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Fire Detection with Image Processing using Live Camera

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Abstract: *People's safety and property can only be saved if the fire alarm signal is precisely detected and identified as early as possible in the fire, which is a terrible catastrophe for the security of people's lives and properties. Fire detection accuracy and validity are degraded as a result of growing ambiguity in the fire signal. – An algorithm for the detection of one dimensional fire space is provided to demonstrate the suggested method's fine fault tolerance, robustness, and accuracy in a novel technique for detecting uncertainty fire signals based on fire scenarios. First, an analysis of fire scenario performance yields a fractal character for the fire space, and then an intelligent method based on rough set theory and trend integration is used to process the multi-source signal obtained from a group of fire detectors. When a relationship between the two characters is recognised as being logically coincident, an actual alarm for a fire is triggered.*

Keywords: Fire Detection, Camera.

I. INTRODUCTION

People's safety and property can only be saved if the fire alarm signal is precisely detected and identified as early as possible in the fire, which is a terrible catastrophe for the security of people's lives and properties. Firedetection accuracy and validity are degraded as a result of growing ambiguity in the fire signal. – An algorithmfor the detection of one dimensional fire space is provided to demonstrate the suggested method's fine fault tolerance, robustness, and accuracy in a novel technique for detecting uncertainty fire signals based on fire scenarios. First, an analysis of fire scenario performance yields a fractal character for the fire space, and then an intelligent method based on rough set theory and trend integration is used to process the multi-source signal obtained from a group of fire detectors. When a relationship between the two characters is recognised asbeing logically coincident, an actual alarm for a fire is triggered.

II. LITERATURE REVIEW

Ke Chen, Yanying Cheng, Hui Bai , Chunjie Mou, Yuchun Zhang ” Research on Image Fire Detection Based on Support Vector Machine.” [1] There are a number of environmental factors that must 1 be taken into consideration when using traditional temperature and smoke sensors to spot early fires. A support vector machine-based image fire detection method is created by studying the attributes of fire in digital pictures. Using the inter-frame difference method, the motion zone is identified as the Suspected fire area. One additional sample is taken to ensure the uniformity of the size. Once these features have been gathered, a support vector machine is utilised to identify and categorise objects based on their coloration and texture. Internet resources and self shot videos were combined to form data sets, which were then tested by a trained support vector machine. As a consequence of the trials, the algorithm was 1 shown to be more accurate in spotting fires at an early stage.

Shixiao wu , Libing Zhang,” Secure and Efficient Data Deduplication in JointCloud Storage.” [2] — Real- time detection, early detection, and incorrect detection are the subject of this study. To better detect forest fires, this work makes use of faster R-CNN, YOLO (yolov.2.0 and yolov3), and SSD. Increased detection accuracy and faster fire detection are only two of the benefits of employing SSDs in real-world applications. To reduce false alarms, we may use the newly implemented improvements to smoke class and fire area. As we continue to work on the song, we've made some changes to the original tiny-yolo-voc structure and offered a new one. Fire detection accuracy has been proven to be improved by using tiny-yolo voc1. If you want to keep tabs on forest safety and health in real time, this piece is a must have.

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Huang Hongyu, Kuang Ping, Li Fan, Shi Huaxin," An Improved Multi-Scale Fire Detection Method Based On Convolutional Neural Network" [3] To minimise financial damages and environmental damage, fire detection systems must be as accurate as possible and respond as quickly as possible when a fire breaks out. For distant high-dome or early-stage low-flame fires, traditional sensors are still extensively deployed, but their performance is poor, hence image- and video-based methods of predicting fires are becoming more prevalent. This study improves the YOLOv4 1 fire detection system by using Convolutional Neural Networks (CNN). An improved loss function for small-scale flame detection, a combination of Soft-NMS post processing and DIoUNMS post-processing to increase the suppression impact of the redundant Bounding box, as well as a reduction in poor recall rate are some of the advantages of our approach. As shown by the model's results on our dataset

Oxsy Giandi, Surabaya, Indonesia oxsy. "Prototype of Fire Symptom Detection System "[4] Cloud storage is one of the most essential cloud computing services, allowing cloud users to outsource their data to the cloud for storage and sharing with other authorised users. Secure deduplication 1 has been extensively investigated in cloud storage because it may reduce redundancy across encrypted data, hence lowering storage space and communication overhead. Deduplication solutions that claim to be safe and private often include characteristics like data confidentiality, tag consistency, access control and resistance to brute force assaults. None of them can fulfil all four conditions at the same time, as far as we can tell, Specifically, we provide a secure deduplication method with user defined access control in this work to solve this restriction. By allowing only the cloud service provider to authorise data access on behalf of the data owners, our approach may decrease duplication to the maximum degree feasible without jeopardising cloud users' security or privacy.

