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Video Processing based fire detection and extinguisher system with GSM interface

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Abstract- Nowadays the cases of fire accidents are happening in commercial, industrial, house hold, small scale factories, cracker industries, warehouses and even forests. The cases of fire are more frequent nowadays. A fire outbreak is a major tragedy that must be avoided by every possible means due to the potential loss of lives and property, fire when not controlled can grow large and may require days to bring under control. To avoid such worse scenario this project can be applied to minimize or even eliminate this great hazard. Like floods and earthquakes, fire causes great loss to people's lives and property. The effective way to reduce this disaster is to take active precautions against fire. However, if a fire takes place, it should be detected and extinguished as soon as possible. Today image/video processing is used in various techniques, the implementation of image processing operations on Raspberry Pi. We are trying to implement a prototype project which can not only detect fire but will also take some controlling actions like turning on the pumps for water supply. And any such case is directly notified to the user about fire using SMS notification. This is an image processing based fire detection and extinguisher system using Raspberry Pi.
It is basically the system is divided into two parts:

1. Fire detection
2. Fire alert notification and extinguisher.

Hence our project 'Video processing based fire detection and extinguisher with GSM module is developed'.

Index Terms-Fire detection, detection system, wireless sensor based fire, area, fire, method, access processing

I. OVERVIEW

Fires represent a constant threat to ecological systems, infrastructure and human lives. Past has witnessed multiple instances of fires. With the faster and faster urbanization process, more and more high-rise buildings appear around us. This also can make the frequency of fire increase and bring great losses to people's lives and property. In areas where fire would pose an unreasonable threat to property, human life or important biological communities, efforts should be made to reduce dangers of fire. As the damage caused by fires is so tremendous that the early fire detection is becoming more and more important. Nowadays we are frequently observing the rate of fire accidents happening around the globe.

Accidental fires are occurring everywhere. Earlier it was just limited to house, or some industries.

But now such cases are happening in commercial, industrial, house hold, small scale factories, and even forests. The cases of fire are more frequent nowadays.

Like floods and earthquakes, fire may cause great losses to people's lives and property. The effective way to reduce this disaster is to take active precautions against fire. However, if a fire takes place, it should be detected and

extinguished as soon as possible. Smoke, gas, heat and flame are four principal physical parameters generated in fire, therefore, fire can be detected and identified through collecting and analyzing these parameters. The flame generated in early-stage fire (hereinafter referred to as fire flame) features flaming area widening, fire edge wobbling and strong infrared radiation. However, the fire detectors commonly used at present are not designed with these characteristics, so some problems still remain with the detectors regarding sensitivity and noise immunity. With the characteristics fully in consideration, we have devised a new system of fire image /video characteristic extraction and identification. Plenty of experiments and field tests have proved that this new system has such advantages as long distance, large detection range and high level of intelligence and visualization.

II. HISTORY

Traditional fire protection methods use mechanical devices or humans to monitor the surroundings. The most frequently used fire smoke detection techniques are usually based on particle sampling, temperature sampling, and air transparency testing. An alarm is not raised unless the particles reach the sensors and activate them. Some of the methods are mentioned below:

A. Fire Watch Tower

In watch towers human are made to observe the location throughout. If any fire occurs he reports it. However, accurate human observation may be limited by operator fatigue, time of day, time of year, and geographic location. In a wireless sensor-based fire detection system, coverage of large areas in forest is impractical due to the requirement of regular distribution of sensors in close proximity and also battery charge is a big challenge.

B. Wireless Sensor Networks

In a wireless sensor-based fire detection system, coverage of large areas in forest is impractical due to the requirement of regular distribution of sensors in close proximity and also battery charge is a big challenge.

