Retraction

Retraction: Fire Detection System Using Machine Learning
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This article (and all articles in the proceedings volume relating to the same conference) has been retracted by IOP Publishing following an extensive investigation in line with the COPE guidelines. This investigation has uncovered evidence of systematic manipulation of the publication process and considerable citation manipulation.

IOP Publishing respectfully requests that readers consider all work within this volume potentially unreliable, as the volume has not been through a credible peer review process.

IOP Publishing regrets that our usual quality checks did not identify these issues before publication, and have since put additional measures in place to try to prevent these issues from reoccurring. IOP Publishing wishes to credit anonymous whistleblowers and the Problematic Paper Screener [1] for bringing some of the above issues to our attention, prompting us to investigate further.

[1] Cabanac G, Labbé C and Magazinov A 2021 arXiv:2107.06751v1

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Fire Detection System Using Machine Learning

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Abstract. The modern age of electronics has seen a lot of development. But the development of electrical and electronic devices has led to a growing rate of fire accidents mainly due to the carelessness. The main problem in the fire accidents is that they are not being able to detect the fire as early as possible. By the time we detect the fire it becomes difficult to safely evacuate all or even reduce the damage caused. Our aim is to detect the fire as early as possible. The main objective is to detect the fire as early as possible. This can be attained by capturing the fire and motions of the spreading fire by using CCTV system and processing it to produce an alert. The processed image is compared with the pre fed image using ML and checked for fire accident. If the processed image matches the pre fed image then an alert message along with a buzzer is enabled. In simple word, this fire monitoring system is an addition to the existing CCTV cameras to detect the fire effectively.

Keywords: CCTV footage- fire detection- processing the image- Check with the dataset fed inside-extinguishing system-machine learning algorithms

1. INTRODUCTION
In the modern electrical era fire accidents have become an regular happening. There has been a lot of machines and systems built to detect the fire and to protect the people and avoid the damage to the surroundings. The main objective of this innovation is to protect the people during these situations. It is an add-on provision to the existing traditional CCTV system. This provision warns the public immediately by a buzzer and also has an in-built fire extinguisher. It creates an opportunity to stop the fire as early as possible using Image processing. Also, we have an extinguisher that might come handy [1].

The data set consists of many images of fire accidents taken place. If any of these pre-defined fire images are found matching in the CCTV it sends a notification via an LCD display or can use any of the extinguishing methods. Hence, this system is used to track the fire accident as early as possible and also alert the inmates of a building as early as possible [2].

1.1 EXISTING METHODS

- CCTV system:

Can’t detect fire: Cameras are used to record footage for watching later, and to help to find the reason for the accident. But they cannot stop a fire accident when it is happening. They do not alert the
police nor the public with an alarm system. Also, we may face storage issues or bad quality of image. Even if we spend thousands of rupees for higher resolution and frame storage [3].

**Fire detection using smoke sensors:**

Not effective: Smoke sensors are used to get the amount of smoke produced by the fire. If the smoke goes beyond a threshold value then we can know that a fire accident has occurred. Also, we cannot detect the fire immediately. So this might lead to a lot of damage and human loss. To reach the threshold set to the smoke sensors it takes a lot of time and they are not cost efficient. These sensors have to be established all over the buildings and is costly [4]

All these drawbacks of the existing systems lead us to the initialization of this monitoring system which can detect fires as early as possible.

2. FIRE MONITORING SYSTEM

The existing methods in the fire prevention and control have a lot of drawbacks and hence to avoid all those drawbacks we are forced to design a new system that has a minimum number of flaws and maximum no of efficiency. As we all know that the CCTV cameras are found almost everywhere. Incorporating the image captured by the CCTV we can process the image using various methods and hence in case of any fire we can alert everyone as early as possible and even extinguish the fire [5].

A recent survey has clearly stated that most of the fire accidents could have been prevented. In most of the areas of fire accidents we have CCTV cameras installed. But they are present for monitoring theft and so on. So by using this to detect the fire could be an easy method to detect the fire [6]

2.1 PROPOSED SYSTEM

The proposed method consists of using the CCTV camera captured video and use that video to detect fire efficiently in next to no time. This is done by using the CCTV camera which is connected to Raspberry-pi which is a mini computer itself. The camera captures the video of a particular location constantly. The video is processed frame by frame at an instant. In case of any fire detection during the processing the buzzer is switched on and the buzzer rings until the fire is detected. Once the fire is extinguished then the buzzer is switched off. The system is also connected to a water extinguisher. The water extinguisher pumps the water to extinguish the fire [7].

