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Implementation of YOLO Based Fire Detection System

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ABSTRACT: Machine learning is an application of AI, machine learning focuses on developing computer programs that can access data and use it to learn for themselves. The machine learning process begins with observations or data; it looks for patterns in data so it can later make inferences based on the examples provided. The primary aim of ML is to allow computers to learn autonomously without human intervention or assistance and adjust actions accordingly. YOLO have yielded state-of-the-art performance in image classification and other computer vision tasks. Their application in fire detection systems will substantially improve detection accuracy, which will eventually minimize fire disasters and reduce the ecological and social ramifications. However, the major concern with fire -based detection systems is their implementation in real-world surveillance networks, due to their high memory and computational requirements for inference. YOLOv3 is a real-time object detection algorithm that identifies specific objects in videos, live feeds, or images. The YOLO machine learning algorithm uses features learned by a deep convolutional neural network to detect an object. Fire detectors are designed to detect one or more of the three characteristics of fire-smoke, heat and flame. The Role of fire detection is to identify a developing fire emergency in a timely manner, and to alert the building's occupants and fire department Depending on the anticipated fire scenario, building and use type, number and type of occupants, and criticality of contents and mission, these systems can provide several main functions, Goals and Objectives.

KEYWORDS: Fire detection, Image processing, Flame detection, Image segmentation, Image information processing system.

I. INTRODUCTION

Recently, a variety of sensors have been introduced for different applications such as setting off a fire alarm, vehicle obstacle detection, visualizing the interior of the human body for diagnosis animal and ship monitoring, and surveillance. Of these applications, surveillance has primarily attracted the attention of researchers due to the enhanced embedded processing capabilities of cameras. Using smart surveillance systems, various abnormal events such as road accidents, fires, medical emergencies, etc. can be detected at early stages, and the appropriate authority can be autonomously informed.

A fire is an abnormal event which can cause significant damage to lives and property within a very short time.

II. LITERATURE SURVEY

In This paper focuses on three problems that surrounded forest fire detection, real- time, early fire detection, and false detection. For the first time, classical objective detection methods are used to detect forest fire [1]. In order to detect and alarm early fire timely and effectively, traditional temperature and smoke fire detectors are vulnerable to environmental factors such as the height of monitoring space, air velocity, dust [2]. The fire detection system should accurately detect the fire in the shortest time to reduce economic loss and ecological damage. now the method of using image and video to predict fire is becoming more and more popular [3].

The proposed system facilitates the process of waste management by monitoring the level of the garbage inside the garbage bins using ultrasonic sensors which are placed at the top of the garbage bin. The drawback of this system is it

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only tackles one of the problems faced in garbage dumps while the system proposed in this paper tackles various problems like garbage bin monitoring (similar approach), gas leak detection, waste management and fire detection [4]. The project will provide an easy method for the disabled to call a specific person. In this project we are going to design sign language translator for disabled persons. This project will change the sign language of disable person into a form that can be understood easily. This project will also help the old people who can't move from their beds[11]. It is a system that gives solutions to tackle issues faced in garbage management like using ultrasonic sensors to monitor the level of trash in dumpsters, fire detection using fire sensors and a sensor for detecting moisture to separate out dry and wet waste. The drawback of this system is there are no measures in place if a fire is detected. The system proposed in this work is designed to deal with such fires on its own. Once a fire is detected, special chemicals and/or water is sprayed on the affected areas using automatic pumps [5].

III. PROPOSED METHODOLOGY

1. **PREPROCESSING:**
   Preprocessing 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 convolutional neural network on raw images will probably lead to bad classification performances

2. **FEATURE EXTRACTION:**
   YOLO that extracts input image features and another neural network classifies the image features. The feature extraction network uses the input image. The extracted feature signals are utilized by the neural network for classification.

3. **YOLO ALGORITHM:**
   The YOLO algorithm uses a convolutional neural network (CNN) to detect objects in real time. As its name suggests, the algorithm only requires one pass through the neural network to detect objects.

