Advanced Automobile Recognition Through the Use of Image Processing Techniques

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Abstract

Many law enforcement agencies have recently shown interest in automated automobile recognition and tracking technologies such as license plate reading or GPS tracking. However, some criminals may drive vehicles that have false license plates or are not equipped with GPS tracking devices, making the pursuit of such vehicles difficult. This project aims to create a computer vision system capable of taking real-time input from a static camera and identifying passing cars by make and model in order to assist law enforcement agencies in the tracking of suspect or stolen vehicles. Vehicle identification is accomplished using a combination of old and new algorithmic image processing techniques.

Keywords: Hough transform, Gaussian smoothing, Canny edge detection

1 Introduction

Many law enforcement agencies, especially ones in large metropolitan areas, are faced with difficulties when tasked with finding one specific car in a city of thousands. For example, a police officer may receive breaking news of a robbery underway, arrive late at the scene, and then have to chase the getaway car provided only with a witness's visual description of the vehicle.

Existing car-tracking technologies such as License Plate Recognition (LPR) would fail in this case, as the officer does not know the license plate number of the vehicle driven by the suspects who he is attempting to apprehend. It is in cases like these that an automatic visual automobile recognition system may prove useful. Thus, this project is primarily aimed towards assisting law enforcement agencies with chasing down criminals or recovering stolen cars.

2 Background

Several computer systems currently exist for the tracking of military and civilian automobiles via License Plate Recognition (LPR) or GPS technology. Such systems are in use by law enforcement entities such as US Customs and Border Protection[1] and UK police[2], and have proved very effective in catching criminals. However, these systems fail when an automobile has fake or no plates, and no GPS tracking device, and is able to avoid recognition. The new system outlined in this paper, on the other hand, is able to alert law enforcement officers of the presence of any specific type of vehicle regardless of whether or not it is equipped with GPS or the proper license plates, assisting in situations such as when an all-points bulletin is put out for a certain vehicle based only on a visual description. In addition, some systems already exist[3] that can automatically recognize military vehicles such as tanks by their color, size, geometric description. However, in the course of my preliminary research I found no existing systems capable of the automated, advanced (ie make and model) recognition of everyday civilian vehicles such as cars, small trucks, semis, etc. The inner workings of my system will be similar to that of the existing systems for the automated detection of military vehicles, in that it will define a certain set of characteristics for comparison, extract those characteristcs from the image of an unknown vehicle or group of vehicles, and search amongst a list of known vehicles for a possible match. The primary difference between these types of systems and my own is that mine will be much more precise in terms of characteristics such as size and shape, and select possible matches from a much more diverse database.

3 Object Isolation

This part of my program will focus on isolating the parts of an image which contain individual automobiles for identification. Currently, a very rudimentary system of color detection is in place. Hopefully, a more accurate system based on color recognition, shape detection, and movement detection will be written by the end of second quarter.

4 Feature Identification

This part of my program will focus on recognizing and classifying key distinctive features from the image of an automobile. Such features may include color, size, shape, hood ornament, etc. Currently, I have implemented edge, line, and vertex detection, underlying building blocks for any advanced feature recognition algorithm. I may at some point decide to investigate machine learning as an possible solution for complex feature identification and image classification due to the success that some researchers have experienced[4] using this method. Again, the target time for the completion of at least one or two advanced feature identification algorithms is currently the end of the second quarter.

5 Results and Discussion

My program is not yet has not yet reach the point where it can provide meaningful results from any form of testing input. I hope to be testing my recognition and classification program on real-world images of cars and trucks by the end of seond quarter.

References

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