**TRAFFIC AUTOMOBILE COUNTER**

**A Project Work Synopsis**

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# **Abstract**

The proposed project aims to develop an Automatic Vehicle Counting System using Computer Vision techniques to count the number of cars and trucks on a road. The system will use a camera mounted on a pole above the road to capture video footage of the traffic, which will be processed using computer vision algorithms to detect and count the vehicles. The project will involve developing and training a machine learning model to recognize and differentiate between cars and trucks. The model will be trained on a large dataset of vehicle images to accurately name distinct types of vehicles in real-time.

Once the model is trained, the system will use it to process the video footage captured by the camera. The video will be analysed frame-by-frame to detect the presence of vehicles and count the number of cars and trucks on the road. The output of the system will be displayed on a screen in real-time, allowing users to check the traffic flow and make informed decisions based on the vehicle count data. This system can be used in various applications, such as traffic management, road safety, and urban planning.

The proposed system offers several advantages over traditional methods of vehicle counting, such as increased accuracy, reduced labour costs, and real-time data analysis. The system can be easily installed and used in various locations, making it a cost-effective and efficient solution for vehicle counting on roads.

Keywords:

**The YOLO** (You Only Look Once) object detection algorithm is used to detect and recognize the vehicles in the video footage. YOLO is an ultramodern deep learning algorithm that can detect and classify objects in real-time, making it an ideal choice for this project.

**The OpenCV** library is used to process the video footage and apply the YOLO object detection algorithm to detect and count the number of cars and trucks in the video stream. The system will also use image processing techniques, such as background subtraction and contour detection, to reduce noise and improve the accuracy of the vehicle counting.

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## **1. INTRODUCTION**

Keeping track of vehicles on the road is a critical aspect of modern transportation management. Traffic congestion is a major problem in urban areas, leading to increased air pollution, long commute times, and decreased quality of life. To address these issues, correct and prompt traffic data is essential for naming areas of congestion, perfecting traffic signals, and planning road improvements.

Tracking vehicles on the road supplies insights into traffic patterns and allows traffic managers to make informed decisions about traffic management and planning. For example, by analysing the number of vehicles passing through a particular intersection during peak hours, traffic managers can adjust traffic signals to improve traffic flow and reduce congestion. Similarly, by showing areas of congestion, traffic managers can prioritize road improvements, such as adding new lanes or upgrading intersections, to alleviate traffic problems.

In addition, tracking vehicles on the road can help name traffic accidents and road hazards, allowing for quick response times and improving road safety. By using real-time traffic data, emergency services can quickly find and respond to accidents, reducing the risk of further accidents and ensuring the safety of road users.

Automated systems like the automobile traffic counter project can supply a more efficient and correct method of traffic data collection, leading to more effective traffic management and improved road safety. These systems use advanced technologies like computer vision and machine learning to analysed video streams and detect and classify vehicles in real-time. By accurately counting the number of vehicles on the road and naming their types, traffic managers can make more informed decisions about traffic management and planning.

Furthermore, tracking vehicles on the road can also have environmental benefits. By finding areas of congestion and perfecting traffic flow, traffic managers can reduce the time that vehicles spend idling in traffic, which in turn reduces emissions and improves air quality.

### **1.1. Problem Definition**

The automobile traffic counter project aims to develop an automated system using YOLO machine learning and OpenCV to count the number of vehicles coming and going in a traffic stream and find whether they are cars or trucks. The system will use deep neural networks to detect and classify vehicles in real-time, supplying correct traffic data for better traffic management and planning. This project will supply a more efficient and correct method of traffic data collection that can lead to better traffic management and improved quality of life for urban residents. The system can also have potential applications in other areas, such as checking parking lots or detecting vehicle types in toll booths.

**1.2. PROBLEM OVERVIEW**

The automobile traffic counter project aims to develop an automated system using YOLO machine learning and OpenCV to count the number of vehicles coming and going in a traffic stream and find whether they are cars or trucks. The system will use deep neural networks to detect and classify vehicles in real-time, supplying exact traffic data for better traffic management and planning. This project will supply a more efficient and exact method of traffic data collection that can lead to better traffic management and improved quality of life for urban residents. The system can also have potential applications in other areas, such as checking parking lots or detecting vehicle types in toll booths.

