A MINI PROJECT REPORT

On

“Vehicle Detection Using Computer Vision”

Submitted by

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M. Sc. Semester – II

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Certificate

This is to certify that Report on **Vehicle Detection using Computer Vision** documents the participation of **Mr. Mohammad Yasir** under my supervision carried out during the semester II of year 2023 in partial fulfillment of requirements prescribed for the degree of M.Sc Computer Science of Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur.

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Declaration

I, The undersigned hereby declare that the project report work entitled **Vehicle Detection using Computer Vision** submitted to Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur, is my independent work. This is my original work and has not been submitted anywhere for an award of any degree/diploma. The system presented here in has not been duplicated from any other sources. I understand that any such copying is liable to be punished in any way the university authority may deem fit.

Mr. Mohammad Yasir

Place : Kamptee

Date:

Acknowledgment

This project has been a great learning experience for me. I would like to express heartfelt gratitude to **Dr. Satish Sharma,** Head of the Department, for giving such a wonderful opportunity to create a project and gain knowledge about this knowledgeable topic. His constant encouragement, valuable help and strong support. He is the inspiration behind my decision to be involved in the project in the first place. His trust, faith and freedom helped me to complete this work.

I am extremely thankful to **Dr. Mrs. S. M. Barhate,** for showing me the right direction of work and for her strong support in the completion of this project.

Special gratitude to **Dr. Mrs. A. D. Sakhare, Dr. Mr Shivkumar Atre, Ms. Deepshika Mehta, Mrs. Shubhangini Dhakte,** who helped me in putting various pieces of the project work together and seeing the light of the day.

I am thankful to all members of the teaching and non-teaching staff of the Department of Electronics and Computer Science for their cooperation during the course.

I am highly obliged to my parents for their consistent moral support and believing in me, my classmates and other colleagues for their utmost and inspiration during the project work.

Lastly, I would like to thank all those who directly or indirectly helped me during my project work.

Date: **Mr. Mohammad Yasir**

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Abstract

Traffic Analysis has been a problem that city planners have dealt with for years. Smarter ways are being developed to analyze traffic and streamline the process. Analysis of traffic may account for the number of vehicles in an area per some arbitrary time period and the class of vehicles. People have designed such mechanisms for decades now but most of them involve use of sensors to detect the vehicles i.e. a couple of proximity sensors to calculate the direction of the moving vehicle. The system involves capturing frames from the video to perform background subtraction in order to detect the vehicle.

Chapter 1: Introduction

1.1: Introduction

A Traffic surveillance system usually contains two parts, hardware and software. Hardware is a static camera installed on the roadside that captures the video feed and the software part of the system is concerned with processing and analyses. These systems could be portable with a microcontroller attached to the camera for the real-time processing and analyses or just the cameras that transmit the video feed to a centralized computer for further processing.

1.2: Existing System Disadvantages

vehicle detection and counting is a challenging task due to many reasons such as: small size of the vehicles, different types and orientations, similarity in visual appearance of vehicles and some other objects (e.g., air conditioning units on the buildings, trash bins, and road marks), and detection time in very high resolution images is another challenge that researchers need to take in consideration.

- Unable to detect in poor visual video streams
- There is no vehicle classification

1.3. Advantages

- Detection of multiple moving vehicles in a video sequence
- Tracking of the detected vehicles
- Identification of Vehicle types
- Counting the total number of vehicles passing in videos.

1.4. Objectives

- Detection of multiple moving vehicles in a video sequence
- Tracking of the detected vehicles
- Color identification of Vehicles
- Counting the total number of vehicles in videos

Chapter 2: Methodology

2.1. Methodology

The system could be used for detection of the vehicles in the video frames and then classify the detected vehicles according to their size in three different classes. The proposed system is based on three modules which are background learning, foreground extraction and vehicle classification as shown in Background subtraction is a classical approach to obtain the foreground image or in other words to detect the moving objects.

2.1.1. Background Learning Module

This is the first module in the system whose main purpose is to learn about the background in a sense that how it is different from the foreground. Furthermore as the proposed system works on a video feed, this module extracts the frames from it and learns about the background. In a traffic scene captured with a static camera installed on the road side, the moving objects can be considered as the foreground and static objects as the background. Image processing algorithms are used to learn about the background using the above mentioned technique.

Fig.2.1.1. Background

2.1.2. Foreground Extraction Module

This module consists of three steps, background subtraction, image enhancement and foreground extraction. Background is subtracted so that foreground objects are visible. This is done usually by static pixels of static objects to binary 0. After background

subtraction image enhancement techniques such as noise filtering, dilation and erosion are used to get proper contours of the foreground objects. The final result obtained from this module is the foreground.

