EMERGING METHODS FOR EARLY DETECTION OF FOREST FIRES

LITERATURE SURVEY :

Surapong Surit, Watchara Chatwiriya 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 :

1. The first is to detect the area of change in the current input frame in comparison with the background image.

2. 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.

3. 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 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 :

1. Preprocessing
2. SWT
3. 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 nonsmoke images are eliminated.

These three are combined and fire is detected.

Osman Gunay and Habiboglu proposed a system based on Covariance Descriptors, Color Models, and SVM Classifier. This system uses video data.

Spatio-temporal Covariance Matrix (2011) 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 filer fire and fire-like regions. This system supports only for clear data not for blur data.

Dimitropoulos (2015) 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 nonparametric 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.

Hamed Adab proposed another system which is based on Indexing. GIS techniques and remote sensing provides further assistance.

The indexing may be structural fire index, Fire risk index, Hybrid fire index. Depending on the geographical condition of the area the indexing differs.

Validations of indices are based on hot spot data. Structural fire indices show static information and it does not change over short time span and used to predict the risk in advance. Fire risk index changes as the vegetation or climate changes. Hybrid index is a combination of Structure and Fire index. The disadvantage of this indexing is that way of combining.

Akshata & Bhosale proposed another method where Local Binary Pattern acts as a base for fire detection and Wavelet Decomposition is used to detect fire. Pixel level analysis is required in this method. This method uses YCbCr color model to detect fire. Detection is based on three phase. The first phase involves segmentation of image using LBP. LBP is a texture operator whose value is computed using image's center and neighboring pixel values.

Further accuracy is improved using Wavelet Transform and complicated data is classified using this approach. 2D Discrete Wavelet Transform is used for decomposition in this system. 2 images should be used as input and the sub bands of every image are compared with the other, if sub bands are equal the images are same else different.

Celik (2007) proposed a generic model for fire and smoke detection without the use of sensors . Fuzzy based approach is used in this system. Color models such as YCbCr, HSV are used for fire and

smoke detection. The fire is detected using YCbCr color model samples because it distinguishes luminance and chrominance. Y, Cb, Cr color channels are separated from RGB input image.

A pixel is more likely a fire pixel if intensity of Y channel is greater than channel Cb and Cr.

Cheng(2011) proposed a fire detection system based on Neural Network; here neural network is used in detection information for temperature, CO concentration, and smoke density to determine probability of three representative fire conditions.

RBF neuron structure is used, the information regarding temperature, CO concentration, and smoke density are collected and data fusion is used to generate fire signal decision. The detectors have continuous analog outputs, when detection limit is exceeded the hardware circuit sends a local fire indication to fusion center, this force the system detectors to generate final decision. Single-sensor detector is used to generate the final decision.

REFERENCES:

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Dr.L.Latha(ASP)
Department of Computer Science and Engineering,
Kumaraguru College of Technology,
Coimbatore, India

P.TamilMathi
Department of Computer Science and Engineering,
Kumaraguru College of Technology,
Coimbatore, India