

# International Journal of Innovative Research in Science, Engineering and Technology

(An ISO 3297: 2007 Certified Organization)

Vol. 5, Issue 7, July 2016

## A Review on Enhanced Method to Detect Fire in Video Surveillance

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**ABSTRACT:** Fire is one of the most serious tragedies that can strike anywhere and can damage all things. A method to detect fire and put out the fire before it becomes too large and out of control. Many existing systems proposed that are able to detect fire by analysing the videos learned by surveillance cameras. One of such recent systems is based on color, shape variation and motion analysis. The main advantage obtained from this approach lies in the fact that the overall performance of the system suggestively increases with a comparatively small effort made by designer. The results obtained by this method settle a consistent reduction in the number of false positives but it still consist some amount of false positive results. Proposed system introduces an idea of fire detection of videos surveillance. The system is elevating the process by detecting the harmful fire only to avoid untrue alarms in the scenario by reducing false positive results. For example system won't alerts if somebody is smoking or candle is burning instead of this system is interested to identify wild fires which are really harmful in destroying live and property. System will use an efficient YCbCr color model with fire morphology examining technique to identify fire. The performance and accuracy of system can be measured by estimating three parameters which are Color, Shape and Movement.

**KEYWORDS:** Video surveillance, Fire detection, Multi expert system.

### I. INTRODUCTION

Fire is one of the few tragedies in which damage can be prohibited or reduced, when compared to other natural disasters. However, in order to control the fire, it is important to detect early so that it be putout easily earlier it grows huge. Nowadays different types of fire and smoke detectors are existing in the market. Smoke detectors are used to detect smoke which specifies that fire is existing. In the previous years many methods have been developed, with the goal to examine the videos developed by traditional surveillance cameras and identify fires or smoke, and the current orderly effort [1] [2] concentrating on improving the strength and performance of the proposed methods, so as to make possible a commercial misuse. Although a severe organization of the approaches is not simple, two leading classes can be illustrious, depending on the analyzed features: color model and motion based. The approaches using the first kind of structures are based on the consideration that a flame, under the statement that it is generated by common combustibles as wood, plastic, paper or additional, can be dependably considered by its color, so that the calculation of the color apparatuses (in RGB, YUV or any other color space) is sufficiently robust to identify the presence of flames. This simple idea motivates several recent methods: for instance, in previous work [3] and [4] fire pixels are going to detected by the technique called background subtraction and statistical color model like RGB, YCbCr, a set of images has been used and the area of the color space has been experimentally detected, so that if pixel goes to this specific region, then it can be categorized as fire. The main benefit of such algorithms lies in the small computational cost permitting the processing of more than 35 frames per second at quarter common intermediate format QCIF (176x144) image determination.

Conventional fire detectors are costly and they are not suitable for open spaces. Moreover they highly produces false alarms and often detects fire when its too late. So it is needed to develop an efficient low cost fire detection system with negligible response time. Computer vision based techniques has a great potential to meet these requirements. Objective of the fire detection system is that 1. To detect fire while they are still small and have not grown too large 2.To

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implement Automatic system to initiate fire alert. 3. To implement SMS alert system for Fire detection. 4. To develop a low cost fire detection system in real time.

The detection of fire in video is mostly appropriate in industrial monitoring and surveillance used to display buildings and environment as a part of an initial warning mechanism that reports rather start of fire. Video-based systems can sense wild fires at an early stage before they turn into tragedy. The advantage of fire detection based on video are: 1] detection techniques are very spontaneous. 2] Fire detection with high real-time and has no delay caused by induction time as broadcast and initiation is higher than smoke and temperature due to speed of light. 3] Remote surveillance cameras can be attached everywhere freely, therefore detection range is larger. 4] Technology has higher consistency and real-time performance. Video fire detection has become very important topic for the researcher in the pitch of fire detection. Detection methods based on image information are more operative than further techniques which use multisensory wireless network or sensor systems.

