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Emergency Vehicle Detection

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Abstract: *Emergency vehicle detection is an important application of computer vision technology that aims to improve the safety and efficiency of emergency services. The main objective of this system is to detect emergency vehicles, such as ambulances, police cars, and fire trucks, in real-time from a video stream captured by a camera installed on the road by using YOLOv3 algorithm. This system uses real-time video processing techniques to detect emergency vehicles and allocate time in traffic signals to prioritize their movement. The system consists of a camera installed on the road that captures the video of the traffic flow. The captured video is then analyzed by the system, and the presence of an emergency vehicle is detected using advanced computer vision techniques such as object detection and classification.*

Keywords: CNN, Bi-LSTM, Deep learning, Natural language processing

I. INTRODUCTION

Emergency vehicles such as ambulances, fire trucks, and police cars play a critical role in responding to emergencies and saving lives. However, navigating through busy traffic can be challenging and time-consuming, leading to delayed responses and potentially endangering both emergency responders and the public. In recent years, there has been an increasing interest in developing intelligent transportation systems that can assist emergency responders in reaching their destination quickly and safely. In this project, we propose an Emergency Vehicle Detection system that uses computer vision techniques to detect and classify emergency vehicles on the road. The system is designed to allocate time for emergency vehicles to pass, reducing their response time and increasing the safety of both emergency responders and the public.

II. PROPOSED SYSTEM

A proposed system for Emergency Vehicle Detection Systems could utilize a combination of technologies and methods to accurately detect and respond to the presence of emergency vehicles on the road. The main objective of this system is to detect emergency vehicles, such as ambulances, police cars, and fire trucks, in real-time from a video stream captured by a camera installed on the road by using YOLOv3 algorithm. This system uses real-time video processing techniques to detect emergency vehicles and allocate time in traffic signals to prioritize their movement. The system consists of a camera installed on the road that captures the video of the traffic flow. The captured video is then analyzed by the system, and the presence of an emergency vehicle is detected using advanced computer vision techniques such as object detection and classification. Once an emergency vehicle is detected, the system allocates a green signal for the vehicle's movement, while all other traffic signals are turned red. This allows the emergency vehicle to move through the traffic smoothly and reach its destination quickly. This technique not only reduces the response time of emergency vehicles but also improves the safety of other road users by ensuring the safe passage of emergency vehicles.

III. METHODOLOGY

The proposed system utilizes a methodology consisting of several steps for detecting emergency vehicles in real-time. First, garbage image acquisition is made the through data cleaning and labeling, aemergency vehicle dataset was constructed. After training, the emergency vehicle classification model was obtained for emergency vehicle detection. The model is then tested on separate datasets to evaluate its performance. Once validated the model is integrated into a real-world. This methodology aims to detect emergency vehicles accurately that helps them to reaches their destination in proper time.

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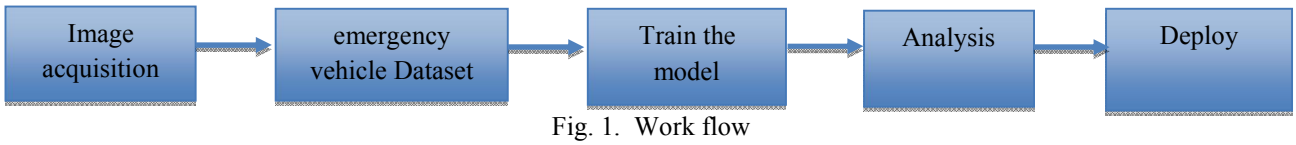

Fig. 1. Work flow

IV. ALGORITHM MODEL

In the field of object detection,YOLO (You Only Look Once) is an algorithm that uses neural networks to provide real-time object detection based on deep learning. This algorithm is very popular because of its speed and accuracy. It has a good global receptive field, grid division, anchor frame matching and multi-semantic fusion detection mechanism. Compared with the traditional object detection methods, YOLO model recently predicts bounding box and probabilistic probability of image object through CNN, so as to effectively improve detection accuracy. YOLOv3 was using Darknet-53 backbone, Darknet-53 has 53 convolutional layers instead of the previous 19, making it more powerful than Darknet-19 and more efficient than competing backbones, and its detection speed is very fast. YOLOv3 firstly separates an image into a grid. Each grid cell predicts some number of boundary boxes around objects that score highly with the aforementioned predefined classes. Compared with previous YOLO series, YOLOv3 is faster and accuracy, its model is light and suitable for deployment to embedded devices.