Jiang Feng, yang Feng "Design and experimental research of video detection system for ship fire" [5] To address the inadequacies of existing fire detectors and increase the reliability of fire alarm, this study employs a lightweight direct regression detection algorithm YOLO v3tiny based on the Raspberry Pi hardware conditions and the Keras deep learning framework. When it comes to video testing and fire simulation, the Rpi Fire system has shown to be very accurate and recallable, making it an excellent fit for shipboard use.

Sneha Wilson, Shyni P Varghese, Nikhil G A, Manolekshmi I,Raji P G," A Comprehensive Study on Fire Detection "[6] Undiscovered fires have cost the world a lot of money in the last several years. Effective fire detection systems are in more demand than ever before. Existing fire and smoke detectors are malfunctioning because of the system's inefficiency. Fire detection systems with high detection rates and low fault alert rates are suggested when using a vision-based and video surveillance system. Live camera data may 1 be used to identify fires in progress. As a consequence of analysing the fire flame characteristics and using edge detection and thresholding techniques, a fire detection model is developed. Hazardous flames are identified by their colour, velocity, form and texture. Color models such as HSV and YCbCr are employed in the system for better detection. Indoor and outdoor environments are suitable for use.

Sneha Wilson, Shyni P Varghese, Nikhil G A, Manolekshmi I, Raji P G," A Comprehensive Study on Fire Detection "[7] Accidents caused by unknown flames have cost billions of dollars throughout the world. The need for efficient fire detection systems is growing. Existing 1 fire and smoke detectors are failing due to the system's inefficiency. A vision-based system integrated with a video surveillance fire detection system should have a high detection rate and a low fault warning rate, according to experts. Real-time fire detection is possible by analysing live camera data. The characteristics of the fire flames are analysed, and the fire is identified using edge detection and thresholding techniques, culminating in the building of a fire detection model. It recognises dangerous flames based on their colour, velocity, form, and texture. Color models like HSV and YCbCr are 1 employed in the system for better detection. It's suitable for both indoor and outdoor use.

Xuan Zhao, Hang Ji," Fire Smoke Detection Based on Contextual Object Detection " [8] Fires have been identified using an autonomous vision system to detect flames in open areas where typical smoke alarms are ineffective. Detecting the smoke trail, on the other hand, presented significant hurdles for both systems. To address this problem, we offer a unique method that blends a context-aware framework with autonomous visual smoke detection. The proposed method is put to the test on a dataset, and the findings show that it is effective.

Hanh Dang-Ng, Hieu Nguyen-Trung" Aerial Forest Fire Surveillance – Evaluation of Forest Fire Detection Model using Aerial Videos "[9] Unmanned aerial vehicles (UAVs), which may offer an aerial view for rapid reaction in large scale disaster zones, have recently been used to monitor forest fires. This study looks at a comprehensive model of forest fire detection utilising aerial videos to see whether it can be used in airborne forest fire monitoring. Fire pixels are extracted using the colour and motion properties of the flame. The usefulness as well as the flaws of our previous fire detection

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technology are shown utilising a large database of different scene conditions. A total of 16898 forest fire frames were analysed in 49 aerial videos in our collection. With a 7.08 percent false alarm rate and a 6.86 percent miss rate, our forest fire detection system has a 93.97 percent accuracy rate. The major reason for the fire's spread is dense smoke that blankets almost the whole area.

III. PROPOSED SYSTEM

In the recommended system, we employ the AES method for encryption and decryption, as well as data protection and secure access control. The MD 5 technique should be used to prevent duplication of data.