## II. LITERATURE SURVEY

As discussed finding of fire is very critical parameter in many fields of industrial area, forest area like this etc. After many researches and study going on the fire detection and smoke detection, different algorithms are particularly designed for this purpose. The algorithms which are present till now are designed for fire detection through videos are, statistical color model, spatial- Temporal Flame Modelling and Dynamic Texture Analysis and optical mass flow estimators now a days this approach is getting attention. The Scientists Nikos Grammalid, Kosmas Panagiotis Barmpoutis and Dimitropoulos are focuses on different modelling algorithms used in fire detection. Also their advantages and disadvantages with respect to their application.

## III. FIRE DETECTION TECHNIQUES

T. Celik et al. [1] proposed alternative system containing a real-time flame detector which syndicates statistical color model information with foreground information. Graphic fire detection is more valuable in area where standard conservative fire detectors can't be used. In this paper the algorithm combines the color information of the flame with sequential changes or movements in the video sequences. Background modelling is used where the camera position is fixed and picture observed is motionless. Basically images are consists of Red, Green and Blue (RGB) components. The Background data is modelled with the unimodal Gaussian method; then the Mean and covariance matrix are removed from images which contains Luminance, Chromablue andChromared components. Background modeling is describe in three steps: first, Estimation of model parameters. Second, adaptation of model parameters and third is enduring variation in background.

I. Bosh et al. [2] proposed a fire detection method constructed on multisensor wireless network. This method consists of technique called wireless sensor network with dominant monitoring station. Respectivelyeach sensor has consists of two camera's (visible and thermal) and a motor with dissimilar settings to swing and operate a larger area; and combined system of capture, processing and communication. This network permits remote monitoring of respectively location as well as communication between each sensor and control station. In the result, it increases coverage area with secure and earlier response. The sensor system allows mindless monitoring of reporting or monitoring area of alarms to other fundamentals in the WSN and to the control station. With GIS i.e geographic information system. This paper gives the explanation of the sensor and the processing scheme, importance of both. In system processing, each infrared image is transformed into a pixel matrix. Each pixel is collected of resolution cell corresponding to certain coordinates of rank.

For color identification, Water Philips et al [3] uses a lookup table for appreciation of fire in video sequences using a guide training set. The lookup table is used identifying the possible fire pixels of color. I proposed system the lookup table algorithm is used it may be consisting of following steps: 1] Generatesets of training images. 2] Construct the color histogram graph, and 3] Color transformation. i.e. transformation of RGB to Boolean value which shows whether an input color is matches with colors predicate. Then the Fire detection algorithm in proposed method chains the color

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detection data with the background subtraction for motion detection. In first step of algorithm removes the background information and detects foreground motion. The second step is useful if there is detection of fire color objects in the foreground pixels. This step is useful to reject nonfire object from foreground image pixels. Step third is useful to remove the noise in hanged detection map. In forth step, the blobs are sensed using related component labelling (CCL) algorithm [4].

Hasan Demireland T. Celik et al. [5] proposed system which enhance system that uses a statistical color model combine with Fuzzy logic for fire pixel classification. The proposed system in this paper develop two models; one based on luminance information and second is based on chrominance information. Fuzzy logic uses the YCbCr color model space for the separation of luminance information from chrominance effective than that of other color spaces such as RGB. This proposed system achieves 99.00% correct fire detection rate with a 9.50% false alarm rate.

Pietro Morerio, Lucio Marcenaro, Carlo S. Regazzoni, Gianluca Gera [6] proposed new system in this the detection of fire and smoke pixels is at first realized by motion detection algorithm. In addition, separation of smoke and fire pixels using color information is completed. In parallel, a selection of pixel based on the dynamics of the area is carried out to achieve the reduction in false detection. The output of the three parallel algorithms is eventually attached by means of a Multi-layer Perceptron (MLP). The algorithm proposed in tis paper tested on different database and not only achieve correct detection and false detection events but also the response time, which plays an important role in “early warnings

