RESEARCH ARTICLE OPEN ACCESS

Forest Fire Detection Based on Wireless Image Processing

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Abstract:

Fire is a terrifying weapon, with nearly unlimited destructive power. Fire accidents are a major cause of human suffering and material loss and the one that perhaps are predicted the least accurately. A series of computer vision-based fire detection algorithms is proposed in this paper. These algorithms can be used in parallel with conventional fire detection systems to reduce false alarms. The motivation behind this research is to obtain beneficial information from images in the forest spatial data and use the same in the determination of regions at the risk of fires by utilizing Image Processing and Artificial Intelligence techniques. The proposed intelligent system will thus aid in alerting the fire stations with the help of a Global System for Mobile Communications in event of any fire to take immediate actions before fire spreads quickly and causes traumatizing loss.

Keywords **— Image processing, Forest flame, Forest Fire Detection, Rule based color model.**

I. Introduction:

The rapid progress in scientific data collection has led to enormous and ever-increasing quantity of data making it. Un feasible to be manually interpreted. Forest fires represent a constant threat to ecological systems. Infrastructure and human lives. Past has witnessed multiple instances of forest and wild land fires. Strong combustion not only burns forest and plants on the ground, but also changes forestry structure, forest biology, climate and soil performance. A manually segmented fire set is used to train a system that recognizes fire like color pixels. The training set is used to form a look-up table for the fire detection system. it is difficult or impossible to effectively detect fire. Due to single criterion, traditional fire detecting technology can't meet the demand of sensitivity and reliability. The current fire detecting technology is too laggard to discover the hidden trouble in advance and prevent the fine effectively. Image processing techniques profit a number of fields like to manufacturing, process control, fraud detection and network management. Other than this, a huge variety of data sets like market basket data, web data, DNA data, text data, and spatial data have benefited as well.

II. Overview of Proposed Paper :

This paper proposes an intelligent system that is capable of detecting fires in commercial buildings with the aid of Image Processing and Artificial Intelligence techniques. Color spaces used as a part of the color image pipeline in video and digital photography systems. Fires have notable influence over the ecological and economicutilities of the forest, being a prime constituent in a great number of forest ecosystems X is distinguished from X which is luminance, meaning that light intensity is nonlinearly encoded based on gamma corrected XYZ primaries. Therefore a value expressed as elements is predictable only if standard RGB primary chrom aticties are used. Due to the forest fires, several hundred million hectares of forest and other vegetation are destroyed every year.

III. Wireless Sensor Networks:

In a wireless sensor-based fire detection system, coverage of large areas in forest is impractical due to the requirement of regular distribution of sensors in close proximity and also battery charge is a big challenge.

IV. Satellite Antenna Monitoring :

Earth-orbiting satellites and even air-floating devices have been employed for observation and detection of forest fires. Satellite images gathered by two main satellites launched for forest fire detection purposes, the advanced very high resolution radiometer (AVHRR), launched in 1998, and the moderate resolution imaging spectroradiometer (MODIS), launched in 1999, have been used .Unfortunately, these satellites can provide images of the regions of the earth every two days and that is a long time for fire scanning; besides the quality of satellite images can be affected by weather conditions.

Fig. 1. point of sample fire Satellite Antenna Monitoring

V. Proposed Forest Fire Monitoring System :

The proposed research has been motivated by several earlier researches in the literature related to forest fire detection using spatial data and artificial intelligence techniques. A concise description of some of the recent researches is given in this section.

Nowadays, two different types of sensor networks are available for fire detection, camera surveillance and wireless sensor network. The development of sensors, digital camera, image processing, and industrial computers resulted in the development of a system for optical, automated early recognition and warning of forest fires.

