

# A SURVEY ON FOREST FIRE DETECTION

## **ABSTRACT:**

Fire detection at an early stage is important for the safety of the people. Lack of information due to manual detection is the main cause of failure of fire detection. Fire can be detected by using smoke at an early stage as it is the fire indicator. Generally automatic forest fire detection using image processing techniques represents one of the significant aspects of forest fire avoidance earlier. Detection using image and video is effective than using sensors. In image processing the inputs for the fire detection may be an image or a video but the input as a video is quite complex process but provides good result. The techniques such as Wavelet decomposition, spatial and temporal analysis, Gaussian Mixture Model, Multi-Feature fusion detect fire in an accurate manner.

## **Literature Survey:**

Surapong Surit, Watchara Chatwiriya [8] proposed a method to detect fire by smoke detection in video. This approach is based on digital image processing approach with static and dynamic characteristic analysis. The proposed method is composed of following steps, the first is to detect the area of change in the current input frame in comparison with the background image, the second step is to locate regions of interest (ROIs) by connected component algorithm, the area of ROI is calculated by convex hull algorithm and segments the area of change from image, the third step is to calculate static and dynamic characteristics, using this result we decide whether the object detected is the smoke or not. The result shows that this method accurately detects fire smoke.

P. Piccinini, S. Calderara, and R. Cucchiara [2] proposed a method based on the wavelet model and a color model of the smoke. The proposed method exploits two features: the variation of energy in wavelet model and a color model of the smoke. Smoke is detected based on the decrease of energy ratio in wavelet domain between background and current. The deviation of the current pixel color is measured by the color model. Bayesian classifier is used to combine these two features to detect smoke.

R.Gonzalez proposed a method to detect fire based on Wavelet Transform.

Stationary Wavelet Transform is used to detect Region of Interest. This method involves three steps preprocessing, SWT, histogram analysis. In preprocessing unwanted distortions are removed and image is resized and transformation of resized image is performed. High frequencies of an image are eliminated using SWT and the reconstruction of image is done by inverse SWT. Image indexation is performed to group the intensity colors that are closed to each other. Histogram analysis is used to determine the various levels of indexation. After analysis a comparison is made with non-smoke frame and non-smoke images are eliminated. These three are combined and fire is detected.

Osman Gunay and Habiboglu [4] proposed a system based on Covariance Descriptors, Color Models, and SVM Classifier. This system uses video data. Spatio-temporal Covariance Matrix (2011) [13] is used in this system which divides the video data into temporal blocks and computes covariance features. The fire is detected using this feature. SVM Classifier is used to filter fire and fire-like regions. This system supports only for clear data not for blur data.

Dimitropoulos (2015) [1] proposed an algorithm where a computer vision approach for fire-flame detection is used to detect fire at an early stage. Initially, background subtraction and color analysis is used to define candidate fire regions in a frame and this approach is a non-parametric model. Following this, the fire behavior is modeled by employing various Spatio-temporal features such as color probability, flickering, spatial and spatiotemporal energy. After flame modeling the dynamic texture analysis is applied in each candidate region using Linear Dynamical Systems, Histogram and Mediods. LDS is used to increase the robustness of the algorithm by analyzing temporal evolution of pixel intensities. Pre-processing is done after this to filter non-candidate regions. Spatio-temporal analysis is done to increase the reliability of the algorithm. The consistency of each candidate fire region is estimated to determine the existence of fire in neighboring blocks from the current and previous video frames. Finally, a two-class SVM classifier is used to classify the fire and no fire regions.

## **Conclusion:**

Different fire detection techniques have been proposed for safety and protection of the people and environment. It is very crucial to develop an appropriate detection system to avoid dangerous situation caused due to fire. Though fire detection using image produce satisfying result we now go for fire

detection to produce accurate result. Wavelet based smoke detection is used for smoke detection in video sequences of outdoor environment. Covariance method is for flame detection. This method use temporally extended covariance matrices representing all the information together. The method works only well when the fire is clearly visible. If the fire is small and if it is far away from the camera or covered by dense smoke the method fails. Wavelet and Color model combined together and detect smoke earlier. Neural Network produces accurate result as it uses temperature, smoke density and CO concentration. Fuzzy based approach uses YCbCr and HSV model and detects fire at an early stage. By these approaches we cannot completely protect the forest from fire but we reduce the level of damage. Perception Neural Network along with Multi Threshold algorithm classified image pixels of cloud, land, smoke, and background and produced accurate result of smoke.

## **References:**

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## **Problem Statement:**

### **To solve forest fire problems-**

1. Government Regulations. ...
2. Banning Clear-Cutting of Forests. ...
3. Reforestation and Afforestation. ...
4. Reduce Consumption of Paper. ...
5. Educate Others. ...
6. Eat Less Meat. ...
7. Purchase from Sustainable, Forest-Friendly Companies. ...
8. Reduce Consumption of Deforestation Prone Products.

