PROPOSED ALGORITHM FOR FIRE ALARM

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Abstract : The main objective of the process is to identify fire in the video frames based on the color based segmentation of the images, to remove other objects other than fire in the input videos by the application of frame differencing, to improve the accuracy of the proposed method further compared to the existing method. In this project, we proposed a fire detection algorithm based on Image Processing Techniques which is compatible in surveillance devices like CCTV, wireless cameras to UAVs etc. This algorithm uses RGB color model to detect the color of the fire which is mainly comprehended by the intensity of component R, which is Red color.

IndexTerms **- rgb color model, luminance and chrominance, edge detection, segmentation techniques, motion detection**

I. INTRODUCTION

Fire, especially fire in buildings can spread quickly and cause great loss of life and property. Therefore, early fire detection and warning is imperative. Fire detectors, smoke detectors and temp. detectors have been widely used is protect property and gives warning of fires. However, smoke and temp. detection is slower than light detection, which is substantive detection method proposed in this project. Furthermore, to cover the entire area potentially subject to fire temperature detector is required.
In order to facilitate earlier detection of fire, and to monitor spread of the fire we proposed a fire detection system based on light detection, as distinct from smoke or heat detection. The system will trigger an audible alarm and provide visual images of fire a red box superimposed over the image of the fire flame in the video sequences.

II. PROPOSED SYSTEM

Input videos were converted into frames. The fire in the frames are detected based on the threshold applied to the images. The threshold value is identified from HSV and YCbCr color models of the input RGB image.
The current frame is subtracted from the previous frames and the region other than the fire regions are removed.
Proposed a fire detection techniques based on color, motion and pattern characteristics of fire, which uses a generic color model as well as the geometrical independent component analysis model. Our proposed method is a real time processing method and uses simple algorithm based on color condition and fire growth checking.

III. LUMINANCE AND CHROMINANCE

RGB has disadvantages of illumination dependence. It means that if the illumination of image changes, the fire pixel classification rules cannot perform well. Furthermore, it is not possible to separate a pixel's value into intensity and chrominance. To distinguish luminance information from chrominance information more effectively we can use these color model :1)YCbCr (Working on this model) 2) HSI 3) HSV 4) L*a*b*

IV. EDGE DETECTION

Edge detection is image processing technique for finding the boundaries of object within images. It works by detecting discontinuities in brightness. Edge detection is used for image segmentation. Edge detection can done by various method such as Sobel Edge Detection, Canny Edge detection or fuzzy logic etc.

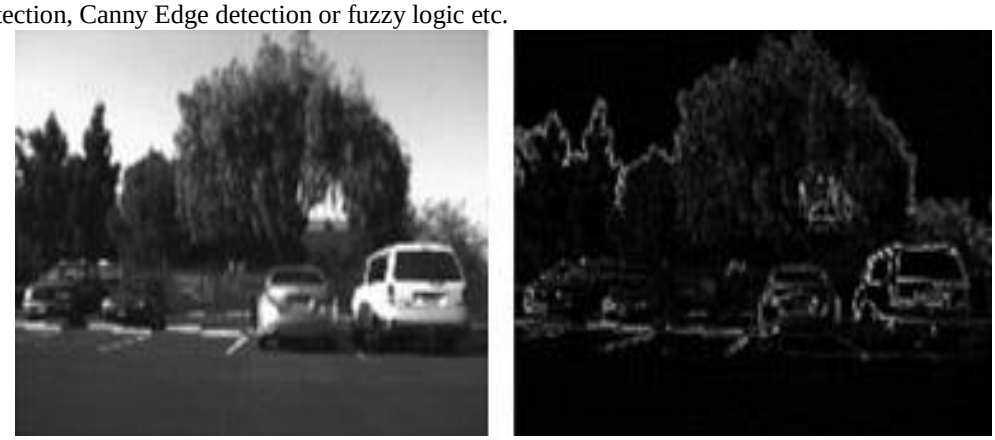


Figure 1 edge detection

V. SOBEL EDGE DETECTION

Sobel edge detection uses sobel filter. It works by calculating the gradient of image intensity at each pixel within the image. It finds the direction of the largest increase from light to dark and the rate of change in that direction.The result shows how abruptly or smoothly the image changes at each pixel, and therefore how likely it is that pixel represents an edge. It also shows how that edge is likely to be oriented. The result of applying the filter to a pixel in a region of constant intensity is a

zero vector. The result of applying it to a pixel on an edge is a vector that points across the edge from darker to brighter values.

