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Fire Detection

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Abstract— Fire detection is the main objective of this project besides surveillance. The goal of the venture is to early detection of fireplace other than preventive measures to reduce the losses because dangerous fire. The project is undertaking is specifically based on image processing. In this project, at the user end, the fire images will be feed in the form of images sequences i.e. in video layout. Fire detection using image processing presents a fast fire detection algorithm for the purpose of automatically detecting fire in IR images. The presented algorithm makes use of brightness and movement along with image processing techniques ways of doing via histogram-based segmentation. The colour models are extracted using a statistical analysis of samples extracted from exceptional sort of image sequences. The camera will give a real-time video output to the user on the laptop or computer via a small GUI-graphic user interface which is to be built in .net language. Thus, the fire will be detected using image processing model.

Keywords — Fire, detection, smoke, video, image

I. INTRODUCTION

Fires represent a constant hazard to ecological systems, infrastructure and human lives. Past has witnessed a couple of times of fires. With the quicker and faster urbanization procedure, increasingly more high-rise buildings seem around us. This can also make the frequency of fireplace boom and bring awesome losses to people's lives and assets. Even wooded area fires cause the destruction of forests and the flora and fauna that inhabits them and feature disastrous social, financial and environmental effects. Woodland hearth fighting involves considerable human assets. Fire preventing is a totally dangerous activity, which originates causalities each year. As the injury caused by hearths is thus tremendous that the first fire detection is turning into a lot of and a lot of necessary. Now many fire detectors have been used in many places; they used the smoke, temperature and photosensitive characteristics to detect fires. However they're too worse to meet the wishes in a big area, harsh environment or the out of doors environment and so on.

Conventional fireplace protection methods use mechanical devices or people to display the environment. The maximum regularly used fireplace smoke detection strategies are typically based on particle sampling, temperature sampling, and air transparency trying out. An alarm isn't raised until the particles reach the sensors and spark off them.

II. LITERATURE REVIEW

Fire and Smoke Detection without Sensors: Image Processing Based Approach

There square measure scores of hearth detection systems within which the colour data is employed as a pre-processing step. Phillips etal. [1] used colour predicate data record and also the temporal variation of little set of pictures to understand hearth in video sequences. A manually divided fire place set is employed to coach a system that understand recognizes fire like colour pixels. He training set is used to form a look-up table for the fire detection system. This paper [1] offer the use of generic look-up table if the training set is not available. Chen et al. [1] used chromatic and dynamic features to e2tract real fire and smoke in video sequences. They [1] employ a moving object detection algorithm in the pre-processing section. The moving objects are filtered with fire and smoke clear out to raise an alarm for feasible fire in video. They used a generic fire and smoke model assemble the corresponding filter. Töreyin et al [1] proposed a real-time algorithm for fire detection in video sequences. They [1] combined motion and colour clues with fire flicker analysis on wavelet domain to detect fire. The paper author have used a mixture of ten three dimensional Gaussians in RGB colour space to model a fire pixel using a training set. Töreyin et al. [1] proposed formula of fuzzy logic to fire detection which mix generic colour model based on RGB colour space, motion information and Markov [7] process associated fire blaze analysis to make an overall fire detection system. They have employed the fire colour model developed by Chen et al [1]. Later on they have employed the same fire detection strategy to detect possible smoke samples which is used as early alarm for fire detection.

Flame Detection using Image Processing Techniques

The fire is characterized using efficient features and detection of the equal uses of an appropriate processing. From every image the pixel is checked for the presence or absence of fire using colour detection. And periodic behaviour in lire regions is likewise analysed. In paper [3] we use combined approach of color detection, motion detection and area dispersion to detect fire in video data. Firstly the algorithm [3] locates desired color regions in video frames. And then determines the region in the video where there is any movement, and in the last step they calculate the pixel arm of the frame. The combination Automatic of color, motion and area clues is used to detect fire in the Video.

