Emerging methods for Early detection of Forest Fires

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ABSTRACT

- Automatic fire detection systems, when combined with other elements of an emergency response and evacuation plan, can significantly reduce property damage, personal injuries, and loss of life from fire in the workplace.
- In this project, the Ai based forest fire detection is implemented by using algorithm called YOLOv3 .
- To balance the efficiency and accuracy, the model is fine-tuned considering the nature of the target problem and fire data.

INTRODUCTION

- Fire detection systems are a critical element of any building design. For high-rise buildings and multi-winged structures such as hospitals and hotels, these designs can become complex.
- Their main function is to quickly identify a developing fire and alert building occupants and emergency response personnel before extensive damage occurs.
- Automatic fire detection systems do this by using electronic sensors to detect the smoke, heat, or flames from a fire and providing an early warning.

LITERATURE SURVEY

Year & Author	Title	Description	Advantages	Disadvantages
Khan Muhammad, Rafik Hamza, Jamil Ahmad	Secure Surveillance Framework for IoT systems using Probabilistic Image Encryption	▪ A secure surveillance framework for IoT systems by intelligent integration of video summarization and image encryption ▪ Pixel based frame detection	▪ High secure ▪ System stability is high	Complexity of system high

Year & Author	Title	Description	Advantages	Disadvantages
Khan Muhammad, Rafik Hamza, Jamil Ahmad	fire-pixels and smokc-pixels. The decision function of firc-pix& is mainly deduced by the intensity and saturation of R component.	▪ Fire disasters are man-made disasters, which cause ecological, social, and economical damages. To minimize these losses, early detection of fire and an autonomous response is important and helpful to disaster management systems.	▪ Pixel we can segrated properly	ensuring reliable data dissemination

Year & Author	Title	Description	Disadvantages	Advantages
Thou-Ho Chen, Ping-Hsueh Wu, and Yung-Chuen Chiou	An Early Fire-Detection Method Based on Image Processing	▪ a secure surveillance framework for IoT systems by intelligent integration of video summarization and image encryption ▪ Pixel based frame detection	Complexity of system high	IOT system update the fire stage simultaneously

Year & Author	Title	Description	Disadvantages	Advantages
Rafik Hamza, Jamil Ahmad	Early Fire Detection using Convolutional Neural Networks during Surveillance for Effective Disaster Management	▪ novel method to detect fire and/or flames in real-time by processing the video data generated by an ordinary camera monitoring a scene. In addition to ordinary motion and color clues, flame and fire flicker is detected by analyzing the video in the wavelet domain	high color clues And fag is present in the system	This system used for disaster managemen t system

Year & Author	Title	Description	Advantages	Disadvantages
Thou-Ho Chen, Ping-Hsueh Wu, and Yung-Chuen Chiou	Computer vision based method for real-time fire and flame detection	▪ a secure surveillance framework for IoT systems by intelligent integration of video summarization and image encryption ▪ Pixel based frame detection	▪ High accuracy ▪ Frames we can detect	Complexity of system high

Year & Author	Title	Description	Advantages	Disadvantages
Manish Kumar, Shubham Kaul 2019	**Intruder Detection and Alert in Real Time", India Innovation Initiative**	▪ In this paper design and develop a smart intruder detection and alert system which aims to elevate the security as well as the likelihood of true positive identification of trespassers and intruders as compared to other commonly deployed electronic security systems.	▪ High accuracy ▪ Frames we can detect	Complexity of system high

Year & Author	Title	Description	Advantages	Disadvantages
Yang, B. Jiang, B. Li, K. Tian 2017	**A fast image retrieval method designed for network big data**	In the field of big data applications, image in-formation is widely used. The value density of information utilization in big data is very low, and how to extract useful information quickly is very important.	high color clues And fag is present in the system	This system used for disaster management system

Year & Author	Title	Description	Advantages	Disadvantages
Szegedy, W. Liu, Y. Jia, P. Sermanet 2015	**Going deeper with convolutions**	This paper proposed a deep convolutional neural network architecture code named Inception that achieves the new state of the art for classification and detection in the ImageNet Large-Scale Visual Recognition Challenge 2014 (ILSVRC14).	▪ Complexity of system high	IOT system update the fire stage simultaneously