VI. SOBEL FILTER

The sobel filter uses two 3 x 3 kernels. One for changes in the horizontal direction, and one for changes in the vertical direction. The two kernels are convolved with the original image to calculate the approximations of the derivatives. If we define Gx and Gy as two images that contain the horizontal and vertical derivative approximations respectively, the computations are:

$$G_x = \begin{pmatrix} 1 & 0 & -1 \\ 2 & 0 & -2 \\ 1 & 0 & -1 \end{pmatrix} * A \quad \text{and} \quad G_y = \begin{pmatrix} -1 & -2 & -1 \\ 0 & 0 & 0 \\ 1 & 2 & 1 \end{pmatrix} * A \qquad (1.1)$$

Where A is the original source image. The x coordinate is defined as increasing in the right-direction and the y coordinate is defined as increasing in the down-direction.

At each pixel in the image, the gradient approximations given by Gx and Gy are combined to give the gradient magnitude, using:

$$G = \sqrt{G_x^2 + G_y^2} \qquad (1.2)$$

The gradient's direction is calculated using:

$$\Theta = \arctan\left(\frac{G_y}{G_x}\right) \qquad (1.3)$$

A value of Θ would indicate a vertical edge that is darker on the left side.

VII. IMAGE SEGMENTTION, POSITION IDENTIFICATION AND MOTION DETECTION

Image Segmentation is the process of partitioning a digital image into multiple segments (set of pixels).The goal of segmentation is to simplify and change the representation of image which is more useful. We use image detection to segment fire from the non- fire background. Image segmentation and edge detection helps to check growth of fire. Position identification method is used to detect dispersion of fire pixel area in the sequential frames.

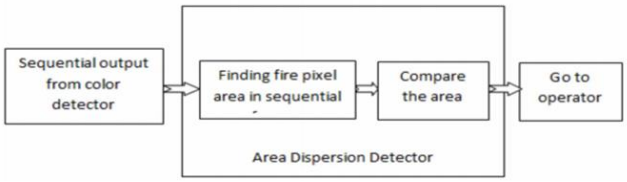


Figure 2 block diagram

Motion Detection is used to detect any occurrences of movement in a sample video.

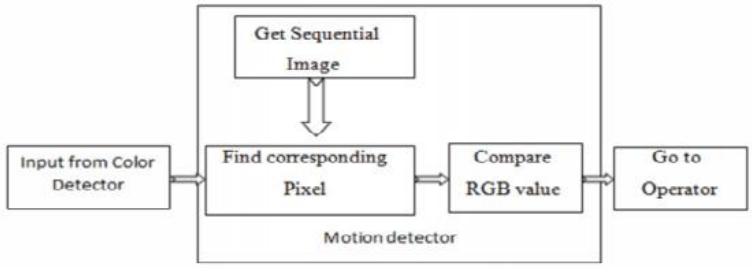
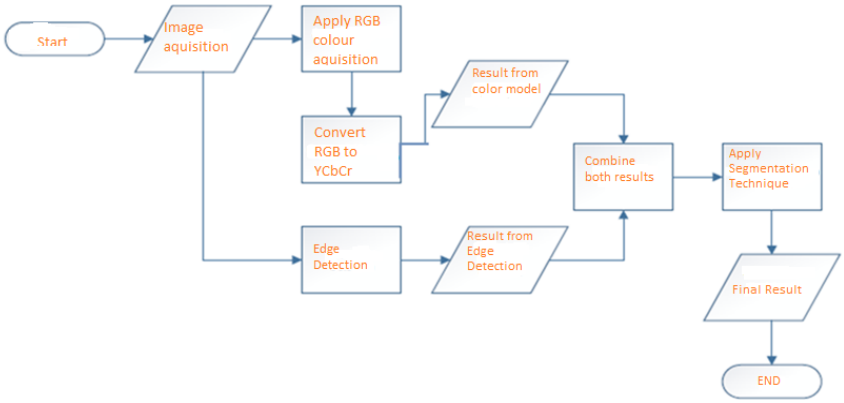


Figure 3 motion detection block diagram

VIII. FLOWCHART OF PROPOSED ALGORITHM OF FIRE ALARM



IX. ADVANTAGES AND DISADVANTAGES

- **Advantages-** a) Cost of this type of detection is cheaper and implementation is simpler over traditional method. b) Response time of fire detection is faster compared to any other traditional method. c) Most benefit of these type of system is fire source can be saved in form of image or video which can be used for promoting the diversification of fire detection method greatly.
- **Disavantages -**a) Less accuracy visual information. b) It is possible for a false detection if only color characteristics had been used.
- **To overcome disadvantages-** a) Temperature Sensor can be used. b) Smoke Detection using Image Processing.

