ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Website: www.ijircce.com

Vol. 5, Issue 4, April 2017

Detection of Fire and Fire Edges from Video

Ancy Jacob, Manu Jose

M. Tech Student, Dept. of ECE, VJCET, Kerala Technological University, Vazhakulam, Ernakulam, Kerala, India

Assistant Professor, Dept. of ECE, VJCET, Kerala Technological University, Vazhakulam, Ernakulam, Kerala, India

ABSTRACT: There are many methods to detect fire in real time.Most cases people use sensors to detect presence of fire.Here vision based method is used to detect fire.An HSV based color space model is used. This color space model is used to detect fire processing video data generated by pi camera monitoring a scene.Thismethod analyze the frame-toframe changes to determine the region of fire by detecting the characteristics of fire.The characteristics make the system affirmative to detect fire.This method is more efficient than rgb color space.Then an edge detection algorithm called Auto adaptive edge detection algorithm is used to obtain the edge of fire.This method obtain the edge from black ground. With increasing emphasis on security, the automated flame detection using edge analysis has extensive usage. In general, an algorithm of edge detection finds the sharp intensity variation of an image and in this way it obtains the edges of the objects contained on the image.

KEYWORDS: HSV colorspace,Autoadaptive edge detection.

I. INTRODUCTION

Automatic flame or fire detection systems play a major role in the early detection and response of an unexpected fire hazard. Most sensor based fire alarms are designed for indoor use and are not applicable in outdoor scenarios, forests and in large infrastructure settings such as aircraft hangers, large tunnels and exhibition building etc. For identification of fire flames in video a new proposal and analyzation methods have been approached. This paper propose that, changes in the features of the of fire regions occurring differently at different frames can be used for the detection of fire flames in videos by combined algorithm.Combining both methods ie.Autoadaptive edge detection algorithm for flame and HSV based color space model gives more accurate result for fire detection. The determination of flame or fire edges is the process of identifying a boundary between the area where there is thermo chemical reaction and those without It is a pre-cursor to image-based flame monitoring, early fire detection, fire evaluation, and the determination of flame and fireparameters.HSV based color spaced model consider the hue, saturation values of the fire image.HSV helps to detect brightness parameter of the fire.from the background of image.Applying edge detection gives the edge of the flame.

II. RELATED WORK

TianQiu, Yong Yan and Gang Lu [1]proposed an edge detection method for flame that detect edge on dark background.Z. Zhang, J. Zhao, D. Zhang, C. Qu, Y. Ke, and B. Cai [2] suggested a new method using FFT and wavelet transform for the contour analysis of forest fire images on a video. X. Zhou, F. Yu, Y. Wen, Z. Lu, and G. Song [3] used method to early fire and tested it on video clips. M. I. Chacon-Murguia and F. J. Perez-Vargas [4] suggested a method to detect and analyze fire information on a video through the analysis of shape regularity and intensity saturation feature. H. C. Bheemul, G. Lu, and Y. Yan[5] proposed a system consisting of 3 monochromatic CCD cameras,a frame grabber and a computer with dedicated software.It is developed to reconstruct 3D models of flame using its contour extracted from 3D images. Q. Jiang and Q. Wang [6] presented a canny edge detector which was used to detect moving fire regions in large space fire images. Om Prakash Vermaa,*, RishabhSharmab , Deepak Kumarc [7] proposed a method to binarize the intensity values 0 and 255 of 8-bit imageThe difference between intensity values of the present pixel with each of the neighbouring eight pixels.Whenever the bacteria finds the intensity difference of 255 it will treat that pixel as an edge pixel.

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Website: www.ijircce.com

Vol. 5, Issue 4, April 2017

III. PROPOSED ALGORITHM

The proposed system implements HSV based color space model and auto adaptive edge detection algorithm to detect fire from video.Video is captured using pi camera connected to raspberry pi board.The proposed method is applied to each frame of video. The block diagram for proposed method is given below in Figure1:

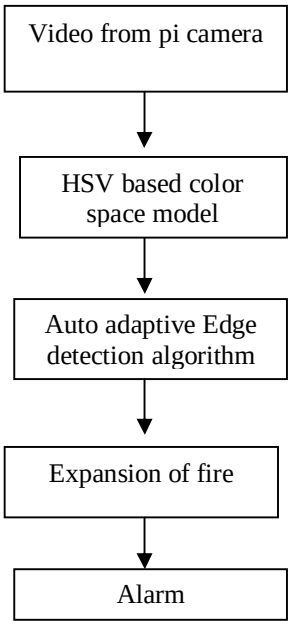

Figure 1: Block diagram of the Fire detection.

HSV color range is obtained to detect fire and edge detection algorithm applied to it.HSV based color space model used to detect the fire from input frame.ThenAutoadaptive edge detection algorithm used to detect edge of the fire image.Based on the area of fire alarm is operated to inform presence of fire.

