LITERATURE SURVEY

Emerging Methods for Early Detection of Forest Fires

INTRODUCTION:

Over the last few years, climate change and human-caused factors have a significant impact on the environment. Wildfires have extreme consequences on local and global ecosystems and cause serious damages to infrastructure, injuries, and losses in human lives therefore,fire detection and the accurate monitoring of the disturbance type, size, and impact over large areas is becoming increasingly important.To this end, strong efforts have been made to avoid or mitigate such consequences by early fire detection or fire risk mapping.Traditionally, forest fires were mainly detected by human observation from fire lookout towers and involved only primitive tools, such as the Osborne fire Finder however, this approach is inefficient, as it is prone to human error and fatigue. On the other hand, conventional sensors for the detection of heat, smoke, flame, and gas typically take time for the particles to reach the point of sensors and activate them. In addition, the range of such sensors is relatively small, hence, a large number of sensors need to be installed to cover large areas .Recent advances in computer vision, machine learning, and remote sensing technologies offer new tools for detecting and monitoring forest fires. Depending on the acquisition level, three broad categories of widely used systems that can detect or monitor active fire or smoke incidents in real/near-real-time are identified and discussed, namely terrestrial, aerial, and satellite. These systems are usually equipped with visible, IR, or multispectral sensors whose data are processed by machine learning methods. These methods rely either on the extraction of handcrafted features or on powerful deep learning networks for early detection of forest fires as well as for modeling fire or smoke behavior.

REFERENCE:

TITLE AND AUTHOR	PROPOSED APPROACH
G. Hristov, J. Raychev, D. Kinaneva and P. Zahariev, "Emerging Methods for Early Detection of Forest Fires Using Unmanned Aerial Vehicles and Lorawan Sensor Networks," 2018 28th EAEEIE Annual Conference (EAEEIE), 2018, pp. 1-9, doi: 10.1109/EAEEIE.2018.8534245.	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.
T. Gupta, H. Liu and B. Bhanu, "Early Wildfire Smoke Detection in Videos," 2020 25th International Conference on Pattern Recognition (ICPR), 2021, pp. 8523-8530, doi: 10.1109/ICPR48806.2021.9413231.	Recent advances in unmanned aerial vehicles and camera technology have proven useful for the detection of smoke that emerges above the trees during a forest fire. Automatic detection of smoke in videos is of great interest to Fire department. To date, in most parts of the world, the fire is not detected in its early stage and generally it turns catastrophic. This paper introduces a novel technique that integrates spatial and temporal features in a deep learning framework using semi-supervised spatio-temporal video object segmentation and dense optical flow. However, detecting this smoke in the presence of haze and without the labeled data is difficult.
A. S. Mahdi and S. A. Mahmood, "Analysis of Deep Learning Methods for Early Wildfire Detection Systems: Review," 2022 5th International Conference on Engineering Technology and its Applications (IICETA), 2022, pp. 271-276, doi: 10.1109/IICETA54559.2022.9888515.	A wildfire is an uncontrollable fire that arises outside of a specific focus, damages property, and poses a threat to human life and health. Thousands of fires are started every year for a variety of reasons, including dry seasons, thunderstorms, and volcanic activity. However, in recent years, the human factor has emerged as the main reason for irreparable forest fires. In order to address the problem of wildfire detection, deep learning model-based wildfire detection and recognition have been attracted by researchers. Deep learning models using Convolutional Neural Network (CNN) are essentially required several dataset samples to train the network with high accuracy.

Chi Yuan, et al(2017) “Fire detection using infrared images for UAV-based forest fire Surveillance”	The paper proposed an image processing method for the application to UAV for the automatic detection of forest fires in infrared (IR) images.The algorithm makes use of brightness and motion clues along with image processing techniques based on histogram-based segmentation and optical flow approach for fire pixels detection.
B.C. Arrue, et al (2000)”An intelligent system for false alarm reduction in infrared forest-fire Detection”	The FAR system consists of applying new infrared-image processing techniques and artificial neural networks (ANNs), using additional information from meteorological sensors and from a geographical information database, taking advantage of the information redundancy from visual and infrared cameras through a matching process, and designing a fuzzy expert rule base to develop a decision function.