In this project we use the VNC viewer in windows to make the execution easy. As previously mentioned the Raspberry-pi is a mini computer, the Virtual Network Computing is used to share the contents of raspberry-pi to the viewing computer. The viewing computers mouse and keyboard can be used to access the coding and execute the program [8].

![Figure 1. Outline of the components](image)

The monitoring system consists of a Detection module, Alert module, Extinguisher module, software part and Network connection part. Figure 1 shows Outline of the components.
2.1.1 VNC VIEWER

The VNC acts as a screen sharer or a network sharer between two computers or two mini computers. This acts as interface between the user and the system. This enables the user to access the files and contents in one computer by virtually connecting it to another computer. In our system the Raspberry-Pi act as a mini computer and our laptops act as the main system. In our project the VNC viewer is used. This is used because this enables easy access of the raspberry-pi which in other cases becomes very much complicated. Figure 2 shows VNC Viewer

![VNC Viewer](image)

Figure 2. VNC Viewer

In the VNC we give the IP address of the particular computer and then we enable an connection with other computers. Once the connection is established we can access the files present in the other computer with the help of the input devices of the main computer. This part acts as a regular display of the output. It displays no fire when the normal conditions occur. If a fire is detected then Fire detected is displayed in the screen.

2.1.2 DETECTION MODULE

This module consists of an camera. This is used to capture the video. The captured video is processed frame by frame. Thus this is the most important module of the entire system. In case of fire the recorded image which is processed frame by frame is checked for fire. We set a threshold for the fire image brightness detection which is less than 2000. When the processed image produces a brightness more than 2000 and also matches the dataset images present in the input dataset then we can be sure that a fire is detected. Figure 3 shows Detection Module

![Detection Module](image)

Figure 3. Detection Module
2.1.3 ALERT MODULE

This module consists of a Buzzer which is turned on when a fire is detected. This module is used to alert the people in the particular building that a fire has occurred. This module works on the fact that once a fire is detected the raspberry-pi sends a signal to the buzzer module that switches the buzzer on. The buzzer is switched on until the fire is present. This module also consists of electric motor. This motor pumps water to an area when the fire is detected. This is the same time when buzzer is switched on. Figure 4 shows the Alert Module

![Alert Module](image)

2.1.4 SOFTWARE MODULE:

This module is the module where we can write, edit and then save and dump the code into the mini computer. This module in our project contains one main program and 3 sub programs. The main program contains the library cv which is used in image processing. The main program contains all the function calls to all the sub programs. The openCv algorithm is used in image processing.

The code is written in python. The python is a user friendly as well as one of the most celebrated languages in the world. This language has a lot of inbuilt function which enable the easy processing of each frame and is also very fast. The video is captured in the CCTV camera with the help of VideoCapture function. To check if the image is captured we use the Grabbed function. The grabbed video is processed. Then we check the video for fire. In the cv algorithm we collect the image details based on 3 colours red, green, blue. If the value of red is more than 2000 we can get that a fire has occurred. So this is the methodology used in the software Module.

3. DEPENDENCY

The system mainly depends on the fact that the camera used should be of high resolution. If the camera used is of low resolution, then even if a high lighting is found in a particular area there is high chance of considering it as a fire. Thus the camera used should have high resolution as well as cost efficient. Also the efficiency of the motor to pump water is directly proportional to the efficiency of detection of the fire. Also the motor can pump the water only to a certain extent. So for efficiency more electric motors have to be installed.

4. OUTPUT

The output of the system is obtained clearly in the system monitor using the VNC viewer. We can get the system output as well as the buzzer output. Figure 5 shows the Output when no fire is detected.
If the fire is detected in a particular frame, we can clearly see the increase in the color of red and hence the monitor shows that the fire is detected and a buzzer is turned on. As said earlier the camera quality plays a major role. If the camera is of a low quality then the fire will be detected even for a high beam of light. Hence we check for a threshold of 2000 for red light. If the threshold is reached we can confirm that a fire has occurred. Thus this an effective system to monitor buildings to prevent fire accidents. Figure 6 shows the Detection of fire.

Figure 5. Output when no fire is detected.

Figure 6. Detection of fire.

5. Conclusion

According to lots of survey’s taken many fire accidents could have been prevented. So as “Prevention is better than Cure” we should design mechanisms that detect the fire before it has happened. As such a machine is not practically viable we can create a system that detects the fire as early as possible. Thus detecting the fire as early as possible gives us the possibility to prevent damage to property as well as life. And this system also has electric motors attached to it, which helps to extinguish the fire as early as possible. This system is also a part of smart buildings. As there is no need to add external elements to the system it is practically implementable as well as cost efficient. ML in python is a major field that is improving so we can make further improvements to the system in the near future as well. This system is a efficient way to deal with the fire accident problems in the modern electrical era.

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