A LITERATURE SURVEY ON EMERGING METHODS FOR EARLY DETECTION OF FOREST FIRES AND INFORMATION GATHERING

COMPUTER SCIENCE AND ENGINEERING

JEPPIAAR SRR ENGINEERING COLEEGE

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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 leaves 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 amount of gases and particle mater are released in the atmosphere. To fight forest fires, different solutions were employed throughout the years. They were primary aimed at the early detection of the fires. The simplest of these solutions is the establishment of a network of observation posts - both cheap and easy to accomplish, but also time-consuming for the involved people. The constant evolution of the information and communication technologies has led to the introduction of a new generation of solutions for early detection and even prevention of forest fires.

Keywords:

Early fire detection, Multispectral imaging systems, Terrestrial, Aerial, Satellite, Artificial intelligence

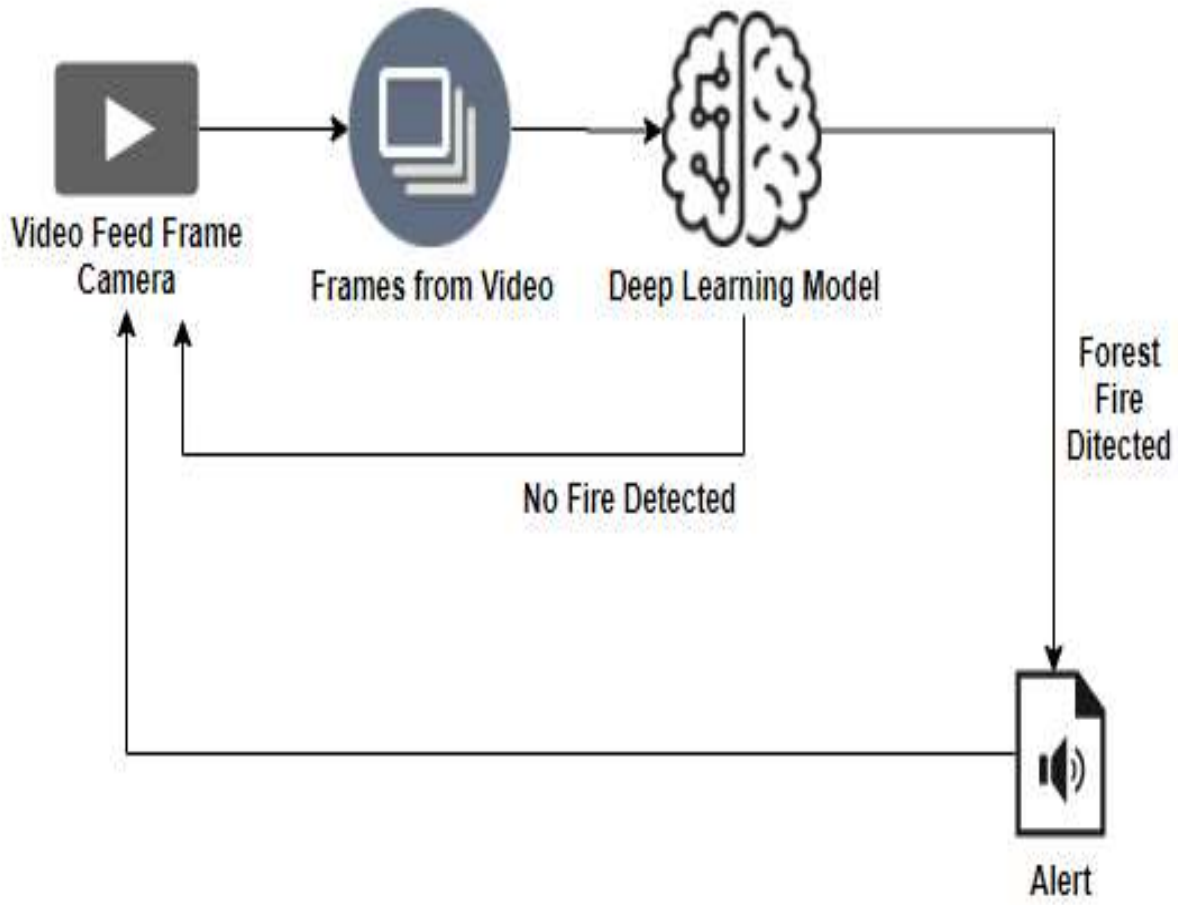
INTRODUCTION

Over the last few years, climate change and human-caused factors have a significant impact on the environment. Some of these events include heat waves, droughts, dust storms, floods, hurricanes, and wildfires. 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

TECHNICAL ARCHITECTURE



WORKFLOW

The camera-based fire monitoring system can monitor the specified area in real time through video processing. When a fire is detected based on the video, it will send a captured alarm image to the administrator. The administrator makes a final confirmation based on the submitted alarm image

We combine motion detection based on frame difference with color detection based on the RGB/HSI model. Color detection is only for regions of motion that the motion detection phase is completed. Our method has improved the precision and reduced redundant calculation. In addition, we have improved the frame difference method.

According to the spatial correlation between consecutive image frames, we have improved the traditional methods of detecting fire from one single image frame. Temporal information is combined with the flame features through a space-time flame centroid stability-based detection method. At the same time, we combine the data obtained during the fire pre-processing phase to reduce computational redundancy and computational complexity.

We extracted various flame features, spatial variability, shape variability, and area variability. We used the support vector machine to train, complete the final verification, reduce the false negatives rate and false positives rate, and improve the accuracy.

SOFTWARE REQUIRED

Python, CNN, IBM Cloud, IBM Watson Studio, Open CV, Deep Learning, Python-Flask

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