Forest Fire Accident Detection and Prevention Using Image Processing

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Abstract **- Forest fires represent a real threat to human lives, ecological systems, and infrastructure. Many commercial fire detection sensor systems exist, but all of them are difficult to apply at large open spaces like forests because of their response delay, necessary maintenance needed, high cost, and other problems. In this paper a forest fire detection algorithm is proposed, and it consists of the following stages. Firstly, background subtraction is applied to movement containing region detection. Secondly, converting the segmented moving regions from RGB to YCbCr color space and applying five fire detection rules for separating candidate fire pixels were undertaken. Finally, temporal variation is then employed to differentiate between fire and fire-color objects. The proposed method is tested using data set consisting of 6 videos collected from Internet. The final results show that the proposed method achieves up to 96.63% of true detection rates. These results indicate that the proposed method is accurate and can be used in automatic forest fire-alarm systems.**

Index Terms**-Arduino Nano, Anaconda.**

I. INTRODUCTION

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 offire. As the damage caused by fires is so tremendous that the early fire detection is becoming more and more important. Recently, some fire detectors have been used in many places, they used the smoke, temperature and photosensitive characteristics to detect fires. But they are too worse to meet the needs in a large space, harshenvironment or the outdoor environment etc. The motivation for an image processing based approach is due to rapid growth of theelectronics. 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.

II. LITERATURE SURVEY

In Paulo Vinicius Koerich Borges, and Ebroul Izquierdo, proposed a new identification metric based on colour for fire detection in videos. Also identified important visual features of fire, like boundary roughness and skewness of the fire pixel distribution. The skewness is a very useful descriptor as the frequent occurrence of saturation in the red channel of fire regions is identified. While comparing with other methods which extract complicated features, the features discussed here allow very fast processing, making the system applicable not only for real time fire detection, but also for video retrieval in news contents, which requirefaster than real-time analysis. In Osman Gunay, Behçet Ugur Toreyin, Kivanc Kose, and A. Enis Cetin, an EADF is proposed for image analysis. In this work assumed that several sub algorithms are combined to get the main algorithm for a specific application. Each of the sub algorithm yields its own decision to representing its confidence level. Decision values are combined with weights, updated online by using nonorthogonal e-projections onto convex sets describing sub algorithms. This framework is applied to a real time problem of wildfire detection.

III METHODOLOGY

In this proposed system instead of analyzing characteristics parameters of fire i.e color, area, motion, smoke individually, all the parameters are examined simultaneously to reduce the false alarm rates which was present in a previous detection systems. The main part of this system is the flow that will be used to estimatethe amount of motion undergone by an object while moving from one frame to another. The proposed system will give the combine result at the output whether smoke and fire is present or not. The system performance can be improved with the use of optimalalgorithms for detecting motion and area and extracting features of fire.

Description:

In our proposed Fire Detection System, we detect the fire based on the various parameters and condition as shown in above Figure Flowchart. Firstly, our system extracts images of the environment on a real-time basis, in every 2 seconds. These images then go through the detection techniques of : Area detection, Color detection , Motion detection and Smoke detection.

The captured images first go through Area detection, where the area under fire is detected in by converting RGB into HSV color space. After area. In Color detectionthe RGB components of the captured image are separated and also it is converted from RGB to YCbCr color space. Then based on various comparisons in RGB and YCbCrcolor space and also, using thresholds which we have decided by experimental evaluations, color detection is done. Then we go for motion detection, where we convert the 2 frames from RGB into gray and after comparison we check for the mean motion threshold, which is decided after experimental evaluation and motion detectionis done. For Smoke detection, we keep the extracted images in RGB color space andbased on the decided smoke threshold and evaluated mean threshold the frames are processed and smoke detection is done.

On the start of monitoring, after going through the mentioned detection techniques, the condition is checked to give final discretion that fire is detected or not, dependingon which the alert alarm is turned ON.

