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A HYBRID APPROACH FOR FIRE SAFETY INTENSIVES AUTOMATIC ASSISTANCE SYSTEM

Tareek Pattewar[1], Shukla Vaibhav[2], Patil Vaishali[3], Shinde Manshi[4], Thakare Dipti[5], Borse Renuka[6]

[1]Assistant Professor, Dept. of Information Technology, R. C. Patel Institute of Technology, Maharashtra, India
[2,3,4,5,6]Student, Dept. of Information Technology, R. C. Patel Institute of Technology, Maharashtra, India

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Abstract - *Fire is one of the most dangerous threat for mankind because it can cause serious Disasters and it impacts people, property and the environment in all countries around the world. Many systems are invented to reduce the damages of an fire but it will active after the damage has been caused. So we are proposing a system which will give us early detection of fire which can save many lives.*

***Key Words*: Image processing , Image Segmentation , Extracting frames, Edge Detection , Feature Extraction**

Current vision based techniques mainly follow the colour clues, motion in fire pixels and edge detection of flame. Fire detection scheme can be made more robust by identifying the gray cycle pixels nearby to the flame and measuring flame area dispersion. Fire detection system is the most important component in the surveillance system. Fire has been one of the major disasters, even though it is so important to fulfil certain activities in day-to- day life. Fire disasters will cause severe damage to human properties and cause terrible mental and physical injuries, if they are not detected at the right stage [2] Fire detection systems play an important role in safeguarding places against fire. To minimize fire risk and its impact, any company should apply sound fire detection method. A key aspect of fire protection is to identify a developing fire quickly and to alert the building's occupants and fire emergency organizations. A necessity of a Fire Detection System is the detection of fire conditions as early as possible, to provide.[3].

1. 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 of fire. 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, harsh environment or the outdoor environment etc. [1].

Fire detection system sensors are used to detect occurrence of fire and to make decision based on it. However, most of the available sensors used such as smoke detector flame detector, heat detector etc., take time to response. It has to be carefully placed in various locations. Also, these sensors are not suitable for open spaces. Rapid developments in digital camera technology and video processing techniques, conventional fire detection methods are going to be replaced by computer vision based systems.

Time for Automated Systems/ Fire personnel for effective counter action Fire detection system sensors are used to detect occurrence of fire and to make decision based on it. However, most of the available sensors used such as smoke detector, flame detector, heat detector etc., take time to response. It has to be carefully placed in various locations. Also, these sensors are not suitable for open spaces. Due to rapid developments in digital camera technology and video processing techniques, conventional fire detection methods are going to be replaced by computer vision based systems. Current vision based techniques mainly follow the colour clues, motion in fire pixels and edge detection of flame.

2. SYSTEM DEVELOPMENT

2.1 Extracting Frame

A video file consists of frames. These frames when appear before us in a rate more than our perception of vision, gives a sensation of an object moving before us, by looking just at the screen on which frames are appearing at high rate. Thus one can say that frames are the fundamental entity of a video file. Frames can be obtained from a video and converted into images. To convert a video frame into an image,[4] MATLAB function `frame2im' is used. To read a video in avi format, the function `aviread' is used. The original format of the video that has been used in this example is .gif file

format. The image is converted from .gif file format image into an avi format video For instance, in the `fire.avi'

2.2Edge Detection

Edge detection method is used to detect the colour variance in an image, it also mathematical methods that aim at identifying points in a digital image at which the image brightness changes sharply or, more formally, has discontinuities. The points at which image brightness changes sharply are typically organized into a set of curved line segments termed edges. The same problem of finding discontinuities.

In one-dimensional signals is known as step detection and the problem of finding signal discontinuities over time is known as change detection. Edge detection is used for image segmentation and data extraction in areas such as image processing, computer vision, and machine vision. The edges extracted from a two- dimensional image of a three-dimensional scene can be classified as either viewpoint dependent or viewpoint independent.

2.3Image Segmentation

Image segmentation is a further step to separate the background from the foreground object in the image. Lots of image segmentation techniques can be used here such as compression, morphological processing, edge detection and many more advance techniques. This is the hardest part in digital image processing since it involves segmentation procedures to partition the image into the objects desired. Next, the purpose of thresholding is to extract the objects from the background by selecting the best threshold value for the image. In order to differentiate between background and fire, the process will include segmentation of the fire region and thresholding which value can be found using colour thresholding tools in MATLAB. In this process, histogram plays a important role to find the best threshold value. RGB and YCbCr both have different threshold value of fire region. The special range and pixel value to be classified as fire in RGB and YCbCr colour space is highlighted. Then, the most important step will proceed which is feature extraction.

2.3 Features Extraction

Feature extraction is where all the data pixels that represent and describe the desired pixels is been grouped. The set of features will extract relevant information accordingly to the desired task _re pixel had been extracted by using two colour spaces and seven rules that were applied for each of image tested. The rules are listed in Table Seven rules for fire recognition Each of the rules constructed according to the analysis of 100 sample images. For example, for the Rule 1 and Rule 2, all fire images show that R is the major component in a fire image. However, the R colour component reduces significantly during afternoon because of strong sunlight. To overcome this problem, average value of R, G and B was determined based on 100 images used in this work. Hence, generally we can classify that the fire region component R should be greater than G and G should be greater than component.[4]

Color space	Rules
RGB	1) R> G >B
	2) if R> Rmean ∩ G> Gmean ∩ B< Bmean
YCbCr	3) Y(x,y) >= Cb(x,y)
	4) Cr(x,y) >= Cb(x,y
	5) Y(x,y) ≥ Ymean ∩ Cb(x,y) ≤ Cbmean ∩ Cr(x,y) ≥ Crmean
	6) Cb(x,y) – Cr(x,y) ≥ Th
	7) (Cb(x,y) ≤ 120) ∩ (Cr(x,y) ≥ 150)

Fig-2.3: Seven rules for fire recognition

3. Extraction of images from the video

A video file consists of frames. These frames when appear before us in a rate more than our perception of vision, gives a sensation of an object moving before us, by looking just at the screen on which frames appearing at high rate. Thus one can say that frames are the fundamental entity of a video file. Frames can be obtained from a video and converted into images. To convert a video frame into an image, the MATLAB function `frame2im' is use.