HSV Color Space Model-This is a suitable way to detect the colour of fire. After some comparisons, we decided to use HSV colour domain. HSV means hue saturation value.As can be seen in Figure2 the H parameter represents the colour information, and shows the position of the spectral colours; red, green and blue are separated by 120°. Complementary colour differ 180°. The S parameter represents saturation. HSV is an intuitive colour model to the user, and is much easier than the RGB colorspace . HSV is an intuitive colour model to the user, and is much easier than the RGB colour space. H parameter shows the pure color, S parameter describes how white the coloris.A pure red is fully saturated with a saturation of 1.tints of red have saturation less than 1;and white has a saturation of 0.The value of a color also called lightness.Figure 3 shows HSV output of an image.

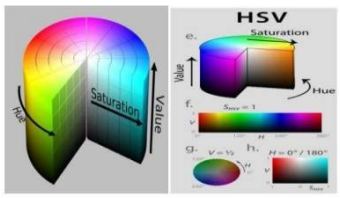

Figure 2:HSV color model mapped to a cylinder.

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Website: www.ijircce.com

Vol. 5, Issue 4, April 2017

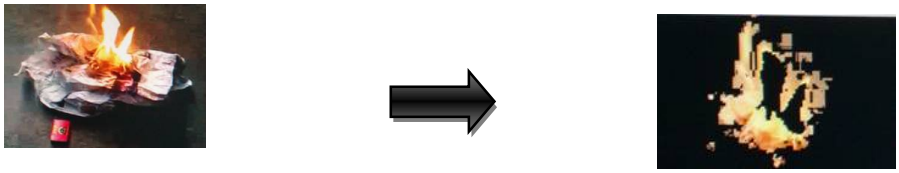

Figure 3: Fire detection output

Autoadaptive Edge Detection Algorithm-The determination of flame or fire edges is the process of identifying a boundary between the area where there is thermo chemical reaction and those without. It is a pre-cursor to image-based flame monitoring, early detection, fire evaluation, and the determination of flame and fire parametersBasic steps of algorithm is shown below and output obtained is shown in Figure 4.

- Adjusting the gray level of a flame image.
- Normalized histogram equalization.
- Smoothing the image to eliminate noise using a gaussian filter.
- Using the Sobel operator for finding basic edges.
- Adjusting TH and TL for better results.
- Dilation
- Achieving a clearly defined edge.

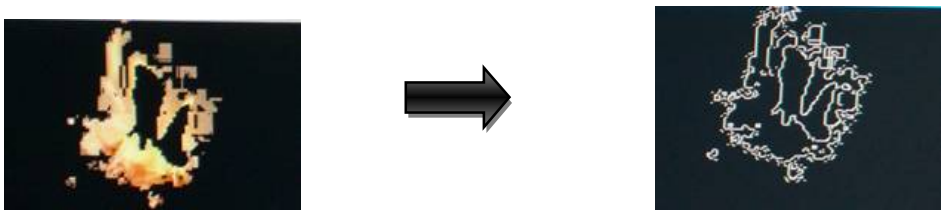

Figure 4: Auto adaptive edge detection output

IV. HARDWARE REQUIREMENTS

The Raspberry Pi is a credit-card-sized single-board computer as shown in Figure. 5, developed in the UK by the Raspberry Pi Foundation with the intention of promoting the teaching of basic computer science in schools. The Raspberry Pi is manufactured in two board configurations through licensed manufacturing deals (Premier with Newark element14 Farnell), RS Components and Egoman. These companies sell the Raspberry Pi online.Egoman produces a version for distribution solely in China and Taiwan, which can be distinguished from other Pis by their red colouring and lack of FCC/CE marks. The hardware is the same across all manufacturers. The Raspberry Pi has a Broadcom BCM2837 system on a chip figure 4.Raspberry pi board which includes an ARM Cortex-A53 Quad Core Processor powered Single Board Computer running at 1.2GHz, Video Core IV GPU, and wasshipped with 1.2GB RAM. It does not include a built-in hard disk or solid-state drive, but uses an SD card for booting and persistent storage. The Foundation provides Debian and Arch Linux ARM distributions for download. Tools are available for Python as the main programming language, with support for BBC BASIC (via the RISC OS image or the Brandy Basic clone for Linux), C, Java and Perl.

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Website: www.ijircce.com

Vol. 5, Issue 4, April 2017

Figure 5: Raspberry Pi

V. SOFTWARE REQUIREMENTS

Operating system:Raspbian (Debian), Language: Python2.7, Platform:OpenCV (Linux-library) .The operating system under which the proposed project is executed is Raspbian which is derived from the Debian operating system. The algorithms are written using the python language which is a script language. The functions in algorithm are called from the OpenCV library. OpenCV is an open source computer vision library, which is written under C and C++ and runs under Linux, Windows and Mac OS X. OpenCV was designed for computational efficiency and with a strong focus on real-time applications. OpenCV is written in optimized C and can take advantage of multi-core processors. The OpenCV library contains over 500 functions that span many areas in vision, including factory product inspection, medical imaging, security, user interface, camera calibration, stereo vision, and robotics. Because computer vision and machine learning often go hand-in-hand, OpenCV also contains a full, general-purpose Machine Learning Library (MLL).

