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VEHICLE SPEED DETECTION

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ABSTRACT

Now a days we see traffic and increase in accident is a big issue we are facing . We many vehicle drivers don't obey the traffic rules. So its important to monitor the vehicles. In cities traffic is a very big issue. Now-a-days traffic in two-tier cities has increased lot, so surveillance system is needed to monitor the traffic and avoid unwanted delays and accidents.By our project we monitor the vehicle and traffic. Through our vehicle speed detection project we can monitor it. Vehicles speed estimation can be done by analyzing the video captured.In speed estimation we need to detect vehicle from the captured video and analyze the video considering the centroid at each instance of a frame and distance will be calculated.Image processing and computer vision techniques are used to monitor manage and to determine speed of the moving vehicles. These techniques are more efficient compared to present and other techniques in terms of accuracy and processing speed. As the population has increased the vehicles on road is increasing tremendously and hence traffic surveillance systems based on capturing video and processing it to determine the speed has become an important issue to control the accidents and traffic jam problems.The main process of vehicle speed detection includes the following parts: the establishment and updating of background model, moving target detection, vehicle centroid localization and motion speed calculation.

I. INTRODUCTION (Font-Cambria, Bold, Font Size -12)

As we know how transport plays a key role in our day to day life. No of vehicles have increased. In a world where technology continues to transform our daily lives, the need for innovative solutions in transportation and traffic management is more critical than ever. Introducing the " Vehicle Speed Detection System," a cutting-edge solution designed to enhance road safety, optimize traffic flow, and contribute to a smarter and more connected transportation ecosystem. In today's fast-paced world, ensuring road safety has become a paramount concern for authorities and individuals alike. One critical aspect of road safety is monitoring and regulating vehicle speeds. Vehicle speed detection technology plays a crucial role in this endeavor by providing accurate measurements of vehicle velocities, aiding in law enforcement, traffic management, and overall safety enhancement. This technology encompasses a diverse range of methods and devices, each designed to detect and measure the speed of vehicles with precision and reliability. From traditional radar guns to sophisticated laser-based systems and innovative GPS technologies, the landscape of vehicle speed detection continues to evolve, offering solutions tailored to diverse needs and applications.

II. PROJECT DESIGN

This system is mainly developed for road safety and to keep eye on the vehicle. Vehicle speed detection serves various purposes, including enforcing
traffic laws, ensuring road safety, and optimizing traffic flow.It involes Object Detection .We Use an object detection algorithm to identify and track vehicles in each frame. Speed Calculation: Once you have identified vehicles, you can calculate their speed by tracking their movement across frames. Use the distance traveled and the time taken to estimate the speed. Display Results: Display the video stream with the detected vehicles and their speeds.
Speed Cameras: These cameras capture images of vehicles as they pass by and use algorithms to calculate their speed based on the time it takes for the vehicle to travel between two points.
This technology encompasses a diverse range of methods and devices, each designed to detect and measure the speed of vehicles with precision and reliability.
Specify the required accuracy, range, and detection capabilities.
Consider factors such as lighting conditions, weather resilience, budget constraints, and regulatory requirements.
Camera Selection:
Choose suitable cameras based on the project requirements.
Select cameras with appropriate resolution, frame rate, and low-light performance.
Consider factors such as field of view (FOV), lens type, and mounting options.
Hardware Setup:
Determine the number and placement of cameras required for effective coverage of the target area.
Install cameras securely and ensure proper alignment for accurate speed measurement.Set up any additional hardware components such as lighting systems, power supplies, and data storage devices.

Software Development: Develop software for camera control, image capture, and speed detection algorithms.Implement image processing algorithms to detect vehicles and track their movement.Design algorithms to calculate vehicle speeds based on image data and timestamps.Create a user interface for configuring system settings, viewing real-time data, and generating reports. SpeedMeasurementAlgorithm: Implement algorithms to measure vehicle speed based on the captured images.Utilize techniques such as optical flow analysis, object tracking, and distance/time calculations.Account for factors like vehicle size, distance traveled, and camera perspective to ensure accurate speed estimation.

III. MODELING AND ANALYSIS

Modeling vehicle speed detection typically involves using sensor data, such as radar or lidar, to measure the speed of vehicles. This data can be processed using mathematical models or machine learning algorithms to estimate vehicle speed accurately. These models can range from simple linear equations to more complex algorithms that take into account factors like acceleration, road conditions, and vehicle type. Additionally, simulation software can be used to validate and refine these models before deployment in real-world applications.

B. Vehicle Tracking

In vehicle tracking module, the method of tracking-bydetection is adopted to track the vehicle, which is mainly divided into two processes. First, the vehicles in each frame are detected. Second, the trajectory set is formed by the data association. The YOLOv3 is used to get vehicle detection results.

For each new frame, the similarity between the object in the current frame and the existing trajectory is calculated to achieve the vehicle tracking.

According to the motion features of the vehicle, tracking is performed based on bounding box prediction and IOU calculation. To achieve trajectory association during tracking, the IOU is used to measure the ratio of overlap between the predicted bounding box given by the Kalman filter and the detected bounding box given by the detection model. As shown in Fig.1. In this scheme, IOU refers to the intersection between the prediction box and the ground truth divided by their union in the object detection. Thus, the IOU is used for matching in object tracking. When the IOU is more than a certain threshold, the detected object and the tracked object are the same object.

