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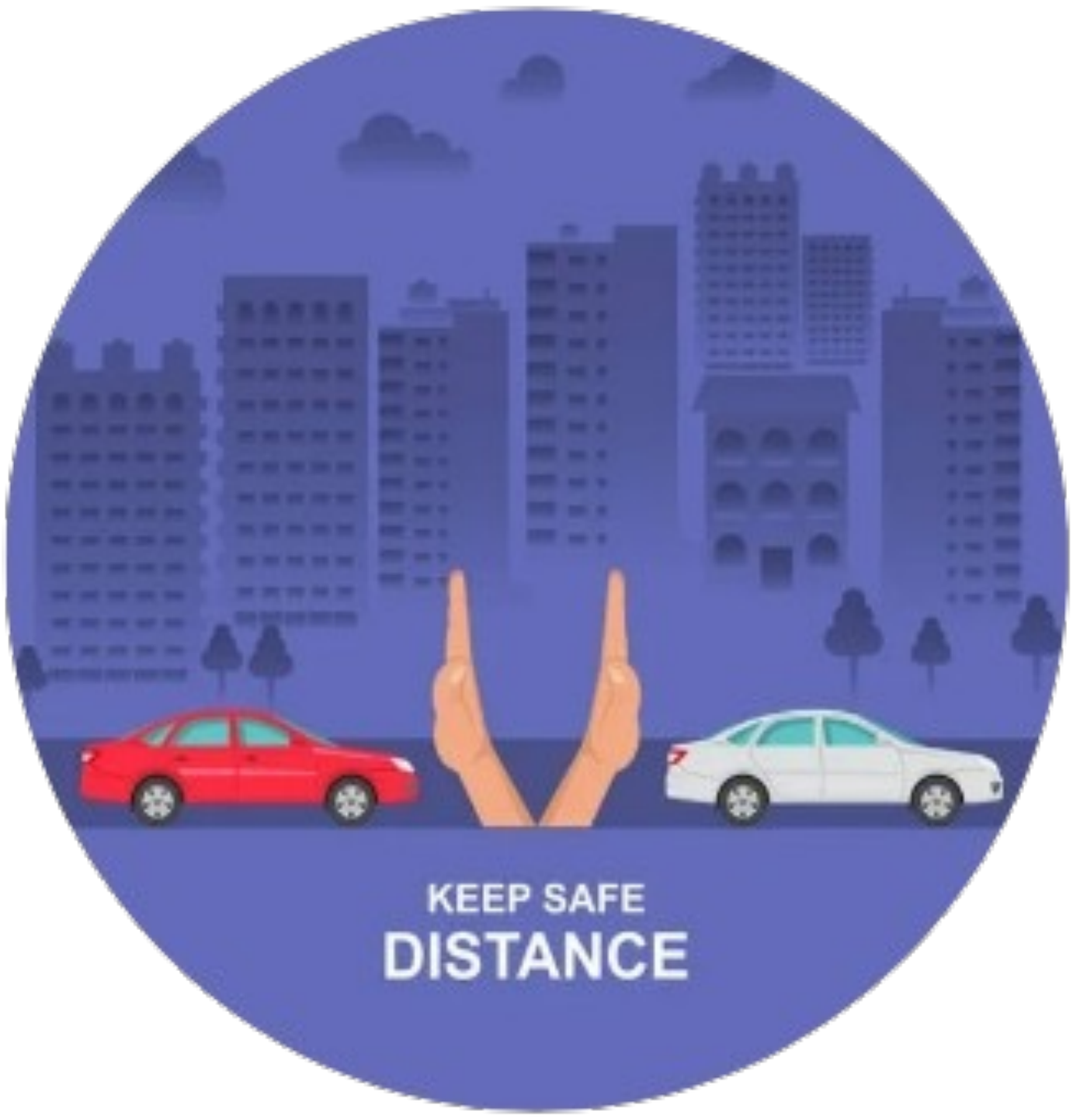
تقنيات إدارة الزحام
Report Template

Field	Description
Title	Monitoring Violations of Vehicles Not Maintaining a Safe Distance.
Abstract	This project uses a YOLOv8 model to detect vehicles violating safe following distances and employs OCR to identify their license plates ,helping improve road safety and traffic enforcement.
Introduction	The project utilizes object detection to detect vehicles violating safe distance guidelines ,aiming to improve road safety and align with Saudi Vision'2030 s smart infrastructure goal.
Literature Review:	The Saher system in Saudi Arabia ,utilizing cameras and radar ,has significantly improved road safety by automating traffic law enforcement , resulting in a notable reduction in accidents and violations.
Data Description and Structure :	The dataset ,sourced from platforms like Kaggle ,includes two classes" :In Lane "and" Out of Lane "to assess vehicle behavior .It was split into %60 training %20 ,validation ,and %20 testing .Data augmentation was applied to simulate varying driving conditions.
Methodology	The yolov8 model is trained to detect vehicles ,classify their position ,and calculate safe distances .It also measures the distance between cars in the same lane ,with a safe distance of at least 2 meters .An optical character recognition model is integrated to recognize license plates .A safety alert system is implemented to warn drivers of unsafe distances ,preventing collisions and improving driver awareness.
Discussion and Results:	This project used a YOLOv8 model to detect vehicles violating safe distances with a precision of ,0.90 recall of ,0.93 and mAP50 of .0.95 Challenges arose with video quality from overhead cameras ,making license plate detection difficult .Ground-level cameras ,like those in the Saher system ,were more effective in capturing plate details.
Conclusion and Future Work	This project leverages AI technologies like YOLOv8 and OCR to detect unsafe vehicle distances and identify license plates ,enhancing road safety .Future plans include integrating overhead cameras for precise distance measurements .These advancements support Saudi Vision 2030 by improving traffic management and reducing accidents.
Team	Raghad Almoqhim , Sama Alharbi and Rehab Almahdawi



