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Fire Detection System using Live Camera

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ABSTRACT: In this paper, we propose a novel system for detecting fire using Deep Neural Networks (DNN). Detection of fire can be extremely difficult using existing methods of smoke sensors installed in the buildings. They are slow and cost inefficient due to their primitive design and technology. This paper critically analyzes the scope of Machine Learning for detection and sending alerts with video from CCTV footages. This project uses self-built dataset containing video frames with fire. The data is then preprocessed and use the DNN to build a machine learning model. The test set of the dataset is given as input for validating the algorithm and experiments are noted. The project focus on building cost efficient and highly accurate machine that can be used in almost any use case of fire detection.

KEYWORDS: Fire detection, Deep neural networks, Machine learning, CCTV, Object detection.

I. INTRODUCTION

Recently, a range of sensors are introduced for various applications like setting off a fire alarm, vehicle obstacle detection, visualizing the inside of the human body for diagnosis, animal and ship monitoring, and surveillance. Of those applications, surveillance has primarily attracted the attention of researchers because of the improved embedded processing capabilities of cameras.

Using smart surveillance systems, various abnormal events like road accidents, fires, medical emergencies, etc., may be detected at early stages, and also the appropriate authority is autonomously informed.

A fireplace is an abnormal event which might cause significant damage to lives and property within a awfully short time. The most causes of such disasters include human error or a system failure which ends in severe loss of human life and other damage. So as to avoid such disasters, it's important to detect fires at early stages utilizing smart surveillance cameras.

Fire can make major hazards in this hectic world. All buildings and vehicles employed in public transportation have fire prevention and fire protection systems due to the accelerated number within the fire incidents. Also, many of the firms conduct a mock fire drill in every occurrence of months to safeguard their employees from the fire. This is able to help them to know what to try and do or what to not do when a fireplace situation happens. Forests are one in every of the most factors in balancing the ecology. It's very harmful when a fireplace occurs in a very forest. But most of the time, the detection of fire happens when it touch a large region. Sometimes, it couldn't be possible to prevent the fire. As a result, the damage of the environment is beyond predictable. The emission of huge amount of dioxide (CO2) from the fire damages the environment.

II. EXISTING SYSTEM

The existing system for detecting fire are smoke alarms and heat alarms. The most disadvantage of the smoke sensor alarm and heat sensor alarms are that only one module isn't enough to watch all the potential fire prone places. The sole thanks to prevent a fireplace is to use caution all the time. Whether or not they're installed in every nook and corner, it just is not sufficient for an efficient output consistently. Because the number of smoke sensor requirement increase the price also will increase to its multiple. The proposed system can produce consistent and highly accurate alerts within seconds of accident of the fireplace. It reduces cost because just one software is enough to power the complete network of surveillance. Research is active on this field by data scientists and machine learning researchers. The important challenge is to attenuate the error in detection of fireside and sending alerts at the correct time.

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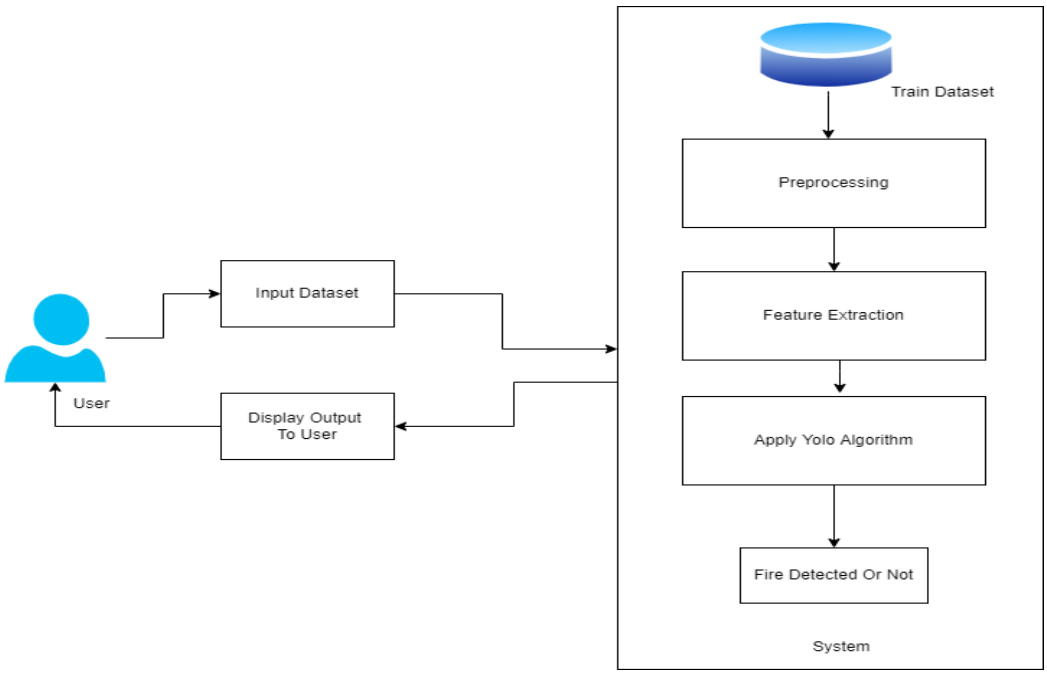
III. PROPOSED SYSTEM

In this paper, the author uses DNN deep neural networks to detect fire with the assistance of live video footage through anti-fire surveillance systems. The paper proposes YOLO V3Deep neural network is one in all the simplest solutions for detecting fire and smoke both indoor and outdoor environment. You simply look once (YOLO) could be a deep learning model for object detection, YOLO V3 is the next version which has been upgraded to rectify the setbacks of YOLO namely the inaccuracy to locate and mark the region of interest within the images and also the lower recall rate compared to other region oriented algorithms. Thus, increasing the efficiency of the architecture. They started with an input image of size 128x128x3. They used convolutional layers to map the features on the input image. The features extracted are then given as input to YOLOV3 object detection subnetwork. YOLOv3 Transform layer is implemented to enhance network stability for object localization.

IV. SYSTEM ARCHITECTURE



Above fig represents the fundamental architecture of Deep neural networks, the data is given as input, images of fireside in this case. Then the layers of the network make an abstract form of the image removing all background noises and highlight the object that needs to be detected. The layers produce region of proposals that are later combined to make a machine learning model in the fully connected layers and the decision-making algorithm analyze output from layers to achieve a conclusion.

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V. METHODOLOGY

Pre-processing : Prepossessing refers to all the transformations on the raw data before it is fed to the machine learning or deep learning algorithm. For instance, training a yolov3 on raw images will probably lead to bad classification performances.

Feature extraction: Yolov3 is a Detect Object and Extract Feature of Object . The input Live camera is used by the feature extraction network. The extracted feature signals are utilized by the neural network for classification.

Segmentation: Yolov3 is one representative work for the region-based methods. It performs the semantic segmentation based on the object detection results. To be specific, yolo first utilizes selective search to extract a large quantity of object proposals and then computes yolo features for each of them.

Classification : The yolov3 is a class of Machine learning. Yolov3 represent a huge breakthrough in image recognition. They're most commonly used to analyze visual imagery and are frequently working behind the scenes in image classification.

VI. CONCLUSION

The scope of using video frames within the detection of fireplace using machine learning is challenging yet as innovative. If this technique with less error rate will be implemented at an oversized scale like in big factories, houses, forests, it's possible to forestall damage and loss thanks to random fire accidents by making use of the Surveillance systems. The proposed system is developed to more advanced system by integrating wireless sensors with CCTV for added protection and precision. The algorithm shows great promise in adapting to various environment.

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