X. SMOKE DETECTION USING IMAGE PROCESSING TECHNIQUES

Smoke pixels do not show chrominance characteristics like fire pixels. When the temperature of the smoke low, it's expected that the smoke color range of white-bluish to white. Towards start of fire, smoke temperature increases and color range of black-grayish to black. These color can be used for detection using RGB model and converting to HSV, YCbCr etc. Since the smoke information will be used for early fire detection system, the smoke samples should be detected when smoke has low temperature.

XI. BLOCK DIAGRAM OF PROPOSED FIRE ALARM AND HARDWARE IMPLEMENTATION

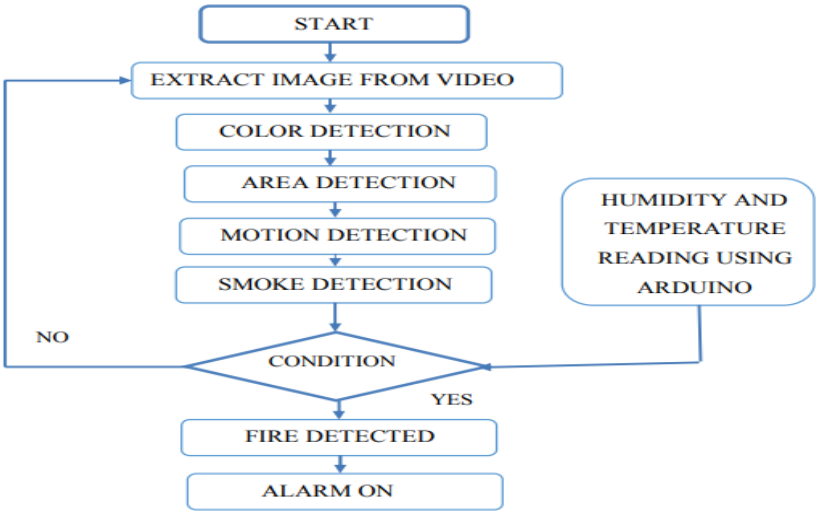


Figure 4 block diagram of proposed fire alarm

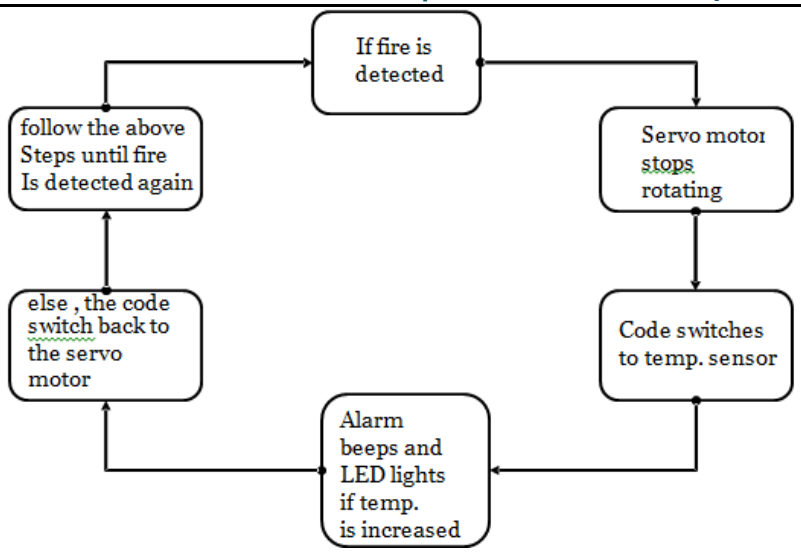


Figure 5 hardware implementation of fire alarm

XII. ACKNOWLEDGMENT

I have taken efforts in accomplishing this project. However, it would not have been possible without the kind support and help of many individuals and organizations. I would like to extend the sincere thanks to all of them.

XIII. REFERENCES

Following papers and sites are used for research of this project

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