Automation fire detection systems use physical sensors to detect and response of fire. The physical sensor utilizes the substance properties noticeable all around are gained by sensor and use by the recognition framework to raise a caution. This [3] can likewise cause false cautions, the physical sensors are additionally not relevant holders, for open air condition and in substantial framework settings, for example, aircraft large tunnels. Due to the fast development of digital camera technology and superior content of high quality pixel based photo and video processing, there is a major trend to switch traditional fire detection system with computer vision based system.

Automated Fire Extinguishing System With Gsm Alarm

Paper [6] demonstrates the requirements. Specifications, layout problems and solutions for the fire extinguishing- system project fulfilling the necessities. A fire lighter can be able to extinguish fire quickly, averting the damages and reduce losses. Technology has joined the gap between fire fighting and machines using some effective method the purpose of this are to establish a system. It in the most limited time subject to a few effective factors. In the system [6] aims to put out the fire before it spreads increasing the security of home, laboratory, office, factory and building that is important to human life.

Video-Based Smoke Detection: Possibilities, Techniques and Challenges

In this paper [4] the smoke detected via image processing. Smoke device inherently be afflicted by the transport delay of the smoke from the fireplace to the sensor. A video smoke which is field to input system detection would not have delay in current time of environment . Fire is detection on smoke is one of good option. Video is additionally a decent for huge, open territories where there may be no heat or smoke propagation to a settled point. The proposed system is video catcher in visible spectrum through camera. First stage is doing background subtraction using adaptive Gaussian Mixture Model (GMM) [5] in this process, each time the parameters are updated Pixel values that do not match one of the pixel's background Gaussians [5] are grouped using connected component analysis as moving. Second stage Flickering extraction is using Mean Crossing Rate (MCR) [4]. It is as flame move fast from camera or we can say that how the smoke is move according to wind is found via this method. Based on our observations from experiments that smoke flickering [4] mask is thin we choose those shifting blobs the history subtraction module and take a look at whether there may be an enough range of flickering pixels inside the blobs. Smoke is classified based on the work by Catrakis et al. [4] in characterizing turbulent phenomena [4]. The smoke and flame area or surface characterized from video frame. Different formula of area volume and perimeter are used to calculate the result.

Main challenges Is when smoke is downward then it not detect a smoke. Also the weather fog is confusion image processing between fire smoke and fog.

III. OUR PROPOSED SYSTEM

Infrared light can be recognized by infrared cameras. Anyway it isn't unmistakable to the human eye. This makes it unreasonable to use in a framework implied for modest cameras which are effectively reachable and accordingly isn't probably going to have the capacity to catch the infrared range. Warmth can't be distinguished outwardly, which leaves just the smoke and the fire as effectively unmistakable segments of a flame. The program would sound the caution once fire has been resolved. In a perfect world, this incorporates fires that are simply starting and light hints of smoke, for example, that from a matchstick, however sensibly, a little flame, maybe the measure of a flame created by a stove, is distinguished. For flame and fire identification, two principle techniques can be seen from the outcomes.

The proposed system aims to recognize fire autonomously by infrared images that feed from user. The general concept is to be more specific, the proposed fire detection approach can be further described as follows:

1] In order to detect fire using a video feed, a program to be written to process the video feed.it feed video from input hardware from communication interface. Program start by sorting up-buffer for images which used for comparing to each other in order to check fire.
2] Hot objects are detected as candidate fire regions using histogram-based color segmentation method, so as to remove the non-fire background.
3] An algorithm of decomposition has been used in order to detect flames. The initial stages of transformation, the operations of median filtration and the normalization of transformed the images grey levels are performed. Next, the differential image is calculated which is the result of compare of successive images selected from an image sequence.
4] Area is checked by converting the image frame to gray color segmentation. The growth of fire is checked via comparing the previous and next image frame which we have to conclude to fire is split or shrunk.
5] If fire is detected then fire alert message is shown in screen and also sound is generated from the system.
6] The process is continuous until the client will not stop the application.

