LITERATURE SURVEY

The various methodologies that are used for early dectection of Forest fire are discussed as follows:

George E. Sakr et al. [1] (2010) presented a forest fire risk prediction method. The findings show that a small quantity of data can be used to estimate forest fire risk.

Mauro Castelli et al. [2] (2015) demonstrated a novel intelligent GP-based approach for examining burned areas in this demonstration. The major goal was to create a system that could forecast how much land will be destroyed in the event of a forest fire. The experimental findings revealed that geometric semantic genetic programming outperforms due to the small MAE.

Kansal et al. [3] (2015) proposed the use of regression and the division of datasets has been proposed in this paper as a method for detecting fire. The algorithm achieves a low R-squared and a low root mean square error. This method could be used for other calamities in the future. The use of specific transformations may also help to increase the model's efficiency.

Yu, N. Wang, and X. Meng [4] (2005) proceeded Ensemble learning is used at all cluster heads in this case. At the base station, SVM, a supervised machine learning technique, is used with a polynomial kernel function. Carbon dioxide, temperature, humidity, and carbon monoxide can all be detected using the sensors that have been installed. Clustered stream generates data in tabular or clustered form. After that, the SVM is used to detect fire.

Guruh Fajar Shidik and Khabib Mustofa [5] (2014) described an alternative hybrid model capable of predicting the extent of forest fire has been developed in this study. The algorithm, which includes meteorological and forest weather index variables, has successfully classified the level of burning into three categories: No Burn Area, Light Burn, and Heavy Burn. The proposed model's examination revealed encouraging results in terms of accuracy. of confusion matrix around 97.50% and Kappa 0.961.

Paulo Cortez and Anibal Morais [6] (2013) investigated a Data Mining approach for predicting the burned area of forest fires in this paper. The optimal configuration combines an SVM with four meteorological inputs to forecast the burned area of minor fires. Such information is especially valuable for bettering the administration of firefighting resources.

Celik and Hasan Demirel et al. [7] (2012) enhanced a system that uses a statistical color model with Fuzzy logic for fire pixel classification. The proposed system develops two models; one based on luminance and second based on chrominance. Fuzzy logic uses the YCbCr color space for the separation of luminance from chrominance instead of using color spaces such as RGB. Existing historic rules are replaced with the Fuzzy logic to make the classification more robust and effective. This model achieves up to 99.00% correct fire detection rate with a 9.50% false alarm rate.

Gonzalez-Gonzalez et al. [8] (2007) proposed a method to detect fire by smoke detection based on wavelets. In this smoke detection method, image processing on video signals is proposed. The SWT transform is used for the area detection of ROI's. This method comprises three steps.In the first step, preprocessing is performed and the image is resized and transformed to grayscale image. Finally indexed the image using indexation. The second step involves high frequencies of an image being eliminated using SWT and reconstructed the image by inverse SWT. In order to group the intensity colors that are close to each other is the main purpose of image indexation.Histogram analysis is used to determine the indexation levels. After that, compare the image with a non-smoke frame and select those pixels that are changed from one scene to another. The final stage consists of a smoke verification algorithm in order to determine whether ROI is increasing its area and to reduce the generation of false alarms. These three steps are combined together to form the final result.

Hidenori Maruta et al. [9] (2015) proposed another method for smoke detection based on a support vector machine. In this approach a robust and novel smoke detection method is proposed using a support vector machine. Firstly preprocessing is performed by extracting moving objects of images. The preprocessing consists of five steps: image subtraction and accumulation, image binarization, morphological operation, extraction of Feret's regions and creation of the image mask. Image subtraction is used to extract regions of moving objects. In order to eliminate noise like regions binarization and morphological operations are used. The position and approximated shape of the object obtained by identifying Feret's diameter is called Feret's region. After preprocessing, perform texture analysis and extract the texture features. These texture features become the component of the feature vector. Feature vector is applied as the input vector and support vector machine is used to classify smoke or not. Smoke detection method involves three steps: analyzing texture features, discrimination of Feret's region using support vector machines and time accumulation. In order to extract feature vectors of the image, texture analysis is performed in this method. Support vector machine is used to classify smoke or non- smoke from the extracted image. The main advantage of this method is that more accurate extraction of smoke areas in image can be obtained using SVM.