4 DETECT THE FIRE

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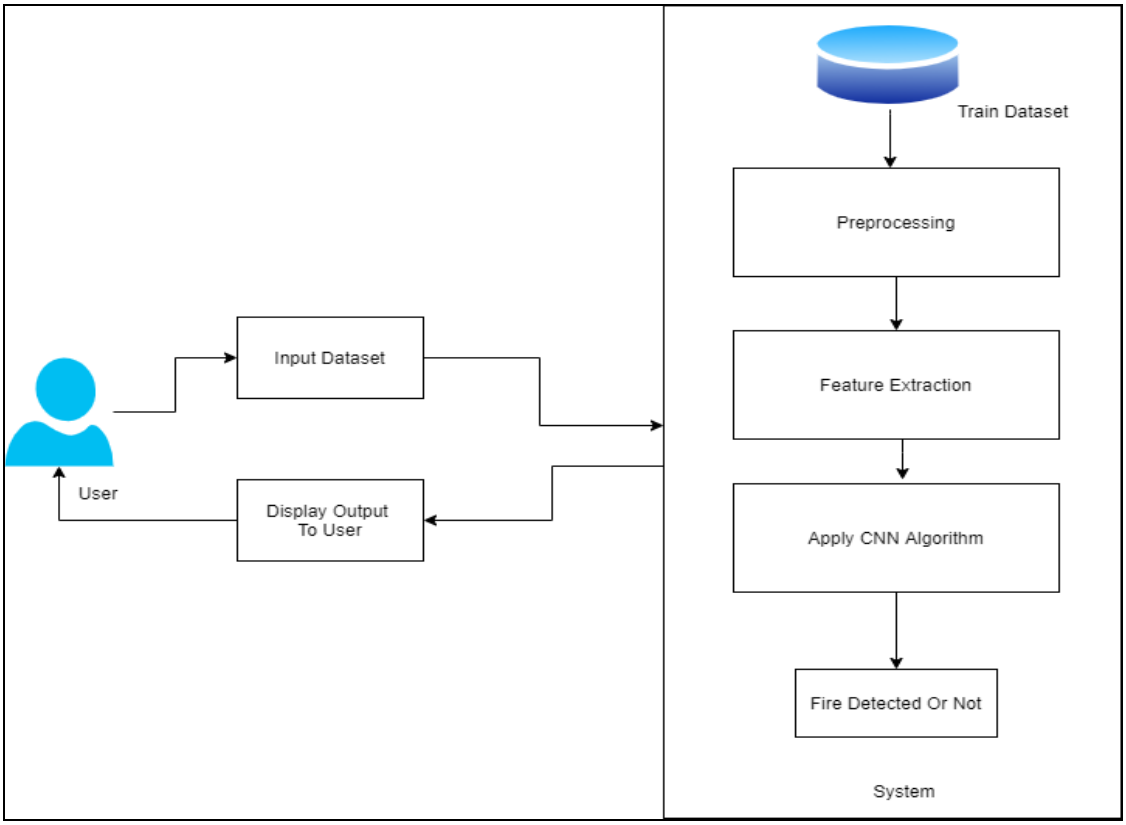
IV. ARCHITECTURE DIAGRAM

SYSTEM ARCHITECTURE:



ADDITIONAL FEATURES

After going through various similar projects, we realized that many projects are missing some features, which can help to make them user friendly and improve the user experience. Following are some additional features of our application

