EMERGING METHODS FOR EARLY DETECTION OF FOREST FIRES

Abstract: Forests can purify water, stabilize soil, cycle nutrients, moderate climate, and store carbon. They can create habitat for wildlife and nurture environments rich in biological diversity. They can also contribute billions of dollars to the country's economic wealth. However, hundreds of millions of hectares of forests are unfortunately devastated by forest fire each year. Forest fire has been constantly threatening to ecological systems, infrastructure, and public safety. In the image processing based forest fire detection using YCbCr colour model, method adopts rule based colour model due to its less complexity and effectiveness. YCbCr colour space effectively separates luminance from chrominance compared to other colour spaces like RGB. The method not only separates fire flame pixels but also separates high temperature fire centre pixels by taking in to account of statistical parameters of fire image in YCbCr colour space like mean and standard deviation. This paper presents a literature study on Image processing for forest fire detection.

Key words: Forest Fire Detection, Image Processing, Colour Model, Colour Space

INTRODUCTION

Image Processing: is processing of images using mathematical operations by using any form of signal processing for which the input is an image, such as a photograph or video frame the output of image processing may be either an image or a set of characteristics or parameters related to the image. Most image-processing techniques involve treating the image as a twodimensional signal and applying standard signalprocessing techniques to it. A colour model is an abstract mathematical model describing the way colours can be represented as tuples of numbers (e.g. triples in RGB or quadruples in CMYK).
1. CMYK Colour Model: Colours can be created in printing with colour spaces

based on the CMYK colour model, using the subtractive primary colours of pigment (cyan (C), magenta (M), yellow (Y), and black (K)). To create a 3-D representation of a given colour space, we can assign the amount of magenta colour to the representation's X axis, the amount of cyan to its Y axis, and the amount of yellow to its Z axis. The resulting 3-D space provides a unique position for every possible colour that can be created by combining those three pigments.

LITERATURE REVIEW

IMAGE PROCESSING APPLICATION FOREST FIRE SURVEILLANCE

This paper describes a scheme for automatic forest surveillance. A complete system for forest fire detection is firstly presented although we focus on infrared image processing. The proposed scheme based on infrared image processing performs early detection of any fire threat. With the aim of determining the presence or absence of fire, the proposed algorithms performs the fusion of different detectors which exploit different expected characteristics of a real fire, like persistence and increase. Theoretical results and practical simulations are presented to corroborate the control of the system related with probability of false alarm (PFA). Probability of detection (PD) dependence on signal to noise ration (SNR) is also evaluated.

ADVANTAGES

- Perform early detection any fire threat

DISADVANTAGES

- Sometime may be have problems to detect.

UAV-BASED FOREST FIRE FIRE DETECTION AND TRACKING

In this paper, an unmanned aerial vehicle (UAV) based forest fire detection and tracking method is proposed. Firstly, a brief illustration of UAV-based forest fire detection and tracking system is presented. Then, a set of forest fire detection and tracking algorithms are developed including median filtering, color space conversion, threshold segmentation, morphological operations, and blob counter. The basic idea of the proposed method is to adopt the channel "a" in Lab color model to extract fire-pixels by making use of chromatic features of fire. Numerous experimental validations are carried out, and the experimental results show that the proposed methodology can effectively extract the fire pixels and track the fire zone.

ADVANTAGES

- Fire detection and tracking method is proposed UAV based forest fire detection tracking system is presented

DISADVANTAGES

- UAV based image processing sometime give late detection alaram

SATELLITE-BASED SYSTEM

Earth-orbiting satellites and even air-floating devices have been employed for observation and detection of forest res. Satellite images gathered by two main

satellites launched for forest re detection purposes, the advanced very high resolution radiometer (AVHRR), launched and the moderate resolution imaging spectroradiometer launched in have been used unfortunately, these satellite can provide image of the regions of the earth every two days and that is a long time for scanning besides the quality of satellite image can be affected by weather conditions.

ADVANTAGES

- Prevent wildfire and reduce their damage
- New generation solution for early detect and prevention of fire forest

DISADVANTAGES

- They spend the use of technology is many cost
- Some time network problem is there

OPTICAL SENSOR AND DIGITAL CAMERA

Nowadays, two different types of sensor networks are avail-able 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.

Different types of detection sensors can be used interrestrial systems

(i) video-camera, sensitive to visible spectrum of smoke recognisable during the day and a fire recognisable at night,

(ii) infrared (IR), thermal imaging cameras based on the detection of heat flow of the fire

(iii) IR spectrometers to identify the spectral characteristics of smoke,

(iv) light detection and ranging systems—LIDAR (detection of light and range) that measure laser rays reflected from the smoke particles.

ADVANTAGES

- Camera based on the detection of heat flow of the fire and very sensitive sensors easily to detect

DISADVANTAGES

- Some issue to identify the fire detection

CONCLUSIONS

The proposed system uses YCbCr colour spaces. Because YCbCr colour space separates luminance from chrominance, hence it is robust to changing illumination than other colour spaces like RGB and rgb (normalized RGB). The proposed method not only separates fire flame pixels but also separates high temperature fire centre pixels by taking in to account of statistical parameters of fire image in YCbCr colour space like mean and standard deviation. It uses four rules to classify the fire pixels. Two rules are used for segmenting the fire flame region and two rules are used for segmenting the high temperature fire centre region

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