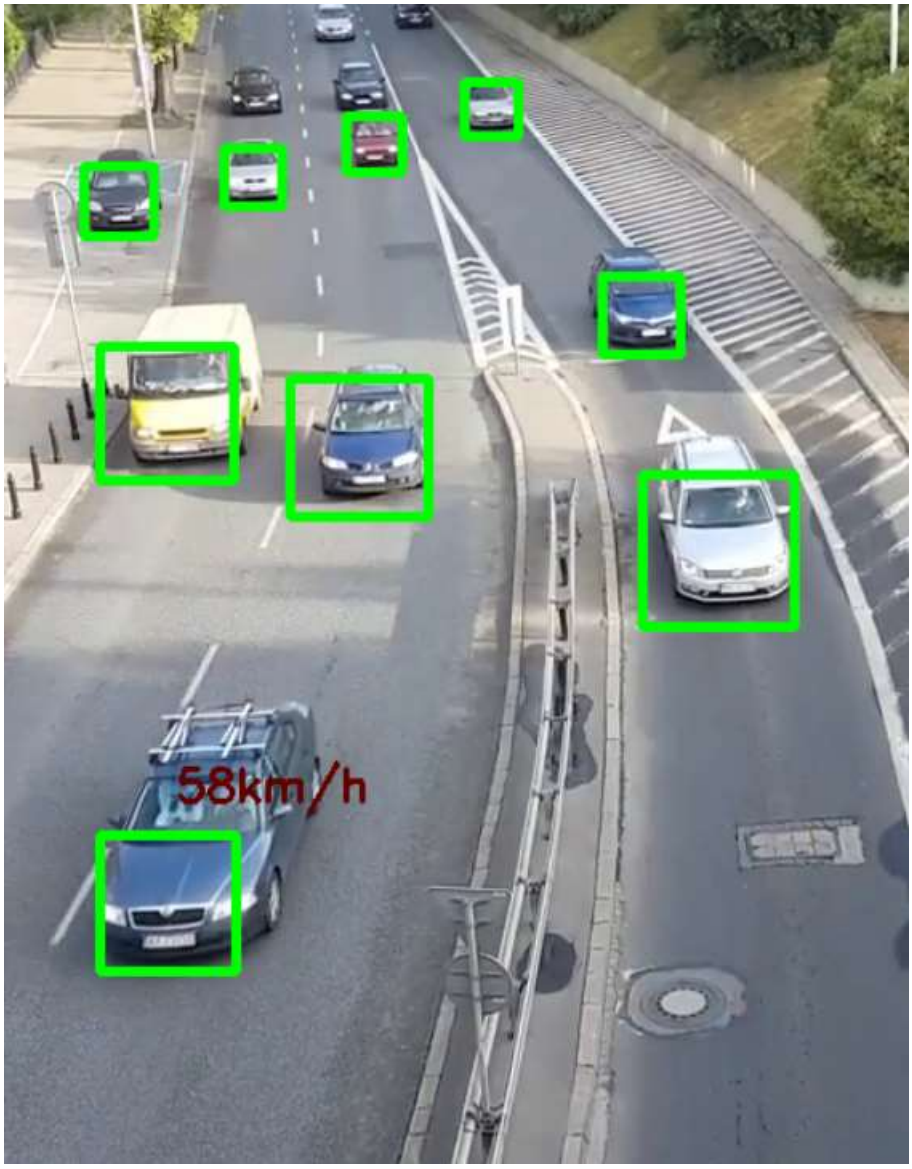

Figure 1:

IV. RESULTS AND DISCUSSION

System capture the vehical and calculate speed and reacts accordingly. Vehicle Speed: The primary result is the speed of the detected vehicle. This speed is typically measured in units such as kilometers per hour (km/h) or miles per hour (mph). The system calculates the speed based on the movement of the vehicle between consecutive frames captured by the camera.

Timestamp: Each speed measurement is accompanied by a timestamp indicating the exact time at which the measurement was taken. This allows for accurate tracking of vehicle speeds over time and facilitates data analysis and reporting.

Vehicle Identification: Depending on the system's capabilities, it may also include information about the detected vehicle, such as its size, type (e.g., car, truck), and possibly its license plate number. Advanced systems may use image recognition techniques to identify vehicles and track them across multiple camera feeds.

Accuracy and Confidence Levels: Some systems provide an indication of the accuracy of the speed measurement, along with confidence levels or uncertainty estimates. This helps users assess the reliability of the speed data and make informed decisions based on the results.

Warnings or Alerts: In certain applications, such as traffic enforcement or automated speed control systems, the result may trigger warnings or alerts if the detected speed exceeds predefined thresholds. These alerts can be used to notify authorities or trigger automated enforcement measures.

Data Logging and Reporting: The system may log speed measurements along with associated metadata, such as location, camera ID, and environmental conditions. This data can be stored for further analysis, used for generating reports, or integrated with other traffic management systems.

Visualization: Results may be presented visually through user interfaces, dashboards, or maps, allowing users to visualize vehicle speeds spatially and temporally. Graphs, charts, or heatmaps may be used to display speed distribution patterns or trends over time.

Overall, the result of vehicle speed detection using a camera system provides valuable insights into traffic behavior, helps identify speed violations, and contributes to efforts aimed at improving road safety and traffic management. The accuracy and reliability of the results depend on various factors, including the quality of the camera system, the effectiveness of the speed measurement algorithms, and the calibration and maintenance of the overall system.

V. CONCLUSION

The implementation of Smart Vehicle Speed Detection marks a significant step towards safe rand more efficient traffic management. By leveraging advanced technologies, this system contributes to creating intelligent and responsive transportation systems for the future.

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