3.1 System Architecture

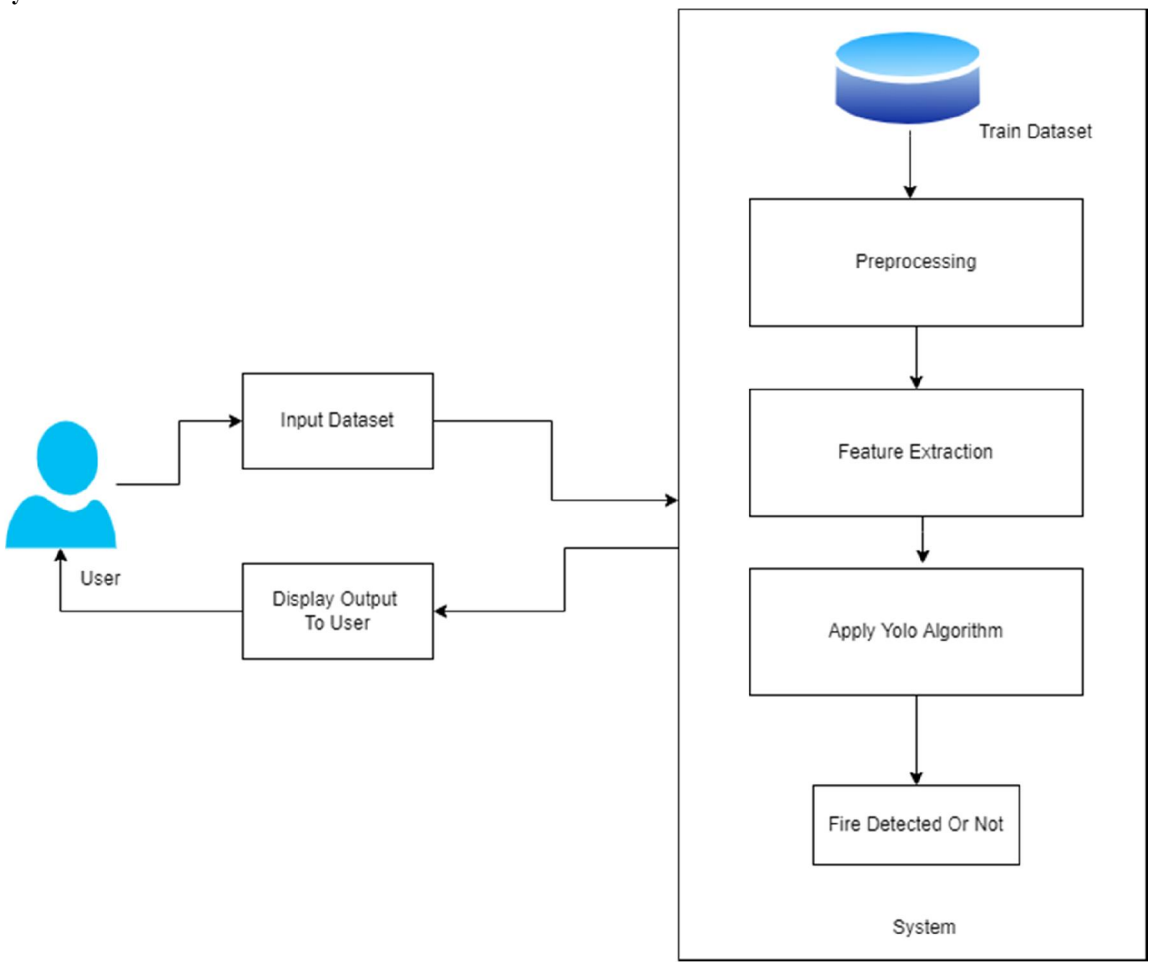

Figure: System Architecture

IV. ALGORITHM

YOLO Algorithm to recognise objects in real time. To detect objects, the approach just takes a single forward propagation through a neural network, as the name suggests. This indicates that a single algorithm run is used to forecast the entire image. You Only Look Once is a real-time object detection technique that saves time by generating region recommendations in real time. It prioritises speed and recognition above exact item location.

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V. CONCLUSION

As a consequence of smart cameras' inbuilt processing capabilities, intelligent surveillance systems have arisen. These intelligent cameras can detect a wide range of unusual events, including vehicle accidents, medical problems, and fires. Fire is the most deadly abnormal occurrence because its failure to be controlled at an early stage may result in huge catastrophes, resulting in human, ecological, and economic losses.

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