Title

Monitoring Vehicles Not Keeping Safe Distances

Abstract

Improper driving behaviors, such as unsafe distances between vehicles, significantly contribute to road accidents and traffic violations. The objective of this project is to identify and categorize these traffic infractions related to maintaining safe distances. To achieve this, we employed a YOLOv8 model, which effectively detects vehicles and classifies them based on whether they are adhering to safe lane-following distances. Additionally, optical character recognition (OCR) was utilized to automatically recognize the license plates of vehicles.

Keywords: traffic infractions, safe distances, YOLOv8, optical character recognition, road safety.

Introduction

Traffic congestion and road safety are critical challenges in urban areas worldwide, with one of the leading causes of accidents being drivers' failure to maintain safe following distances. This issue is particularly significant in Saudi Arabia, where the General Traffic Department has emphasized the importance of adhering to safe distance guidelines to prevent collisions and ensure smoother traffic flow.

To address this problem, this project aims to leverage advanced object detection and classification technologies to automatically identify and categorize vehicles that fail to maintain appropriate following distances. By automating the detection of these traffic infractions, the system contributes to road safety and aligns with the goals of Saudi Vision 2030, which seeks to enhance the quality of life and develop smarter, safer infrastructure.

Literature Review:

In Saudi Arabia, several traffic monitoring systems have been implemented to enhance road safety and reduce the frequency of accidents. One of the most notable systems is **Saher**, a nationwide automated traffic control system that utilizes cameras and radar technology to monitor a range of traffic violations, including speeding, running red lights, and other infractions. The Saher system has played a pivotal role in improving road safety by enforcing traffic regulations through the automated detection and penalization of violations. Studies have shown a reduction in both accidents and traffic violations since the system's implementation, demonstrating its effectiveness in maintaining order on the roads.

Data Description and Structure :

The data for this project was collected from various online platforms, including Kaggle . It includes two classes : "In Lane" and "Out of Lane," which are essential for assessing vehicle behavior on the road.

To prepare the data for analysis, it was divided into three segments: 60% for training, 20% for validation, and 20% for testing. The dataset was also augmented to introduce variations that simulate different driving conditions.

Methodology

- **Vehicle detection, lane classification, and safe distance calculation**
  We trained a yolov8 model to detect vehicles and classify their position as either within or outside the lane boundaries. The model not only identifies the presence of vehicles but also measures the distance between cars in the same lane. A safe following distance is defined as at least 2 meters between vehicles. If the detected distance between two cars in the same lane falls below this threshold, the system flags it as a violation of safe driving practices.

- **License plate recognition**
  we improved vehicle monitoring by integrating an optical character recognition (OCR) model to recognize the license plates of detected vehicles. The yolov8 model was used to identify vehicles and determine their positions on the road, while the OCR model extracted the license plate information.

- **Safety alert system**
  to further enhance road safety, we implemented an alert system that warns drivers when they are approaching an unsafe distance with the vehicle in front. The system uses the distance data from the yolov8 model to trigger a sound alert, reminding drivers to maintain a safe distance. This real-time warning system is designed to prevent collisions and improve driver awareness on the road.

Discussion and Results:

This project achieved a precision of ,0.90 recall of ,0.93 and mAP50 of 0.95 using a YOLOv8 model to detect vehicles violating safe following distances of less than 2 meters , However ,we faced challenges concerning camera angles . When positioned above the road ,the camera's video quality often proves inadequate for accurately capturing license plates .In contrast ,ground-level cameras ,such as those used by the Saher system ,effectively capture the details of vehicle license plates.

Conclusion and Future Work

This project focuses on improving road safety by leveraging advanced AI technologies ,including the YOLOv8 model and Optical Character Recognition(OCR ,(to detect unsafe vehicle distances and identify license plates .Future development will integrate overhead cameras for precise distance measurement with ground-level cameras to capture license plates of violators , enhancing road monitoring and reducing collisions .By improving the models 'ability to adapt to varying environmental conditions like lighting ,weather ,and camera angles ,the system's accuracy and effectiveness will increase .These advancements align with Saudi Vision ’2030s objectives of enhancing traffic management , promoting road safety ,and reducing accidents through intelligent ,real-time solutions.

Team

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