C. Satellite and Aerial

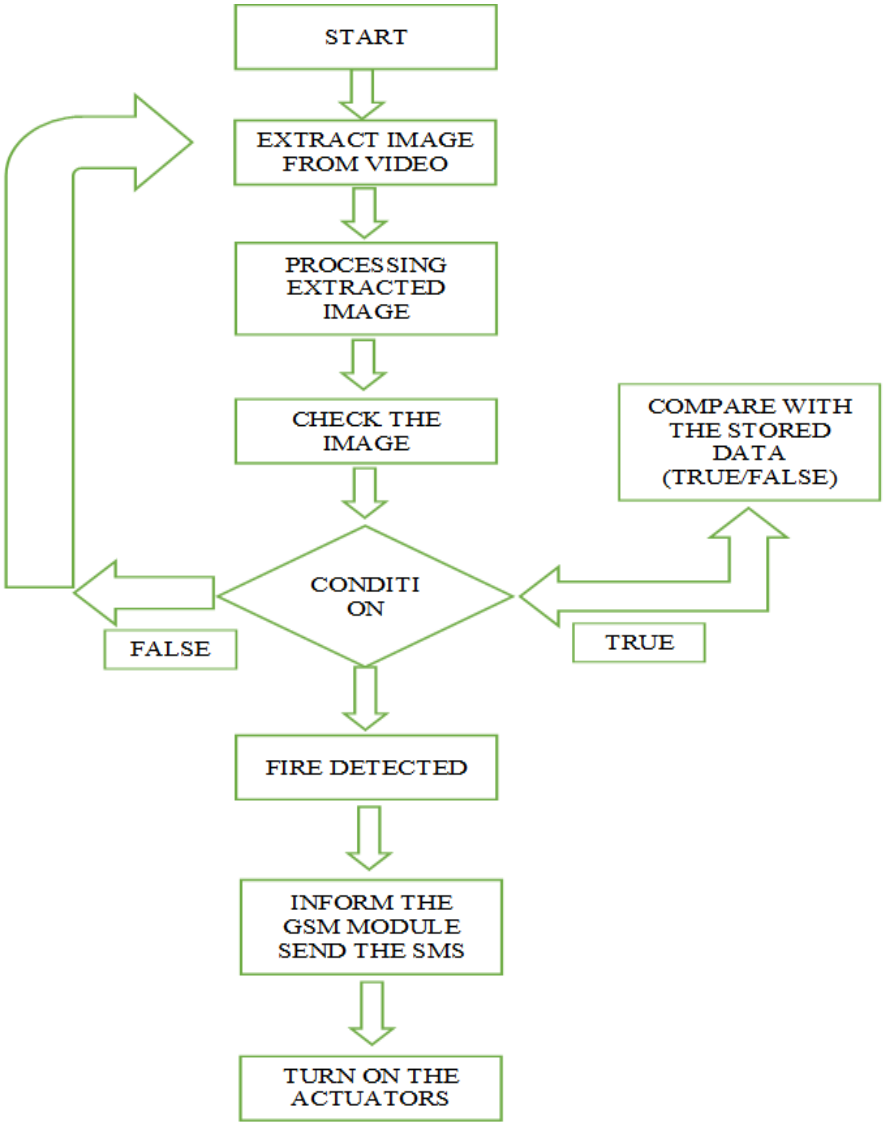
Monitoring Satellites based system can monitor a large area, but the resolution of satellite imagery is low. A fire is detected when it has grown quite a lot, so real time detection cannot be provided. Moreover, these systems are very expensive. Weather condition (e.g. clouds) will seriously decrease the accuracy of satellite-based forest fire detection as the limitations led by the long scanning period and low resolution of satellites.

D. Image processing methods

The motivation for an image processing based approach is due to rapid growth of the electronics. Fire detection systems are one of the most important components in surveillance systems used to monitor buildings and environment as part of an early warning mechanism that reports preferably the start of fire. Currently, almost all fire detection systems use built-in sensors that primarily depend on the reliability and the positional distribution of the sensors. The sensors should be distributed densely for a high precision fire detector system. In a sensor-based

fire detection system, coverage of large areas in outdoor applications is impractical due to the requirement of regular distribution of sensors in close proximity. Due to the rapid developments in digital camera technology and video processing techniques, there is a big trend to replace conventional fire detection techniques with computer vision-based systems.

III. FLOW CHART



IV. IMAGE PROCESSING

Image before colour detection

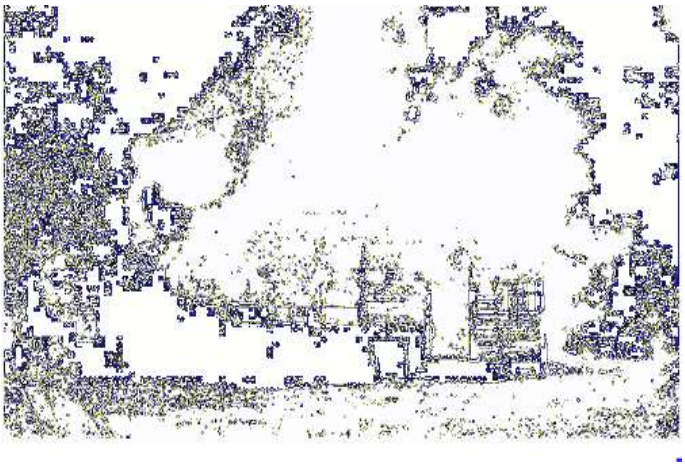


Image after colour detection

V. CONCLUSION

A fire outbreak is a major tragedy that must be avoided by every possible means due to the potential loss of lives and property, fire when not controlled can grow large and may require days to bring under control. To avoid such worse scenario this project can be applied to minimize or even eliminate this great hazard. Traditional fire protection methods use mechanical devices or humans to monitor the surroundings, which cannot be a highly reliable and secure medium. Hence our project video processing based fire detection and extinguisher with GSM module is developed.

VI. FUTURE SCOPE

1. For further accuracy use of Neural Networks for decision making.
2. Robots can be incorporated in this project
3. Use of cloud computing can be used to access the database

Further the detecting algorithms can be improved for better accuracy

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