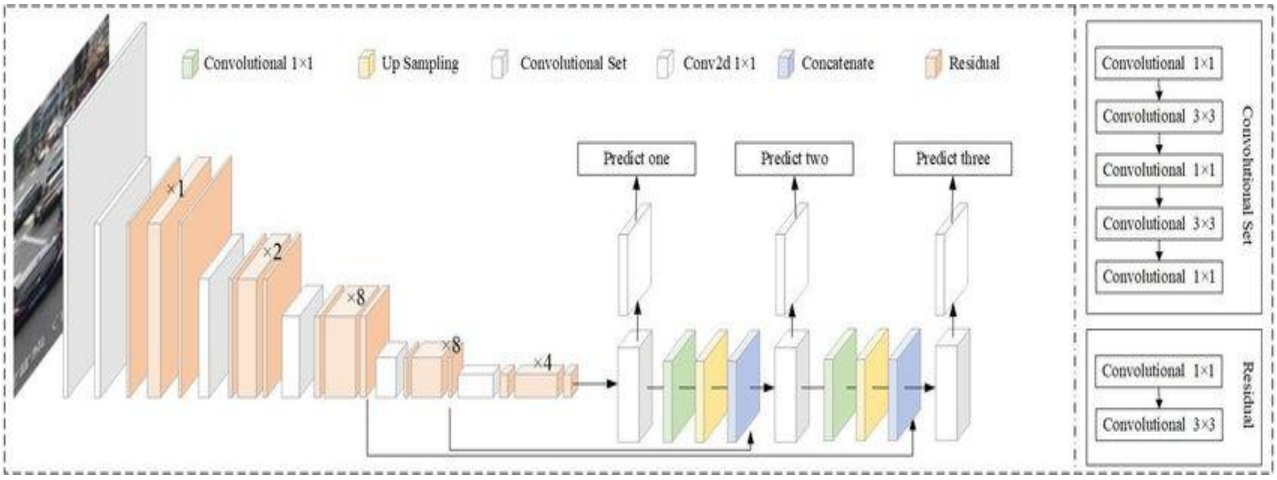

Fig.2. Structure of YOLOv3

V. CONCLUSION

This paper implements emergency vehicle detection based on deep learning. The emergency vehicle detection based on Yolov3 object detection method. The emergency vehicle detection system using YOLOv3 algorithm in traffic can significantly improve the response time of emergency services, reduce congestion on the road, and enhance the safety of road users. By detecting the presence of emergency vehicles and allocating time in traffic signals, the system ensures that emergency vehicles reach their destination quickly and safely. Firstly, collected the images of emergency vehicles, data cleaned, labeled, and built an emergency vehicle dataset. Further the model was built and trained on our dataset. The experimental result shows an accuracy of more than 98%. In real scene the model is deployed and the test result shows that this emergency vehicle detection can accurately identify different emergency vehicles and is able to achieve high detection accuracy. These results show that the proposed method is successful in detecting emergency vehicles.

VI. FUTURE SCOPE

The future scope of the emergency vehicle detection system is promising, as it can be expanded and improved in several ways.The emergency vehicle detection system can be integrated with other smart city systems such as traffic management, public transport, and emergency response systems. This integration can create a more efficient and effective smart city infrastructure. The use of machine learning and AI algorithms can improve the accuracy of the

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emergency vehicle detection system. These algorithms can analyze real-time data and predict the movement of emergency vehicles more accurately.

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