- Using better alert mechanism
- Improving algorithm efficiency

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V. RESULTS

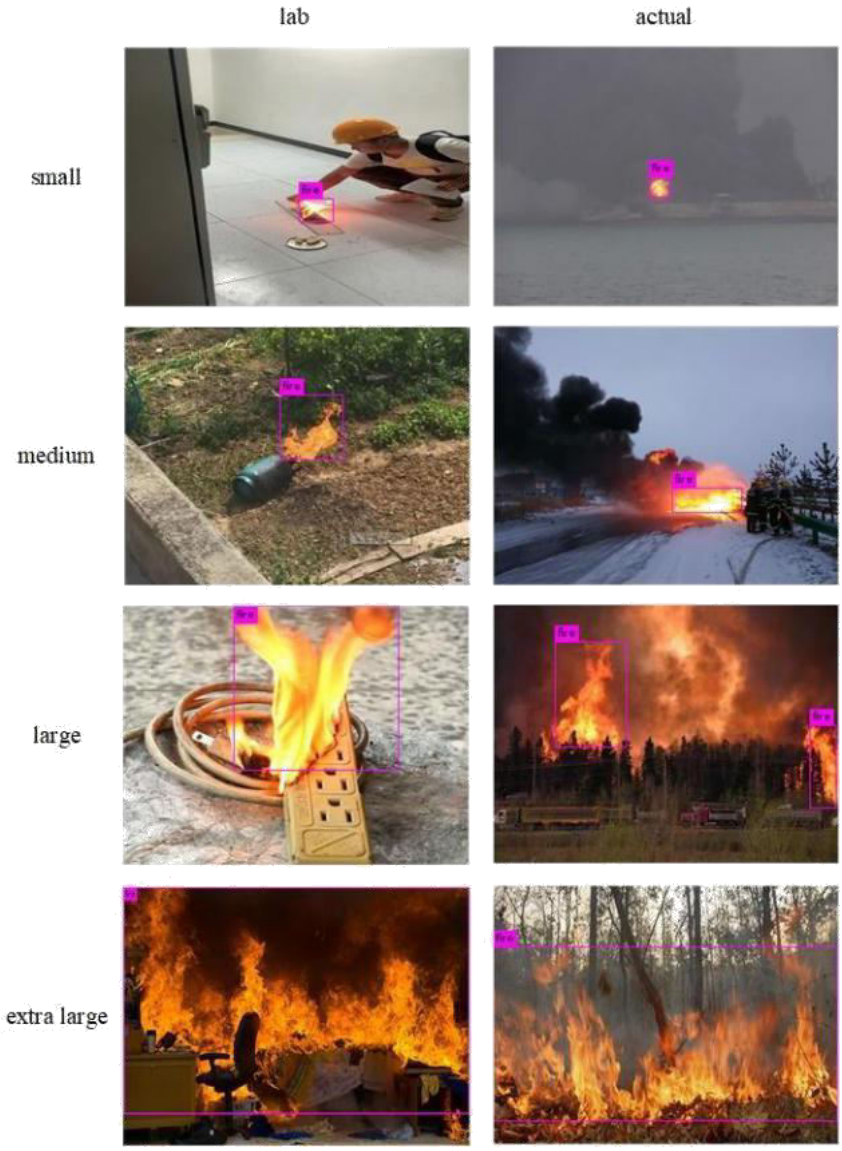

Fig. Prediction results of actual and lab test fire videos [1]

We are working on improving the algorithm and using better methods to alert people in hazardous Situation.
To verify the fire detection effect of our method for the detection of multi-scale (especially small-scale) flames in different complex scenes, we tested our trained fire detection model on multiple actual and experimental fire videos.

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VI. CONCLUSION AND FUTURE WORK

In future work instead of using pre-trained models, self- trained models can be used. With advancing in machine learning algorithms, major incidents can be prevented.

Fire detection technology based on digital image processing is the application of digital image processing technology in fire detection and alarm. In the image fire detection system, the shortcomings of the previous monitoring technology such as small monitoring range and high false alarm rate are overcome. Open operation and close operation are used to process the binary fire image, which eliminates the small interfering objects in the fire image and smoothens the boundary of the suspicious flame area. The method of pre-processing alarm is introduced, which can reduce the time of image processing, enhance the accuracy of fire judgment and reduce the false alarm rate of the system.

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