PREDICTING THE FOREST FIRE USING IMAGE PROCESSING

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Abstract*: Predicting the fire is a crucial problem from many points of view. It destroys ecology and decreases the overall life quality. It is important from economical point of view and deem wood may be a valuable resource. In this paper, we examine the matter of early fire detection using images of various parts of the forest areas. Our approach is based on segmentation and image pre-processing. Pre-processing of images are produced using the segmentation methods. A new approach is used to extract the features using histogram of gradient(HOG) by extracting the features like gradient, angle, magnitude and the support vector machine(SVM) which are used to recognize patterns for classification is shown.*

Keywords: Fire, Pre-processing, Segmentation, Histogram Of Gradient (HOG) and Support Vector Machine(SVM).

I. INTRODUCTION

Forest fire could also be a important issue now a days. It destroys the valuable resources of the forest like woods, etc which they will create great environmental problems for nature. When a wildfire burns out of control, the size of the losses are often almost immeasurable.

The causes for the hearth are weather temperature, wind direction, moisture level, humans carelessness like burning by grazers, shifting cultivation, fires to stay off wild animals or by visitors to forests by way of smoking etc.The cost of such disaster leads to losses of the many trees, additionally to losses of structures, animals and human life. Forest fires also leads to heating , erosion, ozonosphere depletion and thus the loss of livelihood of those enthusiastic to forest products. Early prediction is the only way of protecting forest from wildfires.

A number of early fire detection methods are proposed using various remote sensing systems supported infrared thermal camera imaging, Satellite-based Synthetic Aperture Radar (SAR) imaging techniques,airborne or ground-based Lidar,fire detection based andradio – acoustic based sounding system. Currently many institutions are attempting to develop reliable and efficient methods to forecast the fireside disasters, which may induce heavy property loss also as serious social impact. The traditional method to detect fire is employing some people as inspectors, but human resource is expensive and such approach has very low efficiency.Another method have already been used that is fire Sensors to detect the particles generated by fire or smoke , temperature, ratio, etc. But they have to be placed within the proximity of hearth or their detecting range is usually exceeded and thus the approach fails to supply the additional information about the tactic of burning, like fire location, size, growing rate, and so on. Fortunately, computer vision based fire detection brings us a replacement quite method which can overcome the key deficiencies of the above mentioned methods.

II. LITERATURE SURVEY

A Forest Image Based Fire Flame Detection Method Using Color Analysis by Wen-Bing Horng1* and Jian-Wen Peng,2008m Discussion:Fires usually causes serious disasters. Thus, fire detection has been a crucial issue to guard human life and property. In this paper, we propose a quick and practical real-time image-based fire flame detection method supported color analysis. We first build a fire flame color feature model supported the HSI color space by analyzing 70 training flame images. Then, supported the above regions with fire-like colors,fire flame color features models are roughly separated from each frame of the test videos. Besides, background objects,segmenting fire flame regions with similar fire colors or caused by color shift resulted from the reflection offire flames also are extracted from the image during the above color separation process. To get rid of these spurious fire-like regions, the image difference method and therefore the invented color masking technique

are applied. Finally, the hearth flame burning degree is estimated in order that users might be informed with a correct fire warning alarm

"P. Morerio, L. Marcenaro, C. Regazzoni, and G. Gera," Early detection of smoke and fire based on color features and motion analysis, "IEEE International Imaging Conference, ICIP2012, September 30, Eastern Europe, Orlando, Florida, USA , 2012, pages 459-47 "Fire alarm systems are some of the most important components of surveillance systems that monitor buildings and surrounding areas. As part of the early warning mechanism, it is best for the system to report early. Almost all fire alarm systems now use built-in sensors, depending on the reliability and location of the sensors. For high-precision fire detection systems, the close placement of these sensors is very important. Based on the external environment, large-area coverage is impractical due to the need to place sensors nearby on a regular basis.

"D. Asatryan, G. Sazumyan, H. Shakhverdyan", Coherent Imaging and Applied Segmentation Technology, NASRA IIAP Transaction, Mathematical Problems of Computation, Volume 28, Pages 88-93, 2007, with Los Rapids in Digital Camera "Technologies and developments in the field of content-based video processing are increasingly used in vision-based fire alarm systems.

