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Obstacle and Road Lane Detection using Python and Artificial Neural Network

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Abstract. Object or vehicle detection is an essential component with the detection of lanes. Researchers have suggested a number of methods to improve vehicle and lane detection, but doing so successfully in a wide range of settings remains a significant challenge. This study presented an Open CV-based technique for detecting vehicles and lanes, since the inadequate anti-interference capacity of the conventional detection algorithm no longer suffices for the vehicle system. Images collected by cameras serve as the primary input for the system, allowing it to identify moving objects, people, and lanes so that it can follow the borders of the road. Open CV library functions, the R camera, and Python code were used to put the idea of image processing into practice. This approach is reliable for road detection even under difficult conditions. The proposed method can show the results to detect both the curves and straight lanes correctly also detect vehicles. And avoid the collision. It can meet the vehicle system requirements.
Keywords: detection algorithm, lane detection, Open CV, Image processing, R camera, python programming.

1. Introduction

Technology and population growth have combined to make car ownership and operation a necessity for most people. Due to the ever-increasing quantity of automobiles, more and more people rely on them to get them to and from their destinations. It raises the potential for mishap. Prevention of accidents and protection of human life are both crucial and challenging tasks in the modern world. Several systems have been developed that use GPS and GSM to help prevent accidents and save lives. The general vicinity of accidents may be approximated with the use of GPS. Mobile phone texting through GSM. On the other hand, the suggested system is used to prevent collisions by providing indicators to drivers on both sides of the road. All other existing systems are only useful after an accident has already taken place. A light or buzzer is used to provide the signal. This method was developed to address the shortcomings of existing solutions, and it is both effective and straightforward.

- Artificial Intelligence: In 1955, computer scientist John McCarthy first used the phrase "Artificial Intelligence." Artificial intelligence, or AI, is the capacity of a machine or computer to reason, learn, and act independently.
- Machine Learning: It is a kind of AI that does not need predetermined instructions to learn new things and become better over time. This paper is based on the project of Emergency Autonomous Braking System using ANN's for which the need feral time vehicle detection and lane detection is to be fulfilled. We have done it by using Open CV program of Python.
- Objective: The objective of the program given is to detect the object of interest (Car) in video frames as well as images and detect Lanes and avoid collisions.

2. Review of Literature

Abhinav Kant-Since fuzzy rules may be used to detect changing road conditions, a novel hybrid controller is developed, which combines a sliding mode controller with a fuzzy controller. The nonlinear difficulty that emerges in the use of ABS may be easily remedied with the help of fuzz theory. Eneh I.I. and Okafor P.U.: To ensure the system was ready for deployment, it was put through a series of tests using simulated data, during which the sensor read the speed of the item immediately before of it and the location of the vehicle from the thing. Ms. Sujeetha, Chitrak Bari, Gareja Prdip, Siddhant Purohit: All of them are skeptical of an automobile that does not have a driver, therefore they will do their best to stay away from them. This study presented their thoughts on a self-driving, robotically controlled automobile. Pravin T. Mandlik Prof A. B. Deshmukh: The Hough transform method is used for lane detection on the Open CV platform, while the canny edges detector is used for edge detection. Identifying and tracking lanes in real time has been shown to be a feasible and effective method.

3. Various Approaches

Vehicle Detection and Segmentation Approaches: One fascinating area of computer vision is the identification of areas of change in images of a moving object acquired at various times. A number of techniques are used for video surveillance, and one of them is traffic image analysis, which makes use of techniques including moving vehicle recognition and segmentation.

- Background Subtraction Methods: Backdrop subtraction is the method used to separate a moving foreground item (input picture) from a still background (output image) or a created background frame (video). Based on the above-mentioned model and the equation provided below, we can classify each pixel (x,y) in the picture as either being in the foreground or background.

$$I(x,y)\text{Mean}(x, y)<(C\text{xStd}(x,y))$$

- Feature Based Methods: The feature-based approach facilitates occlusion management between overlapping vehicles and, in comparison to the background subtraction approach, is simpler to implement from a computing standpoint.