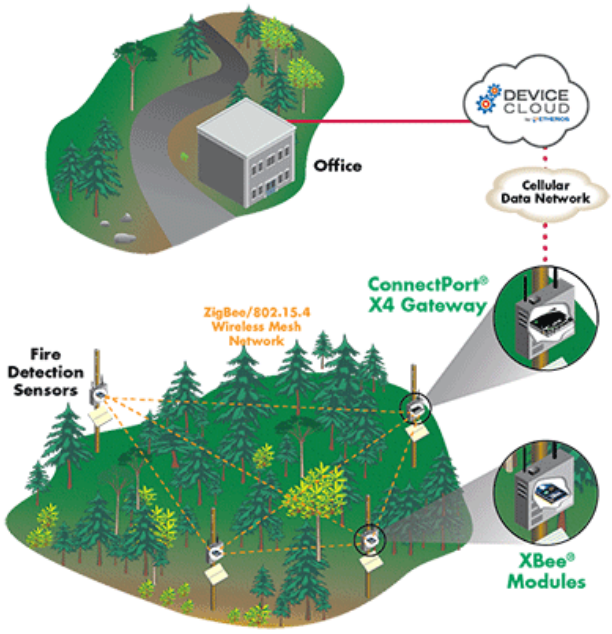

Fig. 2. Forest Fire Monitoring System

This can be detected/ monitored continuously by using temperature sensors and in accordance with the simple arrangement of transmitters. This concept is quite reliable and cost-effective in detecting of forest fire's since simple equipment's are arranged in a simple configuration and also GPS is used in this project to get the location of the forest fire.

VI. Radial Basis Function Neural Network:

Temperature Sensor Setup (TSS) and GPS Module are kept in a glass case/ box which are designed to withstand a high temperature and are located few feet above the ground. The TSS consists of Wired/Wireless temperature sensor and its associated circuitry, LNA (low noise amplifier) and power amplifier. Both the TSS and GPS Module are interfaced with the

Microcontroller. This arrangement is connected to a Secondary transmitter. The function of the Secondary transmitter is to transmit the data/signals from Microcontroller to the Main transmitter cum antenna. The data from the main transmitter will be communicated to an orbiting small satellite. The main antenna's function is to transmit the signals to the satellite.

VII. Transmitting an Alert on Positive Detection:

The line of sight and the early stage of the fire process problem could be solved with the second type of sensors. A new technology called wireless sensor network (WSN) is nowadays receiving more attention and has started to be applied in forest fire detection. Forest fire detection and prevention are another real problem faced by a number of countries. Different methods for monitoring the emergence of fires have been proposed. The early methods were based on manned observation towers but this technique was inefficient and not entirely effective. Subsequently, camera surveillance systems and satellite imaging technologies were tried but this also proved ineffective at being able to efficiently monitor the initial start of the surface fire. For example, camera networks can be installed in different positions in the forests but these provide only line of sight pictures and may be affected by weather conditions and/or physical obstacles.

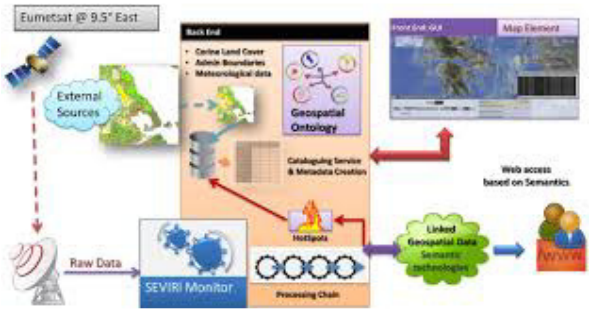

Fig. 2. Transmitting an Alert on Positive Detection

VIII. Conclusion:

In this research work a rule based on network model for forest fire security proposed. When we are using cluster of small satellites, we may also consider using small satellites for different purposes like monitoring the forest fire, vegetation of the forest, for monitoring the climate changes of that particular area like this in low cost. In this paper, we have presented an intelligent system for effective forest fire detection using spatial data. The proposed system made use of networks and artificial intelligence techniques. Hence, the most important goals in fire surveillance are quick and reliable detection and localization of the fire. Information about the progress of fire is also highly valuable for managing the fire during all its stages.

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