Vision-based systems generally use the three attributes of fire: color, movement, and geometric shape. When a potential fire or smoke is detected, the color information is used as a pre-processing step. "Chen, T.-H., Wu, P.-H. Chiu, Y.-K.", an early fire detection method based on image processing, "Proc.IEEE Internat.Conf.on Image Processing, ICIP'04, p.1707-1710, 2004 "The sensors in the fire alarm system are used to detect fire and make decisions based on the fire. However, most of the available sensors, such as smoke detectors, flames Detectors, heat detectors, etc., all take time to respond [1]. It needs to be placed neatly in several places. In addition, these sensors are not suitable for open spaces. With the rapid development of digital camera technology and video processing technology The traditional fire detection methods are being replaced by computer vision-based systems. Modern image-based technology mainly follows color prompts, flame pixel movement and flame edge detection. It is used for flame and flame spread measurement

."Tereyin B., Dedeoglu Y., Cetin A., "Contour smoke detection in video using WAVES", European Signal Processing Conference, EUSIPCO-06, September 2006" In this article, we introduce a video smoke Detection method. Traditional point-type smoke and fire alarms usually detect the presence of certain particles in smoke and fires through ionization or photometers. The main disadvantage of a point detector is that smoke particles in a large room take a long time to reach the detector and cannot be detected. Operate in free space.

III. EXISTING METHOD

There are many fire and/or smoke detection methods and technologies based on image segmentation technology in the scientific literature. We have some links to general descriptions on the subject, but some articles contain ideas and methods that are close to the current one. These methods are based on the use of RGB and YCbCr color spaces. Find the corresponding pixel pattern Y>CRr>Cb in the fire area. Check the feasibility of these three inequality systems | RG |

However, this method is very computationally intensive and is not suitable for making decisions on the go. This paper presents a method based on segmentation and complete simplification of RGB images. And a place without smoke and/or fire.

IV. PROPOSED METHOD

Traditional fire protection methods use mechanical or manual equipment to monitor the environment. The most common fire detection methods are based on particle sampling, temperature sampling and air permeability testing. If the particles fail to reach the sensor and activate them, the alarm will not sound. Then we will capture the image via satellite and pass the captured image as input to the software. The system reports whether there is a fire, and if a fire occurs, it indicates the fire condition. Divided into mild period, severe period or no fire period. First, perform preprocessing. Preprocessing includes three steps, such as B. Convert grayscale, adjust the image to a fixed size and filter the image. Grayscale conversion is used to reduce the gloss effect and reduce the amount of

image required, and then convert it to a fixed size. To simplify calculation and filtering. Perform image processing to remove noise in the image.

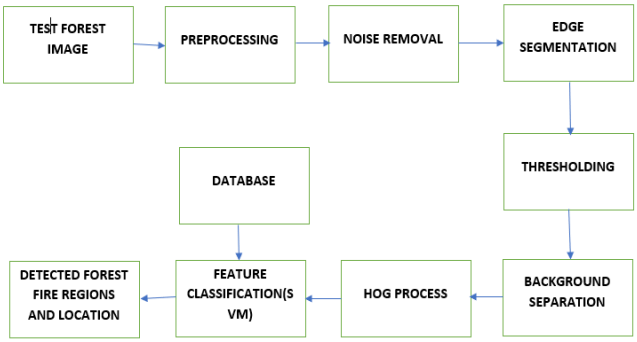


Fig 1:Block diagram of Proposed Model

After the preprocessing is completed ,the segmentation process is performed. When dividing edges, we use the kernel method to find the edges accurately. Therefore, our system uses a threshold method to separate the background and the image. After separating the foreground and the background, the software uses the HOG algorithm to extract attributes such as gradient, size, and angle. These functions are useful for identifying flame and non-flame images. Our system uses SVM classifier to classify images.

V. NUMBER OF MODULES

A.Preprocessing: The image usually includes removing low-frequency background noise, normalizing the intensity of a single particle image, removing reflections and masking parts of the image. In our method, we convert an RGB color image to a scaled image. memory size. Then we resize the image to make it easier to calculate pixels. Then we filter the image to reduce noise.

B. Segmentation: In computer vision, image segmentation is the process of dividing a digital image into several segments. The goal of segmentation is to simplify the representation of the image and/or make it more meaningful and easier to analyze. This is usually used to identify objects or other related information. There are many methods for image segmentation of digital images, including edge segmentation and threshold detection. methods. Thresholding is used to separate the background and foreground by using local threshold and global threshold.

C. Histogram of Gradients (HOG): An image histogram is a type of histogram used as a graphical representation of the tone distribution in a digital image. Histogram Oriented Gradient (HOG) is a function descriptor for computer vision and image processing. This method is similar to edge orientation histogram, invariant element transformation descriptor and shape context, but the difference is that it calculates uniformly spaced cells on a dense grid and uses overlapping local contrast normalization to improve accuracy.

