Design and Development of Forest Fire Video Analyzer

Pratim Sen[1], Dr. Divya T.L[2]

PG Student, Department of MCA, RV College of Engineering, Bangalore, India[1]

Assistant Professor, Department of MCA, RV College of Engineering, Bangalore, India2

ABSTRACT: Forest fires detection algorithms is an important issue, because some of the objects have the same features with fire, which may result in false alarms. It's difficult to use fire detection sensor inside the forest. Using fire sensor in forest is very costly. This project will present a forest fire detection method. Firstly, forest fire video analyzer will resize the video. Secondly, it will be converting the particular moving regions from RGB to HSV color space. It will notify the forest department after fire detection through mail. After the fire detection an alarm will be beeping. In this project image processing will be used for modern days digital videography, the digital camera can give clarity and excellent videography, the response time of image processing methods is better than the fire sensor systems. Forest fire video analyzer will be using Object Based Image Analysis algorithm (OBIA) in this project. Python programming language and OPENCV image processing tool will be used for converting images from RGB to HSV. Forest fire video analyzer will also use NUMPY image processing tool for flip the image into a proper direction.

KEYWORDS: UAV devices, RGB (Red Green Blue), HSV (Hue Saturation Value), Alarm, Notification Mail

I. INTRODUCTION

Forest fire is a major hazard. 54.40% of forests in India are destroyed by forest fire according to the record, which may result for false alarms. The annual losses from forest fire in India for the entire country have been moderately 440cr. It's difficult to use fire detection sensor inside the forest. Currently, commercial fire detection sensors are present, but those systems are very difficult to install in big forests. In this project image processing algorithm will be used for modern day's digital videography. Camera can give clarity and excellent videography, image processing method's response time is better than any of the fire sensor systems. Forest fire video analyzer will analyze the video then detect the fire and send notification mail. According to the latest report of 2017 because of fire accident 127 people including fire fighters are killed and it damages 1.2 million hector lands in Europe. The report says that Govt. was lost 10 million euros by the forest fire. Detect the fire at the initial stage of the severe forest fire accident is the proper solution to decrease our loss. The total classification of fire and no-fire with fire prediction and quick result will help the government to decrease their loss for forest fire. There are two types of UAV devices are present. A fixed wing UAV is totally controlled by a person with the remote. And rotary wing UAV device has blades example like helicopters. Both UAV devices will have very clear and powerful digital cameras which will be optical type or thermal type.

To decrease the false alarm rate we are using two UAV devices. So that if one is not able to catch the clear video with fire the video of another UAV device will be used. Forest Fire Video Analyzer is based on image processing algorithms. At first UAV device take the video then the video analyzer take the video and resize it. After that video will convert from RGB to HSV so that fire object can be detected. After forest fire detection an alarm will be beeping and a notification mail will sent to the forest fire department. Forest Fire Video Analyzer is very helpful for forest fire department so that they can go quickly and control the forest fire. Forest fire is a major issue in 21st century world. Using this proposed system the loss will be decreased, we can detect the forest fire at initial stage.

II. LITERATURE SURVEY

Due to increasing number of fire accident with consequence of people security application of fire detection and prediction system has increased. Heat and pressure these two are the main thing in sensor based fire detection method. This type of detection system will only work when fire increase a specific point. It will cause heavy loss. For solving this digital camera and fire detection with image processing has come [1].

In this paper, Fire detection method is imposed by UAV device. At first we know about different kind of UAV device and forest fire detection method. Then we know about forest fire detection method like median filtering, color space conversion, Otsu threshold segmentation, blob counter and morphological operations. There is a Lab color model, inside that channel A of that lab color is adopted to remove fire pixels using chromatic features of fire [2].

In This paper there is a comparative analysis which is based on image processing fire color detection rules. And there is methods of the geometrical characteristic of wild land fire or forest fire. Here we can see two new rules which set the benchmark of fire detection system. Here machine learning algorithm is used in the proposed methodology [3].