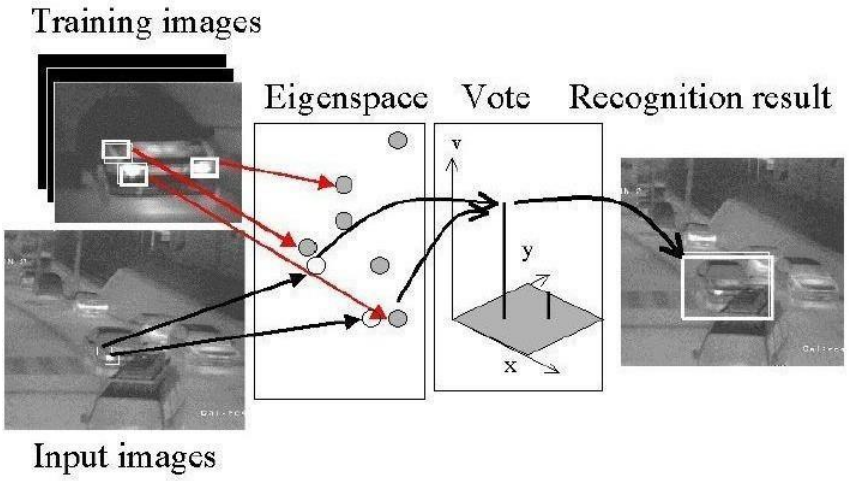

FIGURE 1. Feature based method block diagram

- Frame Differencing and Motion Based methods: Separating the moving objects by inspecting and assigning sets of pixels to distinct classes of articles based on the directions and speed of their advancements from the beginning of the moving scene image grouping is an additional crucial step in detecting cars in picture sequences.

4. Methodology

Vehicle Detection:

- Analysis of data.
- Feature extraction to find the features of images.
- Train a Support Vector Machine classifier.
- Use the classifier to search the car while using a sliding window.
- Vehicle recognition and bounding box generation for a heat map.
- Regulate the outcomes and get rid of the video's false positives.

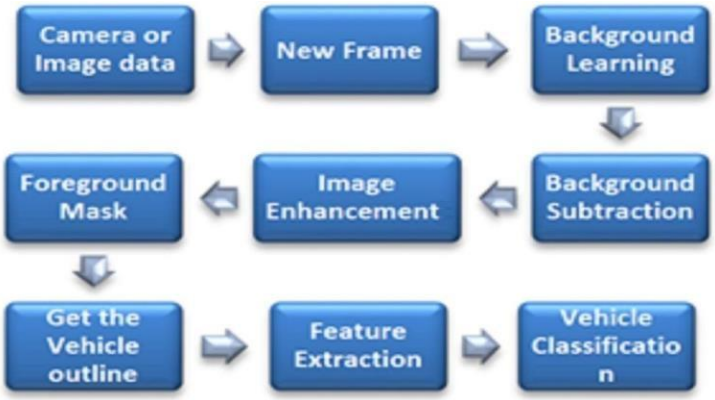

FIGURE 2. Block Diagram for Vehicle Detection.

- ObjectDetection:YOLOv3: In order to pinpoint exactly where something is in a picture, object localization algorithms provide numerical values. The use of bounding boxes to indicate the position of an item in an image is the most common technique for doing so in the field of computer vision.