## IV. PROPOSED FIRE DETECTION METHOD

Now a days used of surveillance camera is increasing rapidly so that any kind of difficulty cannot be obtained. Existing system propose a method able to detect fires by evaluating the videos developed by surveillance cameras. The two main uniqueness have been presented: first, matching information, respectively based on color model, shape variation and motion analysis, are combined together by a multi expert system. The main benefit of this system is that it lies in the fact that the overall performance of system significantly increased with small effort done by designer. Second, a based on a bag-of-words approach has been planned for indicating motion. The proposed method has been tested on large database of fire videos and pictures captured in real environment. The obtained results show the consistent reduction in the number of false positives, and also increase the accuracy of the system.

An overview of the proposed system is presented in Figure 1. Proposed system introduces an idea of fire detection of live videos which are streaming live through the camera. The proposed system is enriching the process by detecting the harmful fire only to avoid false alarms in the scenario. For example system won't alerts if someone in smoking or candle is burning instead of this system is interested to identify wild fires which are really harmful in destroying live and property.

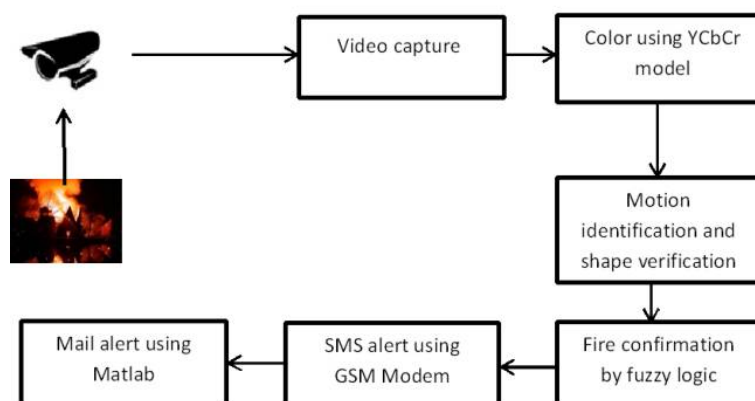


Fig. 1 Overview of the proposed method

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The proposed system consists of the following steps:

## 1. Video capturing

Here in this module the video of the fire is captured by collecting the sequential frames using Java media files (JMF) API.

## 2. Color identification of fire

In order to create a colour model for fire and smoke, we have analyzed the images which consist of fire or smoke samples. *YCbCr* colour space is chosen intentionally because of its ability to separate illumination information from chrominance more effectively than the other colour spaces.

## 3. Motion identification and shape verification of fire

Identifying moving objects from a video sequence is a fundamental and critical task in many computer-vision applications. A common approach is to perform background subtraction, which is used to identify any moving objects from the portion of a video frame that differs significantly from a background model. In this paper we use Frame differencing method to detect the moving pixels in image. Frame differencing uses the video frame at time  $t-1$  as the background for the frame at time  $t$ . The binary background difference is generated by comparing the current frame with the background frame.

The morphology of the any object yield the shape and structure of that object eventually helps to identify right things in the image so we used shape verification.

## 4. Fuzzy logic detection to identifies the fire

Fuzzy logic detector extract feature from color model motion detection and shape verification and check it for threshold value if features value are greater than threshold then it will be detected as fire.

## 5. Sending alert to fire department via SMS

Here in this step a SMS will be sending to the fire department through a GSM modem connected to the system using Attention commands and Java Communication API.

## 6. Sending Fire snaps to fire department via mail

Here in this step an Email will be sending to the concern person by using Java mail API which is powered by Gmail host.

## V. CONCLUSION

We have studied data analysis and data research though various research papers. We came to conclusion that we can propose a fire detection system using an ensemble of experts based on information about color, shape and flame movements. The Experimentation to be confirmed the effectiveness of the MES approach. System will use an efficient *YCbCr* color model with fire morphology analysing technique to identify fire. The performance and accuracy of system can be measured by evaluating three parameters which are Color Evaluation (CE), Shape Variation (SV) and Movement Evaluation (ME).

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