**1.3. HARDWARE SPECIFICATION**

The specific hardware requirements for your automobile traffic counter project may vary based on the size and complexity of your setup. However, here are some general hardware specifications that you might need:

* **Camera:** A camera is needed to capture the video stream of the traffic. You can use a variety of cameras, including webcams or specialized cameras designed for computer vision applications.
* **Computer:** The computer will be used to run the machine learning algorithms and process the video stream. You will need a computer with sufficient processing power and memory to handle the workload. A powerful desktop computer or a laptop with a dedicated graphics card can work well.
* **GPU:** A GPU (Graphics Processing Unit) can accelerate the performance of machine learning algorithms and speed up the processing of video streams. GPUs with high processing power are recommended for better performance.
* **Storage:** You will need sufficient storage to store the video stream data and the trained machine learning models. An SSD or a high-capacity hard drive can work well.
* **Power Supply:** Make sure to have a reliable power supply for your computer and any other hardware to ensure uninterrupted operation.

**1.4 SOFTWARE SPECIFICATION**

Software is a set of instructions or programs that tell a computer or electronic device what to do. It is a collection of code written in a specific programming language that is designed to perform a particular task or set of tasks. Software can be categorized into system software, application software, and middleware. System software handles managing and controlling the computer hardware, while application software is designed to perform specific tasks or supply functionality to users, such as word processors, web browsers, and video editing software. Middleware is a layer of software that connects different software applications and enables them to communicate with each other. Overall, software is an essential part of modern technology that enables computers and electronic devices to perform a wide range of tasks and functions

* **Computer Vision Framework:** The project will use OpenCV, a widely used open-source computer vision framework, to capture and process video streams from cameras mounted at various locations. OpenCV supplies a set of tools and algorithms for image and video processing, object detection, and recognition.
* **Object Detection Model:** The project will use YOLO (You Only Look Once), a popular object detection model, to detect and classify vehicles in real-time. YOLO uses a single neural network to predict object classes and bounding boxes in each image, making it fast and efficient.
* **User Interface:** The project will have a user interface to display real-time traffic data and supply a dashboard for traffic managers to analysed and interpret the data. The user interface will be designed to be intuitive and easy to use.
* **Programming Languages:** The project will use programming languages such as Python and C++ for implementing the computer vision algorithms and building the user interface.
* **Operating System:** The project will be designed to run on a Linux-based operating system such as Ubuntu, which supplies a stable and secure platform for running the software.
* **Hardware Compatibility:** The software will be designed to work with various hardware components, such as cameras and sensors, commonly used in traffic management systems.
* **Machine Learning Framework:** The project will use Anaconda, a popular data science platform, to develop and deploy machine learning algorithms. Anaconda supplies a set of tools for data analysis, machine learning, and deep learning, making it an ideal platform for developing and deploying machine learning models.

Overall, the software specifications for the automobile traffic counter project will supply a robust and efficient platform for collecting and analysing traffic data. By using ultramodern computer vision algorithms and database management systems, the project will enable traffic managers to make informed decisions about traffic management and planning, leading to a more efficient and safer transportation system.

**2. LITERATURE SURVEY**

In a study conducted by Zhang et al. (2018), the authors proposed a real-time vehicle detection and tracking system using a deep convolutional neural network (CNN). The system could detect and tracking vehicles in real-time and was tested on various traffic scenarios. The results showed that the proposed system achieved high accuracy in detecting and tracking vehicles.

In another study by Zhang et al. (2020), the authors proposed a traffic flow analysis system using computer vision techniques. The system was designed to analysed traffic flow patterns and name traffic bottlenecks. The authors used a combination of object detection, image processing, and machine learning techniques to develop the system. The results showed that the proposed system was effective in naming traffic bottlenecks and supplying insights for traffic management.

Another study by Li et al. (2020) proposed a traffic monitoring system using multiple cameras and deep learning techniques. The system was designed to detect and classify diverse types of vehicles, including cars, buses, and trucks, in real-time. The authors used a combination of YOLO object detection and deep learning-based vehicle classification techniques to develop the system. The results showed that the proposed system achieved high accuracy in detecting and classifying vehicles.

Similarly, in a study by Wang et al. (2021), the authors proposed a traffic monitoring system using deep learning techniques. The system was designed to classify vehicles into distinct categories based on their size and type. The authors used a YOLO (You Only Look Once) algorithm for object detection and a ResNet (Residual Network) for vehicle classification. The results showed that the proposed system achieved high accuracy in detecting and classifying vehicles.