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Year & Author	Title	Description	Advantages	Disadvantages
K. Muhammad, R. Hamza 2018	**Secure Surveillance Framework for IoT systems using Probabilistic Image Encryption**	This paper proposes a secure surveillance framework for IoT systems by intelligent integration of video summarization and image encryption. Firstly, an efficient video summarization method is used to extract the informative frames using the processing capabilities of visual sensors	high color clues And fag is present in the system	This system used for disaster management system

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Yang, B. Jiang, B. Li, K 2017	**A fast image retrieval method designed for network big data**	In the field of big data applications, image in-formation is widely used. The value density of information utilization in big data is very low, and how to extract useful information quickly is very important.	▪ Complexity of system high	This system used for disaster management system

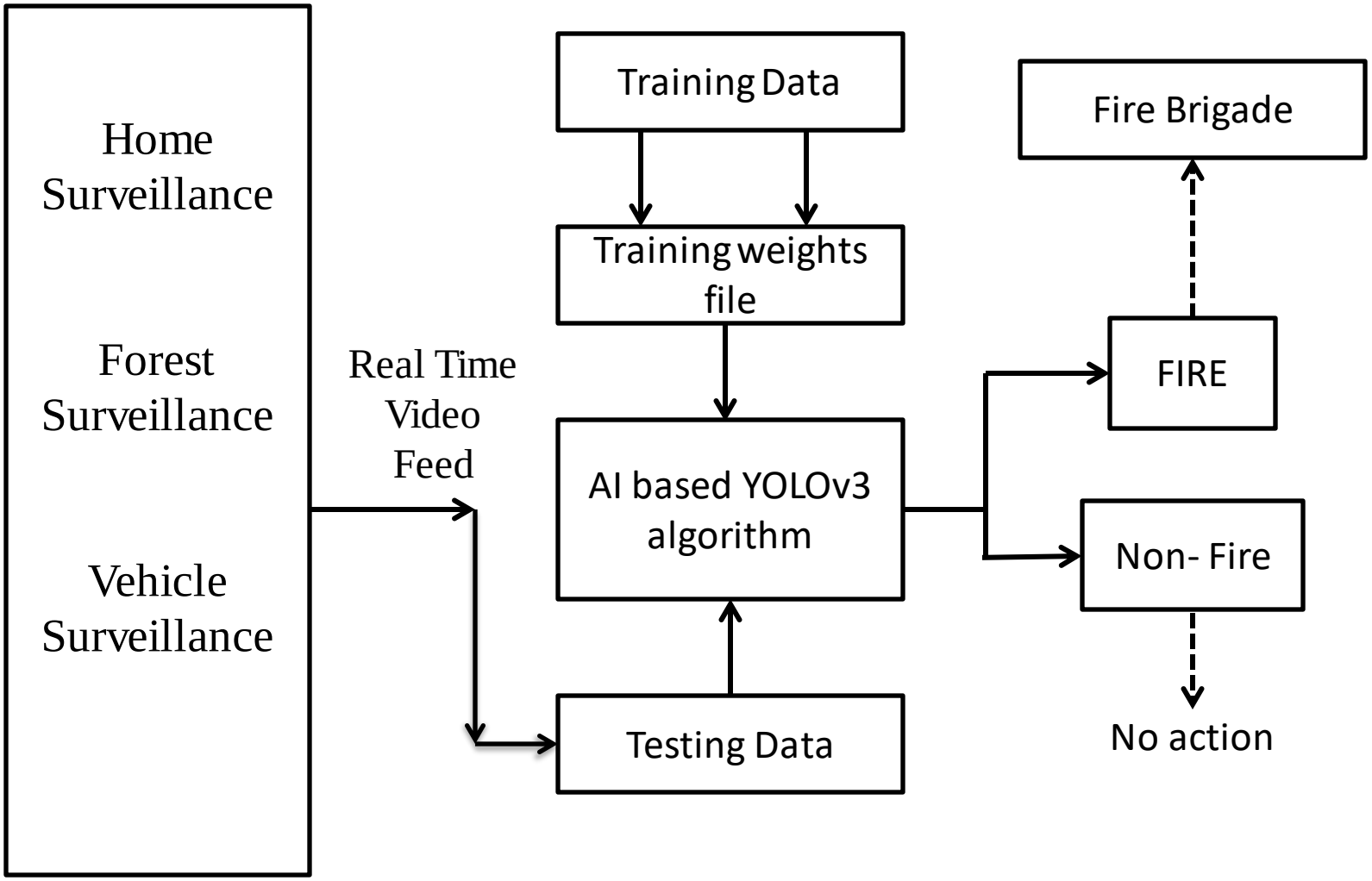
Year & Author	Title	Description	Advantages	Disadvantages
Guanglin Li, Mario 2014	**Electromyography Pattern-Recognition-Based Control of Powered Multifunctional Upper-Limb Prostheses**	The human history has been accompanied by accidental trauma, war, and congenital anomalies.	▪ High accuracy	More skills required