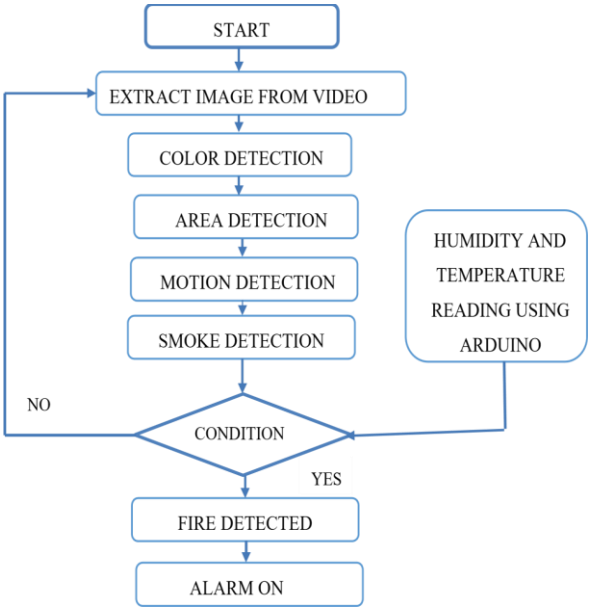

Figure 1: Flowchart

IV BLOCK DIAGRAM

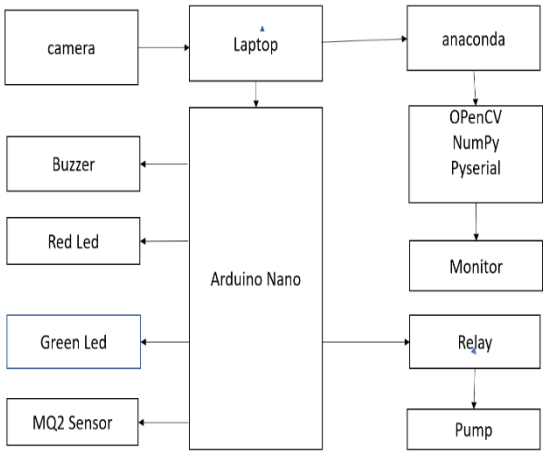

Figure 2: Block Diagram

V.RESULT

By using the camera fire is detected and further by using image processing technique fire is detected. when the fire and smoke is not detected green LED switch ON. when fire and smoke detected red LED and buzzer switch ON. Then MQ2 sensor is used to detect the smoke. For prevention purpose pump will on when there is fire detected.

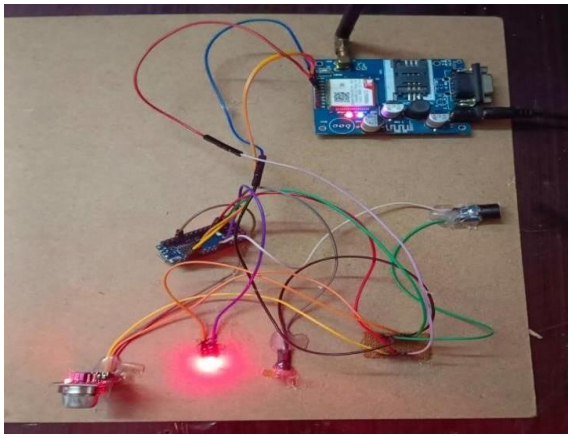

Figure 3: Output

VI.CONCLUSION

Smart cameras can be used to identify various suspicious incidents such as medical emergencies, accidents and fires. Out of these, fire is one of the most dangerous events, because if it failed to control it can lead to massive human life loss and huge disasters. Deep learning can be used to provide better way of approaching solution to this problem. With the help of Deep learning, we can buildcustomized CNN, through which we can detect fire in videos and images at an early stage. In this paper, a model was proposed which can be used to detect fire in surveillance videos. Fair Fire detection accuracy of the model can be of great use to disaster management teams by managing fire disasters on time thereby preventing huge losses.

VII.FUTURE SCOPE

The application can be enhanced by training the model with a larger dataset consisting of fires at various stages and dimensions. With higher GPU memory, we could use two deep learning models for feature extraction, whose output feature vectors are concatenated and classified to offer more robustness. An R-CNN model can be used to implement fire localization along with classification. We can also expect better deep learning architectures to emerge in the future, offering better feature extraction. The application will also offer a considerably better performance when run on machines having better processing power compared to existing one of which it has been developed.

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