Here UAV device is used with thermal and optical sensors. Here also proper image processing algorithm is used with the use of digital camera and computer vision algorithm. This is also help to detect the event related to fire. Any severe fire accident can be detected by this proposed methodology. So, it can help to prevent severe damage. In this proposed system the blob detector is utilize with the color based descriptor which helps to detect fire object [4].

In this paper unmanned aerial vehicles that is UAV is used with the help of unmanned ground vehicles that is UGV is used for forest detection method. UAV devices help very much in forest fire detection method. Here UGV are used for helping the UAV device. If UAV device not able to detect then on ground UGV device is used. UGV has powerful image processing method to predict the fire in the forest and very fast action will be taken by forest department after alarm raised [5].

Here we classify the vegetation of the field and also detected the tonality of flames and smoke. Here we use image size of 960×540 pixels to achieve the fire detection precision of 96.82%. The processing time of the proposed methodology is 0.0447%. It works very quickly and detect the fire within fraction of seconds. So, that it is very helpful for people [6].

III. Proposed Methodology

In this proposed project Object Based Image Analysis algorithm (OBIA) will be used. It will classify only the fire object. It is an image processing algorithm to detect main object. Python programming language and OPENCV image processing tool will be used for converting images from RGB to HSV. Video of forest fire is in RGB that is Red Green Blue and it should be converted in HSV that is Hue Saturation Value to detect the fire. Forest fire video analyzer will also use NUMPY image processing tool for flip the image into a proper direction. Resize the video in perfect frame and rotate it in proper direction is very important to detect fire object. For this we are using NUMPY image processing algorithm. It will be using wavelet image processing algorithm and SVM will be used for classify the region to either real fire or no fire. It classifies the real fire region and no fire region. After fire detection Information will be notified to forest.
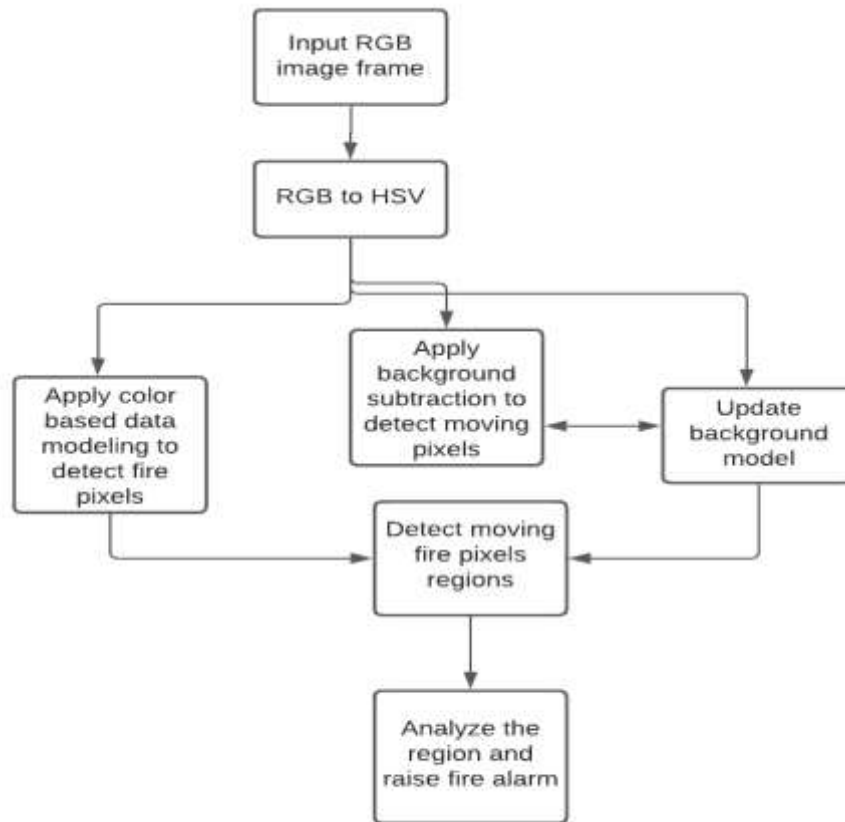
Fig 1 Flow chart of Forest fire video analyzer

