TITLE: Emerging Methods for Early Detection of Forest Fires

DOMAIN: Artificial Intelligence
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Objective:

Forest fires are occurring throughout the year with an increasing intensity in the summer and autumn periods. These events are mainly caused by the actions of humans, but different nature and environmental phenomena, like lightning strikes or spontaneous combustion of dried leafs or sawdust, can also be credited for their occurrence. Regardless of the reasons for the ignition of the forest fires, they usually cause devastating damage to both nature and humans.

Forest fires are also considered as a main contributor to the air pollution, due to the fact that during every fire huge amounts of gases and particle mater are released in the atmosphere. To fight forest fires, different solutions were employed throughout the years.

Abstract:

Continuous monitoring of open space is of the utmost importance for the protection of forests against fire. Collected data in real time provide fast intervention of relevant services to extinguish the fire. Timely information about the appearance of fire reduce the number of areas affected by this fire and thereby minimizes the costs of fire extinguishing and the damage caused in the woods. The current way of detecting fire in an open area in Serbia is not in real time, and due to this, it is necessary to implement modern technology of collecting data related to early detection of fires.

This paper presents an integral project of forest-fire protection on the territory of Serbia in order to provide the reference for the application of terrestrial automated system for early detection and prediction of forest fires. An automated system could be comprised of infrared and high-resolution TV camera surveillance, covering a large part of the forest area and forest land

Keywords: TV camera surveillance, Fire extinguishing, forest-fire protection, Sensors, Detection and prediction of forest fires

Introdction

Forest fires are a major environmental issue, creating economic and ecological damage while endangering human lives. There are typically about 100,000 wildfires in the United States every year. Over 9 million acres of land have been destroyed due to treacherous wildfires. It is difficult to predict and detect Forest Fire in a sparsely populated forest area and it is more difficult if the prediction is done using ground-based methods like Camera or Video-Based approach. Satellites can be an important source of data prior to and also during the Fire due to its reliability and efficiency.

The various real-time forest fire detection and prediction approaches, with the goal of informing the local fire authorities.

Literature Review 1

Title : Early Forest Fire Detection Using Drones and Artificial Intelligence

Author : Varanasi LVSKB Kasyap, D. Sumathi, 1 Kumarraju Alluri, Pradeep Reddy CH, Navod Thilakarathne, R. Mahammad Shafi.

Abstract : Over the last few decades, forest fires are increased due to deforestation and global warming. Many trees and animals in the forest are affected by forest fires. Technology can be efficiently utilized to solve this problem. Forest fire detection is inevitable for forest fire management. The purpose of this work is to propose deep learning techniques to predict forest fires, which would be cost-effective. The mixed learning technique is composed of YOLOv4 tiny and LiDAR techniques. Unmanned aerial vehicles (UAVs) are promising options to patrol the forest by making them fly over the region.

Literature Review 2

Title : Forest Fire Detection System

Author : Sangjoon Cha, Chris Cantu, Pedro Cantu, Jose Flores Dr. Nantakan Wongkasem, Dr. Heinrich Foltz

Abstract : The world is burning. As global warming continues to display a statistical rise in global average temperatures and various environmental factors continue to contribute to the rise in forest fires, the need for a wireless detec_x0002_tion system to recognize these fire hazards and that can successfully alert the necessary first responders is becoming more and more apparent. Such a detection and alert system would be able to potentially save billions of dol_x0002_lars in property, infrastructure, and environmental costs and damages, pre_x0002_serve wildlife habitats and ecosystems that are directly affected by forest fires, and prevent the displacement of countless families from their homes that neighbor forested areas and regions

Literature Review3

Title : Forest monitoring system for early fire detection
Author : Georgi Hristov; Jordan Raychev; Diyana Kinaneva;
Plamen Zahariev

Abstract: Forest fires are occurring throughout the year with an increasing intensity in the summer and autumn periods. These events are mainly caused by the actions of humans, but different nature and environmental phenomena, like lightning strikes or spontaneous combustion of dried leafs or sawdust, can also be credited for their occurrence. Regardless of the reasons for the ignition of the forest fires, they usually cause devastating damage to both nature and humans. Forest fires are also considered as a main contributor to the air pollution, due to the fact that during every fire huge amounts of gases and particle mater are released in the atmosphere. To fight forest fires, different solutions were employed throughout the years

Technical Architecture: