithm for the same has been developed in python environment which is the default programming environment provided by Raspberry pi.

In [4], author Sudhir G. Nikhade discusses wireless sensor network system that has been developed using open source hardware platforms, Raspberry pi and Zigbee. The system is low cost, low power consuming and highly scalable both in terms of the type of sensors and number of sensor nodes which makes it well suited for wide variety of applications related to environmental monitoring.

In [5], author Ms. Sejal V et.al explains the Raspberry Pi board, its features and uses. Uplifts the convenient use of single-board computers today.

In [7], author Liyang Yu, et.al proposed forest fire detection system consists of a vast amount of inexpensive and small sensor nodes. Compared with the satellite imagery based approach, our design can detect forest fire more promptly and forecast the forest fire danger rate accurately.

III. SYSTEM ANALYSIS

A. Existing System

A smoke detector is a device that senses smoke, typically as an indicator of fire. Fire alarm system known as smoke alarms, generally issue a local audible or visual alarm on detection of smoke. Generally, fire alarm consists of smoke detectors with a basic assumption that smoke will be generated by the fire. If we detect smoke, then the fire is detected. Even if there is any fire, the
smoke may be generated quite later after burning the surroundings. For some fires, smoke may not be generated or it takes long time for the smoke detectors to detect the smoke.

Limitations of the Existing System:

1. Only after detection of smoke, the fire is detected.
2. Even if there is any fire, the smoke may be generated quite later after burning the surroundings. For some fires, smoke may not be generated.
3. It takes long time for the smoke detectors to detect the smoke.
4. Surrounding materials will be burnt till the next precautionary measure is taken.

B. Problem Statement

The solution for the problems stated above is to develop a new fire alarm system that alerts the user instantly using GCM push notification, when fire occurs and provide the captured images of surrounding environment to avoid false alarms. The purpose of this study is to implement a fire alarm system using a cheaper single-board computer, the Raspberry Pi and the use of high level programming languages to write the program.

C. Proposed System

A Fire Detection System is number of devices working together to detect and warn people through visual and audio appliances when smoke, fire, carbon monoxide or other emergencies are present. The proposed fire detection system is a real-time monitoring system that detects the presence of fire and captures images via a web camera installed inside a room when a fire occurs. The proposed system is planned to use Raspberry pi. An IR flame sensor and web camera is connected to Raspberry pi. The figure.1. Shows the use case diagram of the fire detection system

Steps to followed by fire detection system
• When fire occurs near the region of the sensor, the IR flame sensor has to detect it.
• The digital pin attached to it has to go high and inform the Raspberry Pi board.
• The Raspberry Pi in turn has to inform the web camera to capture images of the surrounding environment.
• The program coded within the Pi board has to execute the next steps of notifying the admin using GCM push notification along with the captured images.

IV. CONCLUSION

This survey presented the development of a fire alarm system using the Raspberry Pi. Our proposed fire alarm system uses an efficient fire detection technique. The prototype has to be designed to enable verification that a fire actually occurred. The fire alarm system has to warn the user by sending an alert along with the captured images of the surrounding environment. The captured images have to help in preventing false alarm. The proposed system is planned to use low cost, reliable instruments.

REFERENCES