Habiboglu et al. [10] (2012) proposed another method that uses covariance descriptors for fire detection. In this method, color, spatial and domain information are combined by using covariance descriptors for each spatio-temporal block. The blocks are generated by dividing the flame colored region into 3D regions. This method used a covariance matrix for the detection of flames. Background subtraction method is not used in this approach. To detect fire, divide the video into spatio-temporal blocks and covariance features are computed from these blocks. Using an SVM classifier, the flame colored regions are classified by using the spatial and temporal characteristics. These classified flame colored regions are tested using video data that contain flames and flame colored objects. For the classification of pixel colors chromatic color model is used and analyzed fire colored pixels. Object detection and texture classification are performed by applied covariance descriptors. In order to define spatio-temporal blocks, temporal derivatives are calculated along with spatial parameters. Spatial temporal blocks can be defined using covariance matrices. Then compute the covariance values of the pixel property vectors in spatio-temporal blocks. For classification, a support vector machine is trained. According to the number of positively classified video blocks and their positions, confidence value is determined for fire detection. This method is computationally efficient. Covariance approach is well suited for detection of flames. Drawback of this method is that it is well suited when the fire is clearly visible. If the fire is far away from the camera and covered with dense smoke, this method performs poorly.

Mehdi Torabnezhad et al. [11] proposed another method that used image fusion technique to detect smoke. In this method, combine visual and thermal information to improve the rate of fire detection. The invisibility of smoke in the LWIR image can distinguish smoke from smoke-like objects. Infrared images do not detect smoke in the images but can detect smoke like objects. By combining visible and IR images smoke can be distinguished. Based on characteristics of visual and thermal smoke images a potential smoke mask is created. In-order to reduce false alarms, PSM is further analyzed by disorder measurements and energy calculations. For the detection of short range smoke visible and IR image fusion algorithm is used. Scope of this paper is to detect the smoke as an indicator of fire. Here visible and infrared images are combined together to distinguish smoke from smoke like objects. Earlier approaches that used sensor or visible images only gave false alarm.Visible images capture both smoke and smoke like objects. Infrared images do not capture smoke. Integrating these images gives correct information about smoke. Objective of this paper is to save people, forest from the fire. By this method generation of false alarms can be reduced to a great extent. The proposed algorithm consists of two phases. In the first phase combining visual and thermal information of the smoke and potential smoke mask is generated. PSM is again analyzed to differentiate true and false alarms. This method is very efficient and detects smoke successfully. Improves the fire detection rate and reduces the generation of false alarms. The drawback of this method is Correct and punctual detection of fire is not possible and comparison is required to identify smoke.

Anjuman-I-Islam's Kalsekar [12] (2016) proposed the project which is based on image processing and arduino serial communication. In this project, at the user end, the fire images will be feeded in the form of video frames. These images will be further processed by using the software, MATLAB. The proposed system uses RGB and YCbCr color space. The advantage of using YCbCr color space is that it can separate the luminance from the chrominance more effectively than RGB color space. Along with this smoke, motion, area detection is also performed using its color characteristics.

Mubarak A. I. Mahmoud [13] (2018) proposed the Forest fire detection algorithm and it consists of the following stages. Firstly, background subtraction is applied to movement containing region detection. Secondly, converting the segmented moving regions from RGB to YCbCr color space and applying five fire detection rules for separating candidate fire pixels were undertaken. Finally, temporal variation is then employed to differentiate between fire and fire-color objects. The proposed method is accurate and can be used in automatic forest fire-alarm systems.

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