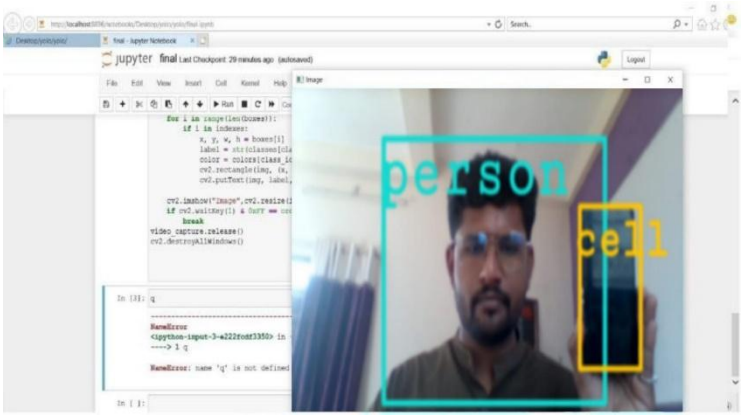

FIGURE 3. Detect objects in real-time using webcam

//Algorithm YOLO loaded
Net=cv2.dnn.readNet ("yolov3.weights","yolov3.cfg") Output:
LOADINGYOLOYOLOLOADED
Video capture=cv2.VideoCapture (0)

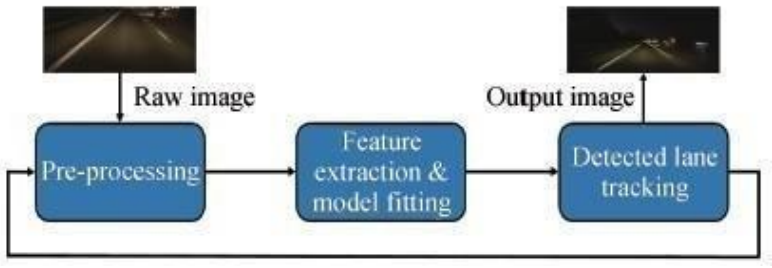

FIGURE 4: Block Diagram for Lane Detection and Tracking

- Lane Detection: It seems that standard computer vision methods may be used to decipher road lane markers. Using various image filtration and processing methods and programming in python for detecting lanes on the road in real time:
- Convert original image to HSL
- Isolate yellow and white from HSL image
- Convert image to gray scale for a sermonic pulsation
- Apply Gaussian Blur to smooth emerges
- Smooth gray picture, then run it via Cranny's edge detector.
- Locate the Region of Interest using the Tracer and ignore any lines found in the previous step that are outside the ROI.
- Trace the red lanes using a Hough Transform to locate the areas of interest.
- Separate left and right lanes
- Extrapolate them to create two smooth lines

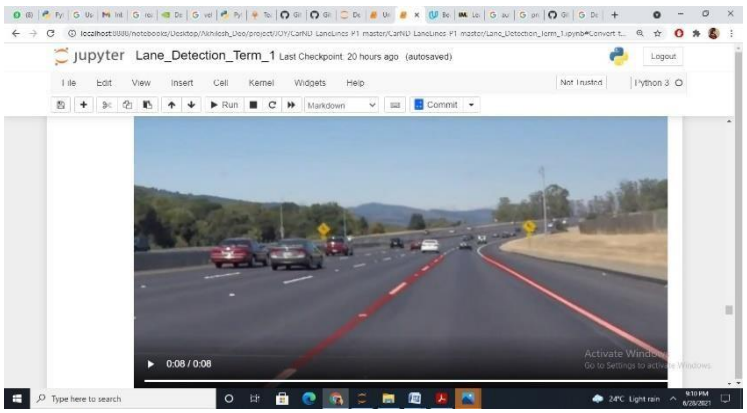

FIGURE 5: Video Output

5. Conclusion

Detection of cars, as well as lane, is a difficult problem, for real- time application, it should be optimized by using parallel processing. Using data collected in a virtual setting, the suggested system gradually develops a sophisticated technique for managing the brakes. The described method is likely to fail where it wasn't trained for pedestrians, bicycles, a dog crossing the street, but working with that data set will be solved. Detection of the vehicle and tracks made by the system is reliable. The numbers of vehicles present in the video are detected in real-time and it all so gives a warning when there is the possibility of collisions. Future Scope In order to effectively identify impediments and create smart driving cars, future work will concentrate on developing the suggested system in tandem with the conceptual hints or sensors. To further enhance the system's intelligence, road sign detection may be included. One future work is to make the system more reliable for theclassificationofvehiclespedestriansanddifferentobjectswiththosedatasets.

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