Emerging Methods for Early Detection of Forest Fires
LITERATURE SURVEY

1. Use of satellite images for forest fires in area determination and monitoring

Authors: Mulayim Gure, Mehmet Emin Ozel, H. Hulya Yildirim, Muzaffer Ozdemir

Abstract: In Mediterranean climate regions, forest fires are quite common in summer months due to increases in air temperature. Reforestation of fire areas are a constitutional obligation in Turkey. Identification as well as the follow-up rehabilitation efforts can be carried out by remote sensing techniques in economic and practical ways. In the present study, the images from LANDSAT and ASTER satellites were used in the determination of areal extentions and levels of damages due to recent forest fires in October 2008 in Canakkale Province of Turkey. Our findings are compared with the official forest fire records by Canakkale Forest Administration Office. Potential use of satellite images and related image processing and GIS techniques in the past and present forest fire identification and rehabilitation efforts are discussed and their possible use in the application of recent forest law amendments (known as 2B) are evaluated

Link: [Use of satellite images for forest fires in area determination and monitoring | IEEE Conference Publication | IEEE Xplore](#)

2. Using Popular Object Detection Methods for Real Time Forest Fire Detection

Authors: Shixiao Wu, Libing Zhang

Abstract: In this paper, we focus on three problems that surrounded forest fire detection, real-time, early fire detection, and false detection. For the first time, we use classical objective detection methods to detect forest fire: Faster R-CNN, YOLO (tiny-yolo-voc, tiny-yolo-voc 1, yolo-voc.2.0, and YOLOv3), and SSD, among them SSD has better real-time property, higher detection accuracy and early fire detection ability. We make the fire and smoke benchmark, utilize the new added smoke class and fire area changes to minimize the wrong detection. Meanwhile, we adjust YOLO's tiny-yolo-voc structure and propose a new structure tiny-yolo-voc1, the experiments proves that this

improves the fire detection accuracy rate. This paper is very practical for forest safety and real time forest monitor.

Link:

3. Forest Monitoring System for Early Fire Detection Based on Convolutional Neural Network and UAV imagery

Authors - Georgi Dimitrov Georgiev, Georgi Hristov, Plamen Zahariev, Diyana Kinaneva

Abstract: Forest fires are one of the main reasons for environmental degradation. In their early stages, the fires are hard to discover, so a faster and more accurate detection method can help minimize the amount of damage they can inflict. In this paper, we present an approach for autonomous early fire detection, which is based on a system with high degree of reliability and with no need of service or human interaction. To provide the autonomous capabilities to the proposed system, we have developed an object detection method, based on a convolutional neural network, which is presented in the main part of the paper. In order to have a better field of view over the observed area, instead of traditional lookout towers and satellite based monitoring, we use live video feed from an unmanned aerial vehicle (UAV), which patrols over the risky area. To make better predictions on the fire probability, we use not only the optical camera of the UAV, but also an on-board thermal camera. With the help of the software platform Node-RED, we have developed a web-based platform, which can present the acquired data in real-time and can notify the interested parties. The workflow for the development of the web-platform is also described in this paper.

Link:

4. Research on Forest Fire Detection Based on Wireless Sensor Network

Authors: Li Guang-Hui, Zhao Jun, Wang Zhi

Abstract: A comprehensive survey of the up-to-date methods and technologies of forest fire detection and monitoring based on wireless sensor network (WSN) is presented. This paper discusses and analyses the system frame and the key problems of WSN-

based forest fire monitoring, it focuses on the forest fire forecast modeling, WSN nodes deployment, WSN nodes and forest fire positioning, transmission control protocol, and the WSN based forest fire detection and alarm system

Link: [Research on Forest Fire Detection Based on Wireless Sensor Network | IEEE Conference Publication | IEEE Xplore](#)