LITERATURE SURVEY

Classification of Forest Fires

Forest fires may be divided into three classes: Surface fire, Crown fire and Ground fire.

Surface Fire

A fire that burns surface litter, other loose debris of the forest floor, and small vegetation. A surface fire may and often does burn up into the taller vegetation and the free crowns as it progresses. This is called crowing out, but it is not a true crown fire. Seeds may escape from serious injuries in surface fire. This is a common type of fire in Chir Pine of forest.

Crown Fire

A fire that advances from top to top of trees or shrubs more or less independently of the surface is called crown fire. This is the fastest spreading fire of all forest fires, and therefore most dangerous. Usually such fires consume, at least kill every thing from the ground upward.

Ground Fire

A fire that consumes the organic material beneath the surface litter of the forest floor is ground fire. In many forest types organic material in various stages of decomposition accumulates on top of the mineral soil. A fire spreading in and consuming such material, as in peat beds, the fire may penetrate a number of feet below the surface and travel entirely underground. They are least spectacular, slowest-moving and often hard to detect. In actual fire situations, these kinds of fires may occur simultaneously and in all kind of combinations. A surface fire may spread into the crowns and develop into a crown fire. A crown fire may drop to the ground and becomes a surface fire. Similarly, a surface fire may develop into ground fire.

Causes of Forest Fire

It is caused mainly by the following ,

Lightening

A fire caused directly or indirectly by lightening. It is a natural cause of fire in high hill coniferous forests. Lightening generally accompanied by rain which prevent the spread of such fires as many have been stated, but this cause may be responsible for serious fires, if occur in accessible areas where suppression is difficult. Or if accompanied by low rainfall and strong winds which accelerate the spread of fires.

Debris Burning

A fire spreading form any fire originally set for the purpose of clearing land, or for rubbish, garbage, range, stubble, or meadow burning. The forest fires which originate from fires set for land management or cleaning land for any purpose, including cultivation, pastoral purposes or for cleaning area from weeds etc, and it became uncontrolled and spread over the entire area. The cause of such fires are carelessness and ignorance, but not for all, as there is same risk more or less inherent in fire use.

Smoker

A fire caused by smokers, matches, or by burning tobacco in any form. It includes the widest range of people and is hardest to identify. This is a major cause of fire in most of the countries and cause fire only because of carelessness of smokers.

Campfire

A fire started for cocking, or for providing light or warmth and that spreads sufficiently from its source to require action by a fire control agency. Fires started by railroad or lumbering employees in connection with their work are usually excluded. Such fires are built by many people as hunters, hikers, fishermen, picnickers etc. Education to change people’s attitudes and habits is the basic prevention approach.

Citations

[1] 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.** In the above image set, the pixel is fire pixel as the intensity of Y channel is greater than Cb and Cr channel. HSV color model is used for Smoke detection as is does not show chrominance characteristics as fire. As smoke is the early indicator of fire it should be detected at lower temperature, here its color varies from white-bluish to white, the saturation is low which satisfies the HSV color model property. As like smoke, sky also has grayish color property and it may be identified as smoke. This problem is rectified by Motion Property, where sky will be removed.

[2] Paulo Vinicius Koerich Borges proposed a fire detection method based on probabilistic method and classification. Computer vision based approach is used in this approach. Though this approach is used surveillance it is also used to automatic video classification for retrieval of fire catastrophes in databases of newscast content. There are large variations in fire and background characteristics depending on the video instance. The proposed method observes the frame-to-frame changes of low-level features describing potential fire regions. These features include color, area size, surface coarseness, boundary roughness, and skewness within estimated fire regions. Bayes classifier is used for fire recognition. In addition, apriori knowledge of fire events captured in videos is used to significantly improve the results.The fire region is usually located in the center of each frame. This fact is used to model the probability of occurrence of fire.

[3] Zhanqing proposed another method using NN and Multi-threshold algorithm. In this method the NN not only classify the smoke, sky, background but also generates a continuous random output representing mixture of these. NN consumes time in case of large areas so multi-threshold algorithm also used as well. These two approaches may be combined or used separately depending on the size of the area. Multilayer Perceptron Neural Network is used here. The number of neurons in the output layer is equal to the number of desired parameters of the output vector, which are “smoke,” “sky,” and “background”. The degree of separation between pixels is identified by Euclidean Distance. Multi threshold algorithm is based on channel wise approach, reflectance of each channel value is used for threshold assumption and is applied to each and every pixels of the image, smoke pixels are marked and false pixels are removed. Threshold value is set as **0.9 <= channel 1 reflectance / channel 2 reflectance<= 1.5.** Pixels which reach this threshold are smoke pixels else are false pixels and are removed.