Overall, these studies prove the effectiveness of computer vision and machine learning techniques in traffic management. The proposed automobile traffic counter project builds upon these studies and aims to develop a real-time traffic monitoring system using computer vision and machine learning techniques. By accurately counting and classifying vehicles, the project will supply valuable insights for traffic management and planning, leading to a more efficient and safer transportation system.

**3. PROBLEM FORMULATION**

The problem formulation for the automobile traffic counter project is to develop a real-time traffic monitoring system that can accurately count and classify vehicles. The system should be able to differentiate between cars and trucks, and should also be able to distinguish between vehicles entering and exiting a particular area. The proposed system should be able to handle varying lighting conditions and different camera angles to ensure accurate vehicle detection and tracking. Additionally, the system should be able to process the video feed in real-time to supply instantaneous results.

To achieve this, the project will use computer vision and machine learning techniques, including object detection and classification algorithms, such as YOLO and ResNet. The system will be developed using Python programming language and OpenCV library for image processing. The project will be implemented on a hardware setup consisting of a computer with a suitable processor and graphics card, and a camera connected to it. The goal of the project is to develop an effective and efficient traffic monitoring system that can supply valuable insights for traffic management and planning.

**4. RESEARCH OBJECTIVE**

The research aims for the automobile traffic counter project are:

* To develop a real-time traffic monitoring system that can accurately count and classify vehicles.
* To implement computer vision and machine learning techniques, such as object detection and classification algorithms, to ensure right vehicle detection and tracking.
* To differentiate between cars and trucks and distinguish between vehicles entering and exiting a particular area.
* To ensure the system can handle varying lighting conditions and different camera angles.
* To process the video feed in real-time and supply instantaneous results.
* To develop the system using Python programming language and OpenCV library for image processing.
* To evaluate the system's performance in terms of accuracy, efficiency, and processing time.
* To supply valuable insights for traffic management and planning, leading to a more efficient and safer transportation system.

The main aim of the project is to develop a robust and efficient traffic monitoring system using computer vision and machine learning techniques. The system should be able to accurately count and classify vehicles, differentiate between different types of vehicles, and process the video feed in real-time. The project aims to contribute to the field of traffic management and planning by supplying valuable insights for improving transportation systems.

**5.    METHODOLOGIES**

The method for the automobile traffic counter project involves using computer vision and machine learning techniques to develop a real-time traffic monitoring system. The project will make use of image processing, edge detection, and segmentation to isolate and show vehicles in the video feed. The YOLO algorithm will be used for object detection, while the ResNet algorithm will be used for vehicle classification. The project will be developed using the Python programming language and OpenCV library for image and video processing. The system will be implemented on a hardware setup consisting of a computer and a camera. The system will be evaluated based on its accuracy, efficiency, and processing time. The main aim of the project is to develop an efficient and reliable traffic monitoring system that can supply valuable insights for traffic management and planning

**6.    EXPERIMENTAL SETUP**

* Single-camera setup: In this setup, a single camera is used to capture the video feed of the traffic, which is then processed in real-time using the developed software. This setup is simple and cost-effective and can be used for monitoring traffic on a single lane or road.
* Multi-camera setup: In this setup, multiple cameras are installed at different locations to capture the traffic from different angles. The video feeds from all the cameras are then processed using the developed software to get a comprehensive view of the traffic situation. This setup is more complex and expensive but supplies more correct and detailed information about the traffic.
* Drone-based setup: In this setup, a drone equipped with a camera is used to capture the video feed of the traffic from a higher altitude. The video feed is then processed using the developed software to get a bird's eye view of the traffic. This setup is useful for monitoring traffic in areas where installing cameras is not possible or safe.
* In-vehicle camera setup: In this setup, a camera is installed in the vehicle, which captures the video feed of the traffic. The video feed is then processed using the developed software to get real-time information about the traffic. This setup is useful for monitoring traffic on a personal level and can supply information about the user's route and travel time.

**7.    CONCLUSION**

In conclusion, the automobile traffic counter project offers an innovative solution to the growing problem of traffic congestion in urban areas. The project's success is attributed to the use of cutting-edge machine learning and computer vision techniques and the careful design of the experimental setup. The system's accuracy, efficiency, and real-time capability make it a valuable tool for traffic management and planning, supplying insights and solutions to improve road safety and reduce traffic congestion. The project can be further expanded to include added features such as pedestrian detection, lane detection, and vehicle speed estimation to supply a more comprehensive solution for traffic monitoring and management.

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