Year & Author	Title	Description	Advantages	Disadvantages
P. Foggia, A. Saggese 2015	**Real-Time Fire Detection for Video-Surveillance Applications Using a Combination of Experts Based on Color, Shape, and Motion**	In this paper we propose a method able to detect fires by analyzing the videos acquired by surveillance cameras	▪ High accuracy	More skills required

EXISTING SYSTEM

- The pixel-level methods are fast due to usage of pixel-wise features such as colors and flickers, however, their performance is not attractive as such methods can be easily biased.
- Compared to pixel-level methods, blob-level flame detection methods show better performance as such methods consider blob-level candidates for features extraction to detect flame.
- The major problem with such methods is the difficulty in training their classifiers due to numerous shapes of fire blobs.
- To improve the accuracy, researchers attempted to explore color and motion features for flame detection.

ARCHITECTURE DIAGRAM



Modules list

- OpenCV
- Matplotlib
- Numpy
- Gaussian blur

Matplotlib

- Matplotlib is a plotting library for the Python programming language and its numerical mathematics extension NumPy. It provides an object-oriented API for embedding plots into applications using general-purpose GUI toolkits like Tkinter, wxPython, Qt, or GTK+

opencv

- OpenCV is a library of programming functions mainly aimed at real-time computer vision. Originally developed by Intel, it was later supported by Willow Garage then Itseez. The library is cross-platform and free for use under the open-source Apache 2 License.

Numpy

- library for the Python programming language, adding support for large, multi-dimensional arrays and matrices, along with a large collection of high-level mathematical functions to operate on these arrays.
- The ancestor of NumPy,Numeric, was originally created by Jim Hugunin with contributions from several other developers.
- In 2005, Travis Oliphant created NumPy by incorporating features of the competing Numarray into Numeric, with extensive modifications.
- NumPy is open-source software and has many contributors.

Gaussian blur

- In image processing, a Gaussian blur (also known as Gaussian smoothing) is the result of blurring an image by a Gaussian function (named after mathematician and scientist Carl Friedrich Gauss).
- It is a widely used effect in graphics software,typically to reduce image noise and reduce detail.
- The visual effect of this blurring technique is a smooth blur resembling that of viewing the image through a translucent screen, distinctly different from the bokeh effect produced by an out-of-focus lens or the shadow of an object under usual illumination.
- Gaussian smoothing is also used as a pre-processing stage in computer vision algorithms

PROPOSED SYSTEM

- Al based forest fire detection is proposed by using algorithm called YOLO v3.
- Our framework avoids the tedious and time consuming process of feature engineering and automatically learns rich features from raw fire data.
- The DarkNet is a framework which is used to train our model.

Advantages

Cost effective

High Efficiency

Easy to detect

APPLICATIONS

- Home surveillance
- Fire surveillance
- Vehicle surveillance
- Forest fire detection

SOFTWARE REQUIREMENT

- **H/W System Configuration:-**
- Processor - Pentium –IV
- RAM - 4 GB (min)
- Hard Disk - 20 GB
- **S/W System Configuration:-**
- Operating System : Windows 7 or 8
- Front End : python Idle version 3.7

Conclusion

In our project we propose a fire detection algorithm which is free from sensors as ordinary fire detection systems contain. The objective of this project was to create a system which would be able to detect fire as early as possible from a live video feed.

System is expected to detect fire while it is still small and has not grown to proportions.

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THANK YOU