IV. **Technologies Used**

OPENCV

OPENCV stands for Open source Computer Vision . OPENCV was founded by Gary Bradsky in 1999. The first version of OPENCV had come out in the year 2000. Vadim Pisarevsky come later and joined with Gary Bradsky to manage Intel software OPENCV which is Russian. Computer Vision and Machine Learning algorithms are supported by OPENCV . In the modern age OPENCV is expanding day by day. Computer vision represents the meaningful things of the physical object from the image. OPENCV is also available on multiple platforms like Windows, Linux, Android, and iOS. Python, c++, java supports the OPENCV library. OPENCV is a rule of how to reconstruct rebuilt, take 2D images and understand the 3d video. By using OPENCV user can capture the videography and save it. It can filter or transform an image. It will detect the object specifically like car, human face, etc.

NUMPY

NUMPY is the library which is used for scientific computing in Python. It is a library in python language that provides an object of multidimensional array. Mainly NUMPY is used for mathematical or logical operations of arrays. In the core of the NUMPY there is the ndarray object. This encapsulates and dimensional arrays of homogeneous data types. Basically NUMPY is a python package. We can use NUMPY for linear algebra operation. It has inbuilt function for linear algebra operations.

PLAYSOUND

If someone want to create some kind of sound in python programming language then python provide some audio libraries that is play sound. For using play sound we have to install it first then we have to import. Playsound is the direct package to use if the user want to play a WAV file or MP3 file. playsound has the play back functionality. In this project for creating alarm sound I am using this python audio libraries playsound Which is very useful and give us exactly alarm sound.

SMTPLIB

The full form of SMTP is Simple Mail Transfer Protocol. SMTP is a protocol which handles sending email to the other server. And It is also routing the email from one server to another server. First we have to put the email like message using the triple quote. And we have to give the headers and format correctly. The format of email is From, To, Header and body. In this user have to place email body in message format using double quote. And we have to give headers format correctly. The email format needs a From, To, and Subject header, and an email body which is separated by a line. For sending the email we have to use smtpobj to SMTP server of local machine. Then we have to use sendmail method with the format from- address, to- address, and message body also. We have to give from and destination address inside mail also. If there is a problem to use SMTP server in our machine then we have use smtplib to connect with remote SMTP server. Basically email provider like google, yahoo, provide us outgoing mail server.

V. **Result Analysis**

The forest fire video analyzer will detect the smoke also. So, after analyzing this video also forest fire video analyzer will detect the fire and will raise alarm. This is the video of forest fire. After analyzing this forest fire video forest fire video analyzer will detect the fire and will raise the alarm. After that a notification mail will be sent to the forest departments.
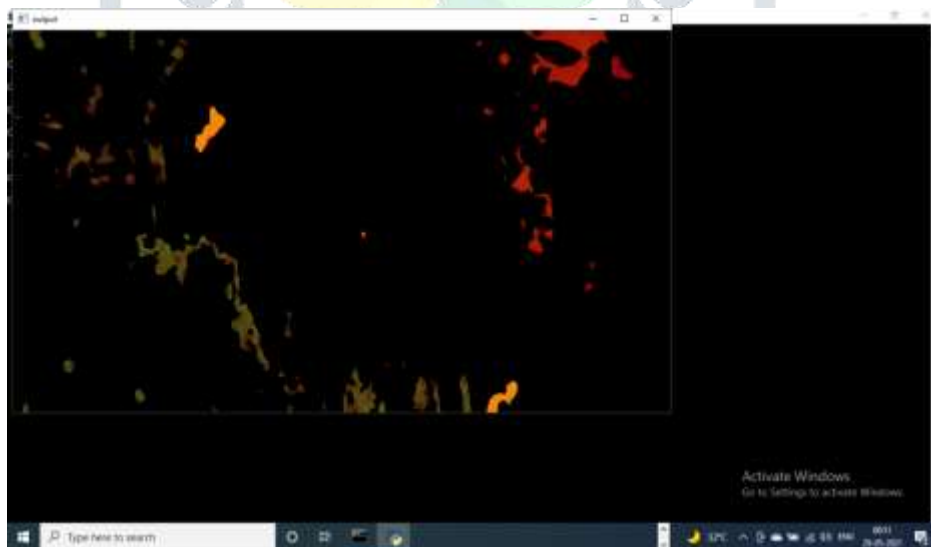
This is HSV format video. Forest fire video analyzer converts the RGB video file to HSV and subtracts the background. So, it is very important to convert the video in HSV format from RGB because after converting system will detect the fire object. After this a notification mail will be sent to forest fire departments within 30 seconds.

