

Emerging Methods for Early Detection of Forest Fires

Problem statement

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 survey

Introduction:

Forests are the protectors of earth's ecological balance. Unfortunately, the forest fire is usually only observed when it has already spread over a large area, making its control and stoppage arduous and even impossible at times. The result is devastating loss and irreparable damage to the environment and atmosphere (30% of carbon dioxide (CO₂) in the atmosphere comes from forest fires) [1], in addition to irreparable damage to the ecology (huge amounts of smoke and carbon dioxide (CO₂) in the atmosphere). Among other terrible consequences of forest fires are long-term disastrous effects such as impacts on local weather patterns, global warming, and extinction of rare species of the flora and fauna.

Authorities Fire Suppression and Detection Techniques:

The most frequently used fire detection and suppression techniques employed by authorities can be summarised as follows:

(i)

Controlled burning,

(ii)

Fire weather forecasts and estimates of fuel and moisture,

(iii)

Watch towers,

(iv)

Optical smoke detection,

(v)

Lightning detectors which detect the coordinates of the strike,

(vi)

Infrared,

(vii)

Spotter planes,

(viii)

Water tankers,

(ix)

Mobile/smart phone calls becoming increasingly common for detecting fires early, and

(x)

Education through Fire Watch or similar schemes for house owners.

Some of the techniques used in fire suppression include burning dry areas under the management of fire fighters rather than having a crisis later or using flying water tankers like in Canada. Interestingly, others sweep away everything within a planned wide line to surround the fire with a dead end of unfuelled areas like in the Middle East. In some parts of Australia, providing the fire does not harm any humans or properties, it is left to burn, until it dies alone.

Satellite-Based System:

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 .

Optical sensor and digital camera:

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.

Machinery and Equipment:

Nowadays, alongside mobile fire extinguishing equipment, fighting forest fires continues to be hard manual work for as many people as are available to fight the fire. Therefore maintaining appropriate fire-fighting tools and machinery is the responsibility of forest enterprises of all ownership type in areas with a medium to high forest fire risk. These include hand tools such as spades, shovels, fire beaters and axes as well as transport vehicles or tractors and ploughs

suitable for working in forests. Such tools and machinery are either kept by the forest enterprise themselves or contracted in.