D. Support Vector machine (SVM): SVM is a supervised learning model with related learning algorithms for analyzing data for classification and regression analysis. The SVM training algorithm labeled as belonging to one of two categories creates a model that maps new examples to one or the other category, making it a non-probabilistic binary linear classifier. SVM represents examples as points in space and maps them so that examples from each category are separated by as much white space as possible. Then, the new sample will be displayed in the same room, and it is predicted that it will be assigned to a category based on the break time this fall.

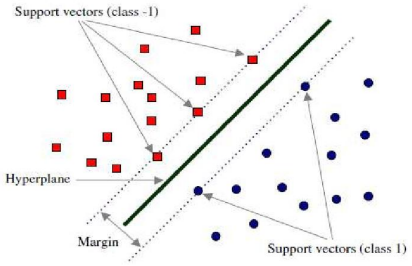


Fig 2:Luminance and Chrominance plots.

SVM is a machine learning algorithm. We will use a series of images to train the SVM. SVM is a pattern recognition classifier that classifies images based on image features. The hyperplanar area is nothing but the decision area where you decide that the test image belongs to this category. The features extracted from the HOG position in the hyperplane determine the image category.

VI. RESULTS

The results obtained using our method show a better approximation than existing systems. This converts the given image to grayscale, reduces the size and noise, and then uses HOG to make the edges of the image meet its threshold and attributes, and then uses the support vector separation machine to make the image lighter, heavier, and fire-free.

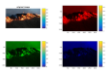


Fig 1:Original Forest Image and it's color component decomposition.

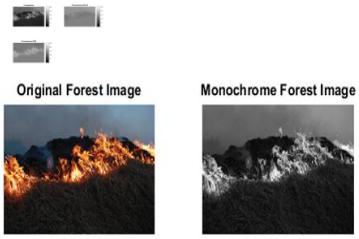


Fig 3:Forest image and its monochrome format.

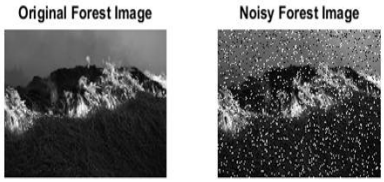


Fig 4:Noisy forest image.

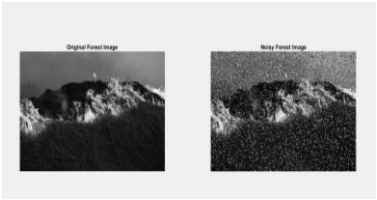


Fig 5:Denoised Forest Image.

Fig 6:Feature extraction with dilated gradient mask.

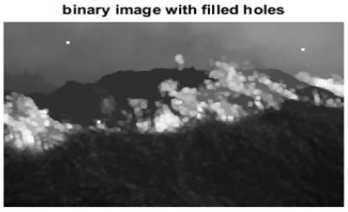
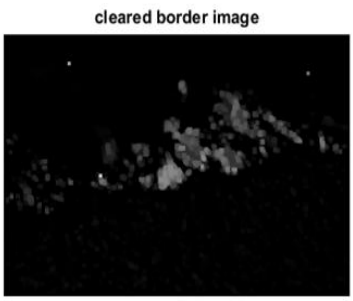
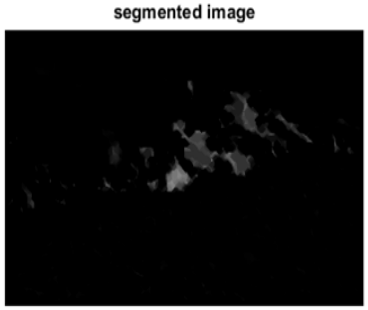


Fig 7:Binary Image with filled holes.





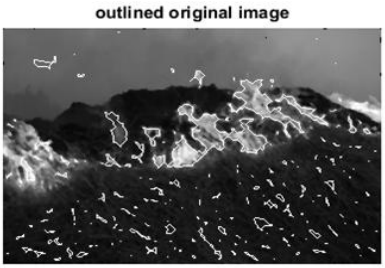


Fig 8:Border Cleared image.

Fig 9:Background separated and segmented Forest image

Fig 10:Outlined Fire Regions

VII. CONCLUSION

A method of using photo data of forest areas to detect fires and then computer processing the data is proposed. A method of reading information, preprocessing the color components of the image, and using SVM to segment and classify the data is a very fast method that can be used for online decision-making and calculations. The effectiveness of the proposed method is shown: the recognition rate of 95 and 5 seconds recognition is shown. The proposed method can be used for monitoring systems from the fire area.

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