Image Segmentation

In our propose method hot object image segmentation using histogram colour summation used. Hot object i.e. fire represented as bright areas, while cold objects are displayed as dark regions. Therefore, fire pixels appear as high intensity regions and local maxima of brightness is a dominant clue for fire pixel classification in images frames.

Colour model

In order to create a colour model for fire, we have analysed the images which encompass of fire samples. YCbCr colour space is selected deliberately because of its capacity to split illumination information from chrominance more successfully than the other colour spaces. The tenets characterized for RGB shading space so as to identify conceivable flame pixel or smoke-pixel applicants can be changed into YCbCr shading space and examination can be performed. However the polices fall short in coming up with a single quantitative degree that could imply how likely a given pixel is a fire pixel. In our approach, this fuzzy output is also capable in higher discriminating fire and fire-like coloured objects with regards to rules defined in.

Flame detection

In our approach, we initial the median filter and normalization technique is use. Normalization is performed to remove the effects of sensor noise and grey level deformation. On fire image which we get from image segmentation that we check the threshold value of IR color and highest signal energy of decompose image goes through matching pursing algorithm and it detect the algorithm.

IV. CONCLUSION

In this paper a new image processing fire detection method is proposed. It is based on the infrared images colour detection. Our methodology utilizes both brightness and flame intensity characteristics of fire in IR images to enhance the reliability and accuracy of fire detection. It can differentiate fires from background as well as non-fire hot objects by using histogram-based segmentation and optical flow analysis. Experimental validations are conducted in IR fire video sequences; good experimental results are obtained with greatly improved reliability. New Fire detection technologies bear the potential to improve the safety of buildings by making a fire warning more reliable and by reducing the false alarm rate.

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REFERENCES

[1] T. Celia, H. Özkaramanlı, and H., "Fire And Smoke Detection Without Sensors: Image Processing Based Approach" Demirel 15th European Signal Processing Conference (EUSIPCO 2007), Poznan, Poland, copyright by EURASIP, Electrical and Electronic Engineering, Eastern Mediterranean University, TURKEY, September, 2007 PP 1-5

[2] R.Divya ,D.Mageshwari, " A Novel Fire Detection System using Image Processing and Artificial Intelligence Techniques" Proceedings published by International Journal of Computer Applications(IJCA), Chennai ,2012

[3] P. Patel, S. Tiwari, "Flame Detection using Image Processing Techniques", Journal of Computer Applications (0975 – 8887) Volume 58– No.18, November 2012. PP. 1-4

[4] Z. Xiong, R. Caballero, H. Wang, A. M. Finn, M. A. Lelic, and P.Y. Peng, "Video-based Smoke Detection: Possibilities, Techniques, and Challenges", United Technologies Research Centre, East Hartford, CT.

[5] C. Stauffer and W.E.L. Grimson: "Adaptive Background Mixture Models for Real- Time Tracking", Proc. IEEE Conf. Computer Vision and Pattern Recognition, 1999.

[6] R. Shams, S. Hossain, S. Priyom, N. Fatema "Automated Fire Extinguishing System With Gsm Alarm" a Thesis in the Department of Electrical and Electronic Engineering Of BRAC University

[7] Töreyin, B.U., Dedeoğlu, Y., Çetin, A.E.,"Flame detection in video using hidden Markov models", Proc. IEEE Internet Conf. on Image Processing, pp. 1230-1233, 2005.

[8] B. C. Arrue, A. Ollero, and J. R. Martinez de Dios, "An intelligent system for false alarm reduction in infrared forest-fire detection," IEEE Intelligent Systems, volume 15, no. 3, pp. 64–73, May/June 2000.

[9] M. ŚRUTEK, T. ANDRYSIAK, "Flame Detection Based On Infrared Images", University of Technology and Life Sciences, Bydgoszcz, Poland, 2013 PP. 1-10.

[10] C. Yuan "Automatic Fire Detection Using Computer Vision Techniques for UAV-based Forest Fire Surveillance", A Thesis in the Department of Mechanical, Industrial and Aerospace Engineering, 2017 PP. 72-87.

