LITERATURE SURVEY
Emerging Methods For Early Detection On Forest Fire

Introduction:

Forest fires are wildfires that spread uncontrollably, burning plants, animals, grasslands and brushlands that fall in their path. The wind spreads the fire rapidly, causing significant air pollution.

Causes:

> **Natural causes** - Many forest fires start from natural causes such as lightning which set trees on fire. However, rain extinguishes such fires without causing much damage. High atmospheric temperatures and dryness (low humidity) offer favorable circumstance for a fire to start.

> **Man made causes** - Fire is caused when a source of fire like naked flame, cigarette or bidi, electric spark or any source of ignition comes into contact with inflammable material.

Effects:

> loss of valuable timber resources.

> degradation of catchment areas.

> loss of biodiversity and extinction of plants and animals.

> loss of wildlife habitat and depletion of wildlife.

> loss of natural regeneration and reduction in forest cover global warming.

> loss of carbon sink resource and increase in percentage of CO2in atmosphere.

> ozone layer depletion.

> health problems leading to diseases.

> loss of livelihood for tribal people and the rural poor, as approximately 300 million people are directly dependent upon collection of non-timber forest products from forest areas for their livelihood.

Literature Survey:

Celik (2007) [1] 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.

Surapong Surit, Watchara Chatwiriya [2] 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.

Chi Yuan (2016) [3] proposed a novel forest fire detection method using both color and motion features for processing images captured from the camera mounted on a UAV which is moving during the whole mission period. First, a color-based fire detection algorithm with light computational demand is designed to extract fire-colored pixels as fire candidate regions by making use of chromatic feature of fire and obtaining fire candidate regions for further analysis.The good performance is anticipated to significantly improve the accuracy of forest fire detection and reduce false alarm rates without increasing much computation efforts.

Toreyin (2007) [4] detect flames in LWIR by searching for bright-looking moving objects with rapid time-varying contours. A wavelet domain analysis of the 1D-curve representation of the contours is used to detect the high frequency nature of the boundary of a fire region. In addition, the temporal behavior of the region. is analyzed using a Hidden Markov Model (HMM). The combination of both spatial and temporal clues seems more appropriate than the luminosity approach and, according to the authors, their approach greatly reduces false alarms caused by ordinary bright moving objects.

Bosch (2013) [5] proposed the evolution of multi-sensor wireless network systems in the early automatic detection of forest fires. To determine the presence of a forest wildfire, the system employs decision fusion in thermal imaging, which can exploit various expected characteristics of a real fire, including short-term persistence and long-term increases over time.

References:

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[3] Chi Yuan, Zhixiang and Youmin Zhang, “UAV-based forest fire detection and tracking using image processing Techniques,” Proc. of IEEE International in ImageProcessing, pp. 978-1-4799-6009- 5/15, 2015.

[4] B.U.Toreyin, Y.Dedeoglu, A.E.Cetin, “Flame detection in video using hidden Markov models”, Procedings of IEEE International Conference on Image Processing, pp. 1230–1233,2005.

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