VI. **Conclusion**

Forest fires detection algorithms is an important issue, because some of the objects have the same features with fire, which may result in false alarms. It's difficult to use fire detection sensor inside the forest. Using fire sensor in forest is very costly. This project will present a forest fire detection method. Firstly, forest fire video analyzer will convert the video dataset into frames. Secondly, it will be converting the particular moving regions from RGB to HSV color space. In this

project we will be using data set of 16 videos collected from Internet. It will notify the forest department after fire detection through mail.

In this project image processing will be used for modern days digital videography, the digital camera can give clarity and excellent videography, the response time of image processing methods is better than the fire sensor systems. Forest fire video analyzer will be using Object Based Image Analysis algorithm (OBIA) in this project. Python programming language and OpenCV image processing tool will be used for converting images from RGB to HSV. Forest fire video analyzer will also use NumPy image processing tool for flip the image into a proper direction. It will be using wavelet image processing algorithm and SVM will be used for classify the region to either real fire or no fire. Anaconda open-source tool will be using in forest fire video analyzer.

VII. REFERENCES

[1]. Kumarguru Poobalan, Siau-Chuin Liew," FIRE DETECTION ALGORITHM USING IMAGE PROCESSING TECHNIQUES," in International Conference on Artificial Intelligence and Computer Science, AICS2015, Penang, MALAYSIA, 12 - 13 October 2015, (e-ISBN 978-967-0792-06-4).

[2]. Chi Yuan, Zhixiang Liu, Youmin Zhang, "UAV-based forest fire detection and tracking using image processing techniques," in 2015 International Conference on Unmanned Aircraft Systems (ICUAS), Denver, CO, USA, 9-12 June 2015

[3]. Toulouse, T., Rossi, L., Celik, T. "et al. Automatic fire pixel detection using image processing: a comparative analysis of rule-based and machine learning-based methods," SIViP 10, 29 June 2015, 647–654 (2016). https://doi.org/10.1007/s11760-015-0789-x

[4]. T. Giitsidis, E. G. Karakasis, A. Gasteratos, G. Ch. Sirakoulis, " Human and Fire Detection from High Altitude UAV Images Share on," 2015 23rd Euromicro International Conference on Parallel, Distributed, and Network-Based Processing, IEEE Computer Society1730 Massachusetts Ave, NW Washington, DC United States.

[5]. Khaled A. Ghamry, Mohamed A. Kamel, Youmin Zhang , " Cooperative forest monitoring and fire detection using a team of UAVs-UGVs," 2016 International Conference on Unmanned Aircraft Systems (ICUAS), 04 July 2016, 7-10 June 2016, Arlington, VA, USA.

[6]. Henry Cruz, Martina Eckert, Juan Meneses and José - Fernán Martínez, " Efficient Forest Fire Detection Index for Application in Unmanned Aerial Systems (UASs)" published in 16 June 2016 Research Center on Software Technologies and Multimedia Systems for Sustainability (CITSEM) .