VI. RESULT AND IMPLEMENTATION

Once configured, the pi can be operated from its own peripherals or another computer connected over the internet.As a desktop, these materials are required Pi 3 Starter kit -or- Pi 3/2 Accessory Kit and your own PiUSB Mouse, USB Keyboard, HDMI monitor/TV/adapted VGA. Figure.6 shows the kit implementation diagram and Figure.7 shows the software booting diagram.The project “Detection of fire and fire edges in video “in raspberry pi” has been successfully designed and tested and expansion is obtained. The expansion value is shown in Figure. 8.It has been developed by integrating features of all the hardware components and software used.

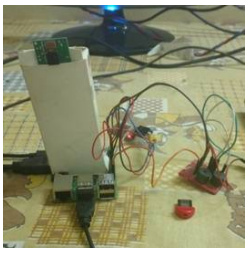

Figure 6:KITimplementation

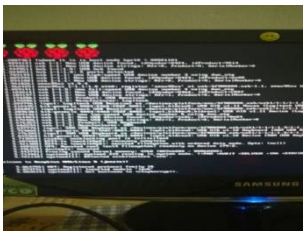

Figure 7: software booting diagram

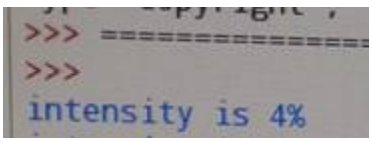

Figure 8:Expansion of fire

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Website: www.ijircce.com

Vol. 5, Issue 4, April 2017

VII. CONCLUSION

Here an efficient method to detect fire using HSV based color space model combining with auto adaptive edge detection algorithm is done and obtained the edge of fire. Expanion of fire can be obtained from this.

REFERENCES

[1] TianQiu, Yong Yan, Fellow, IEEE, and Gang Lu, Senior Member, IEEE "An Autoadaptive Edge-Detection Algorithm for Flame and Fire Image Processing" ieee transactions on instrumentation and measurement, vol. 61, no. 5, may 2012

[2] Z. Zhang, J. Zhao, D. Zhang, C. Qu, Y. Ke, and B. Cai, "Contour based forest fire detection using FFT and wavelet," in Proc. Int. Conf. CSSE, Wuhan, China, Dec. 12–14, 2008, pp. 760–763.

[3] X. Zhou, F. Yu, Y. Wen, Z. Lu, and G. Song, "Early fire detection based on flame contours in video," Inf. Technol. J., vol. 9, no. 5, pp. 899–908, 2010.

[4] M. I. Chacon-Murguia and F. J. Perez-Vargas, "Thermal video analysis for fire detection using shape regularity and intensity saturation features," in Proc. MCPR, vol. 6718, Lecture Notes in Computer Science, 2011, pp. 118–126.

[5] H. C. Bheemul, G. Lu, and Y. Yan, "Three-dimensional visualization and quantitative characterization of gaseous flames," Meas. Sci. Technol.,vol. 13, no. 10, pp. 1643–1650, Oct. 2002.

[6] Q. Jiang and Q. Wang, "Large space fire image processing of improving canny edge detector based on adaptive smoothing," in Proc. Int. CICCITOE,2010, pp. 264–267.

[7] Om Prakash Vermaa,*, RishabhSharmab , Deepak Kumarc, "Binarization Based Image Edge Detection Using Bacterial Foraging Algorithm" 2nd International Conference On Communication, Computing & Security [Icccs-2012]

[8] Zhenhua Wei and JianqiangQiao ,"Industrial Flame Edge Detection Algorithm Based on Gray Dominant Filter" International Journal of Multimedia and Ubiquitous Engineering Vol. 10, No. 2 (2015), pp. 87-96 .

[9]B.U.Toreyin,Y.Dedeoglu,U.Gudukbay,andE.Cetin,"Computervision-basedmethodforreal-timefireandflamedetection,"Pattern Recognit. OjecLett.,2006.

[10] D.HanandB.Lee,"DevelopmentofEarlyTunnelFireDetectionAlgorithmUsingtheImageProcessing,"InternationalSymposiumonVisual Computing, 39-48,2006.

BIOGRAPHY

Ancy Jacob is an M Tech student in Electronics and communication Engineering Department, Viswajyothi College of Engineering and Technology, Kerala Technological University. She completed her Bachelor of Technology from M G University, Kerala. Her research interests are Image Processing, embedded systems, Verilog, etc.

Manu Jose isan Assistant Professor in the Electronics and communication Engineering Department, Viswajyothi College of Engineering and Technology, Kerala Technological University. He received his Master of Degree from M G University in 2008. His research areas are Signal and Image Processing and Embedded Systems etc.