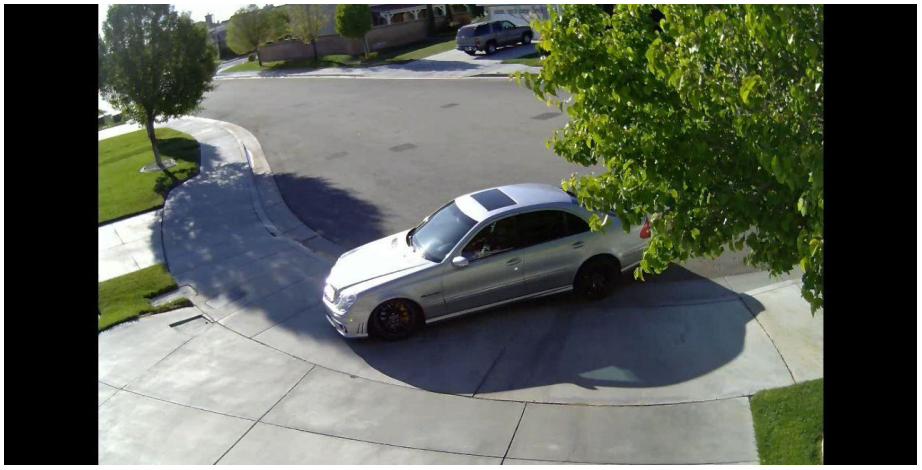

Fig.2.1.2. Foreground

2.1.3.Vehicle Classification Module

The third and the last module in the proposed system is classification. After applying the foreground extraction module, proper contours are acquired, Features of these contours such as centroid. Aspect ratio, area, size and solidity are extracted and are used for the classification of the vehicles.

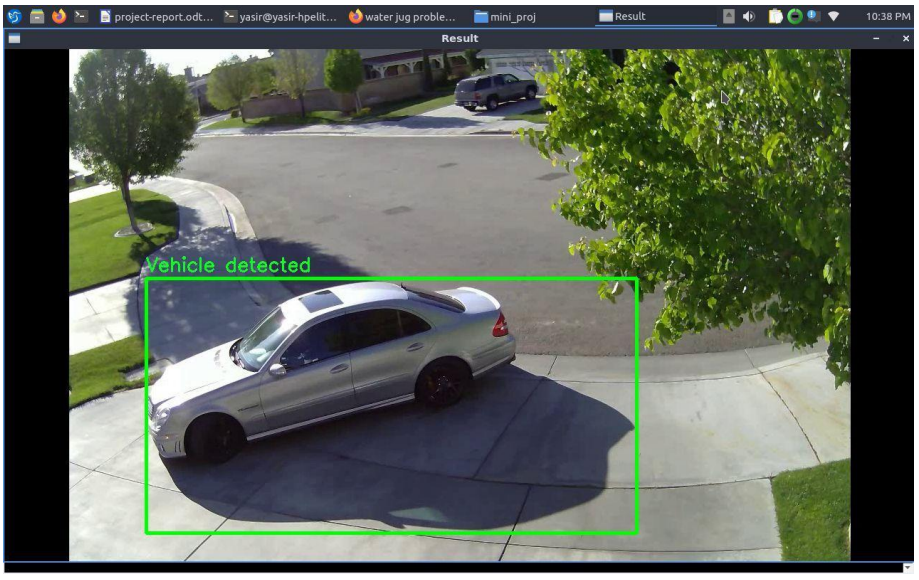

Fig.2.1.3. Final Output

Chapter 3: Requirement and Experimental Work

3.1: Requirement specification

The proposed system is executed in python language on a Desktop with Intel Core i5 Processor @ 2.20GHz x 4. We have used the OpenCV library in the Python programming language with Ubuntu 22.04. Vim is an open source command line text editor which is used to fulfill our goal.

3.2: Coding Details

```
import cv2 as cv

background = cv.imread("background.png")
background = cv.cvtColor(background, cv.COLOR_BGR2GRAY)
background = cv.GaussianBlur(background, (21,21),0)

cap = cv.VideoCapture("test.avi")

while(cap.isOpened()):
        ret, frame = cap.read()
        gray = cv.cvtColor(frame, cv.COLOR_BGR2GRAY)
        gray = cv.GaussianBlur(gray, (21,21), 0)
        diff = cv.absdiff(background,gray)
        thresh = cv.threshold(diff, 30, 255, cv.THRESH_BINARY)[1]
        thresh = cv.dilate(thresh, None, iterations = 2)

        contours, _ = cv.findContours(thresh.copy(), cv.RETR_EXTERNAL,
cv.CHAIN_APPROX_SIMPLE)

        for contour in contours:
                if cv.contourArea(contour)<20000:
                        continue
                (x,y,w,h) = cv.boundingRect(contour)
                cv.rectangle(frame,(x,y),(x+w,y+h),(0,255,0),3)
                cv.putText(frame, 'Vehicle detected', (x, y-10),
cv.FONT_HERSHEY_SIMPLEX, 0.9, (36,255,12), 2)
```

```
        cv.imshow('Result',frame)
        if cv.waitKey(0) & 0xFF == ord('q'):
                break

cap.release()
cv.destroyAllWindows()
```

3.3. Conclusion And Future Work

The proposed solution is implemented on python, using the OpenCV bindings. The traffic camera footage from a variety of sources are in implementation. A simple interface is developed for the user to select the region of interest to be analyzed and then image processing techniques are applied to detect vehicles. Currently proposed system works with already captured videos but it can be modified to be used for processing live video streams by adding microcontrollers.

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