3.1 Colour Detction

Any image in Red-Blue-Green format has each pixel in it possessing a set of values for each of the 3 channels. If we know the range of R-B-G values for a particular colour we want to detect, then while processing the image, we will look only for those pixels which have R-B-G values in the range of what we want. We will check for each pixel whether the value of a certain channel (the higher the value the more the colour is present) is higher than a particular threshold value, and also that the values of the other two channels are LESS than a particular threshold value. If the pixel meets that condition, it is deemed to be of that the basic colour, and we designate it white in the resultant image. Otherwise the pixel is kept black. However, lighting conditions in the background may adversely affect the saturation values of flames resulting in similar R, G and B values which may cause non flame pixels to be considered as flame coloured. Therefore, saturation values of the pixels under consideration should also be over some threshold value.[5]

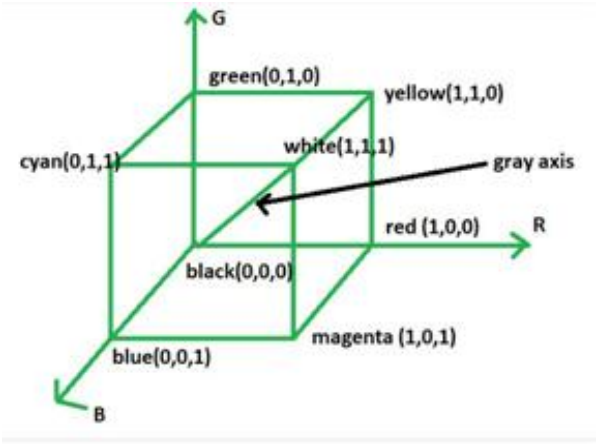

***Figure 3.1: Colour Detection with RGB Colour* Model**

3.2 Decision Making

To reduce false alarms induced by fire- coloured moving objects, one of the two following conditions must be met in order to issue the alarm the bounding boxes of the fire region in question and of any other object being tracked do not overlap there is overlap in the bounding boxes but the distance between the current position of the overlapped object and its position when it emerged in the scene does not cross Given threshold (typically50pixels). The second condition ensures that only stationary objects are considered as putative fire regions. A object exhibiting a fire-like dynamic texture (e.g., a full-bodied person who is shaking but slowly moving and wearing fire-textured clothing) complies with these conditions and, thus, may generate an undesired fire alarm. If the object is of a known non fire category, the alarm can be discarded immediately.

Fire Bird V will help you get acquainted with the world of robotics and embedded system. Thanks to its innovative architecture and adoption of the `Open Source Philosophy' in its software and hardware design, you will be able to create and contribute too, complex applications that run on this platform, helping you acquire expertise as you spend more time with them. The position encoders makes it possible to have position control. The platform can be upgraded to tank drive and Hexapod insect or any other desired form very easily. It is powered by high performance rechargeable NiMH batteries. A 2.4 GHz ZigBee module provides state of the art secure and multi-channel wireless communication up to a range of one kilometre .[7]

4. Proposed System Description

In this proposed system instead of analysing characteristics parameters of fire I .e colour, 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 estimate the 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 optimal algorithms for detecting motion and area and extracting features of fire. The enhanced system will performed well than the existing system in terms of detection rate. we have developed a system to detect an occurrence of fire. Flame properties for fire detection have been used. [8]

For detection purpose two consecutive frames are considered at a time, to make corresponding comparison and analysis. The captured images first go through Area detection, where the area under fire is detected in by converting RGB into HSV colour space. After area detection we go further for Colour detection. In Colour detection the RGB components of the captured image are separated and also it is converted from RGB to YCbCr colour spa

5 APPLICATIONS

1. Most advanced fire alarm systems use wireless technology and smart devices to protect and manage automated buildings from a remote control panel.

2. The computerized logic of the control panel analyzes multiple detectors at the same time to decide on the most appropriate course of action. These modern smart

3. Fire alarm systems are more sensitive than classic models and are better at avoiding false alarms.

4. With better design and stronger resistance, they can be placed in areas diffcult to reach and give instructions about the best escape route to the people in the building.

6 FUTURE SCOPE

1) Fire accidents can be controlled to a great extent in a places such as forests, homes, colleges, industries, trains and some other public places.

2) Fire accidents leads to death of excess people, by using this bot we can save those life easily.

3) It can also be used as fire alarm and with sound to notify people that instruments is been over heated.

7 CONCLUSION

The main objective of developing a fire detection system is to help in early detection of fire which can cause lot of disaster. The fire detection can be done in real time with real time image processing. A novel combination of existing fire detection method and hybrid method can be used together to obtain the optimized and more accurate results and detecting the fire area in video sequence .This hybrid approach can be used to detect fire conveniently in houses, industries schools colleges .

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