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Detection of Unathorized Vechile in BRT Lane

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***Abstract* — The increasing number of unauthorized vehicles in the Bus Rapid Transit (BRT) lanes creates a significant challenge to urban transportation. Due to this efficiency and quality of safety decreases. Our project aims to develop an automated system that detects unauthorized vehicles that come into BRT lanes using deep learning techniques like YOLOv8. The system employs combination video surveillance, image processing, and deep learning models to accurately identify and track vehicles that violate the BRT regulations. The proposed solution enhances traffic management and reduces the incidence of unauthorized lane usage by integrating the real- time data processing and alert mechanisms. The system employs a dataset from Roboflow, extended with a self-made dataset containing images of various vehicles in BRT lanes. We utilize YOLOv8 for object detection to accurately identify and classify vehicles. Also, EasyOCR is used to recognize text from license plates for validation and verification against authorized vehicle list. Our preliminary results demonstrate that the system achieves 80% accuracy in detecting unauthorized vehicles. Our solution is urban traffic management by reducing illegal lane usage and ensuring easier public transport operations.**

Keywords — BRT Lane Violation Detection, YOLOv8, EasyOCR, Object detection, License Plate Recognition, Urban Traffic Enforcement, Traffic Management, Automated Traffic Surveillance, Transport Efficiency, Smart City Solutions etc.

I. INTRODUCTION

Bus Rapid Transit (BRT) systems are rapidly being deployed in cities throughout the world as a way to reduce traffic congestion and increase public transit efficiency. However, the effectiveness of BRT systems is frequently jeopardized by unauthorized vehicles using BRT lanes, resulting in lower service quality and longer delays. Detecting and prohibiting unauthorized cars from accessing these lanes is critical to the integrity and effectiveness of BRT systems. The idea for choosing this issue stemmed from a personal experience shared by our group. We watched a horrible occurrence in which an unauthorized car entered a BRT lane and made a quick bend, culminating in a serious accident that lost multiple lives. This incident demonstrated the crucial need for a practical way to prevent unauthorized vehicles from interrupting BRT operations and jeopardizing public safety. It emphasized the significance of improving traffic enforcement and ensuring that BRT lanes are only used by authorized public transportation vehicles to keep the system safe and efficient.

This project aims to create an automated system for detecting unauthorized vehicles in BRT lanes by leveraging powerful computer vision and deep learning technology. We use the YOLOv8 (You Only Look Once, version 8) model for high-precision object detection, combining publicly available Roboflow datasets with a proprietary dataset. YOLOv8 is well-known for its real-time processing skills and ability to recognize several objects inside an image, making it excellent for identifying different sorts of cars in dynamic urban areas. Additionally, EasyOCR is used to read and check car license plates against a list of authorized vehicles, adding another degree of confirmation. This dual method to object detection and optical character recognition (OCR) provides a comprehensive solution for detecting unauthorized vehicles in BRT lanes.

II. LITERATURE REVIEW

Table I shows an overview of the literature on Detection of unauthorized vehicles in BRT lane and Object Detection using YOLO models using several machine learning algorithms. All the papers related to BRT lane management mentioned below are limited to vehicle detection and photo capture or getting the vehicle data from RFID tags on the contrary, our model automates the extraction of vehicle numbers from surveillance footage, and these processes are completed much faster than manual work at the end of the production line.

In the Paper [1] It surveyed automation for BRT lane surveillance, proximity sensors for detecting and measuring the vehicles, RFID technology for identification, Arduino for integration, and Python for control. Vehicles were monitored; the images were captured if needed. RFID checked for authorization and took pictures of license plates of unauthorized vehicles for legal purposes.

In Paper [2], this paper proposed an automatic BRT management system using OpenCV, Python, a PIC18F microcontroller, and hardware components. The developed system had captured the image of the vehicle, processed the license plates, and checked them in a database. Penalty notices were issued to vehicles unauthorized to pass and block barriers, reducing manpower while improving traffic flow and safety.

In Paper [3], the paper proposed an RFID-based solution in the management of unauthorized movement on BRT lanes. The RFID tags installed on vehicles and readers across entry points identified and validated it against a centralized database.

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