Make, Model, and Color Recognition of Cars

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Abstract

This paper proposes an investigation into recognizing cars by their make, model, and color from images captured by a relatively inexpensive digital camera. This work partially builds off of Louka Dlagnekov's previous work [1] on recognizing cars.

1 Introduction

Object detection and recognition are necessary in an artificially intelligent and autonomous system. Eventually, these systems are expected to venture to the outdoor environment. Thus, detection of common objects in the streets is necessary to provide input and feedback into the system. Pedestrian [] and face [] recognition results have been accurate. Cars, however, proved to be a more difficult object for detection and recognition due to its varying structure from different perspectives of view of the same car, as well as varying between different makes and models.

1.1 Previous Work

Several different approaches of car detection and make and model recognition (MMR) have been proposed in the past. These approaches have used feature detection [5], 3D modeling [3], and Scale Invariant Feature Transforms (SIFT) [1]. While each method of approach to this problem produced considerably accurate detection and classifications of cars, they are constrained to work well only with a specific set of data that is taken in a set condition, i.e. fixed camera position overlooking passing cars directly underneath.

2 Project Objectives

The primary objective of this project is to develop a system that can detect a car and recognize it by identifying its make, model, and color. The detection of a car should ideally work from any perspective of the car. A basic detection of the primary profile views (front, rear, side, and ¾ views) should be developed and expanded upon to work from an arbitrary angle of view.

Next, the MMR can be achieved by using a learning classifier that is trained with a training dataset. The classifier should build a library of cars of different makes and models, each from different angles of views. This library would be similar to having a 3D view of a specific car. From this library, the classifier should be able to recognize a car.

Car color classification is an independent problem from MMR. From a dataset of color images, color can be sampled from the area of positive detection of a car, and in most cases, the more prominent color in the area can be used to label the car color.

2.1 Questions

Questions to be answered by this project are:

- How well do previous approaches of car detection and MMR work on multiple angles of view?
- Can previous approaches be improved to work better on multiple angles of view?
- Which type of cars will be the easiest to recognize? Which would be the hardest?
- Which type of learning algorithm will work best with car recognition?
- Which features of cars can be used for classification to provide the best results for recognition?

3 Software and Datasets

Code will be written in C++ and the OpenCV source library will be utilized for image processing. Matlab can also be used to test image processing techniques or

labeling of training set data.

Datasets previously captured by [1] can be used since they have already been labeled and can be readily used as a training set. This dataset generally consists of views from the rear of cars, and can be used for training a classifier for rear view. For other points of views of a car, a new dataset can be generated by acquiring images with a digital camera of various cars in a parking lot on campus.

4 Milestones

Jan 7:
Complete acquisition of all datasets and setup of work environment with OpenCV.

Jan 14:
Researched and developed method for basic car detection.

Jan 28:
Researched and developed method for car detection from multiple view perspectives.

Mar 10:
Researched and developed method for make, model, and color recognition. Begin writing presentation and report.

Mar 12:
Complete final project presentation.

Mar 17:
Complete final report.

5 Qualifications

During an internship at SPAWAR Unmanned Robotics Laboratory, San Diego, I have developed a door detection software for mobile robots using OpenCV.

My relevant coursework in the field of vision and learning include ECE172A: Introduction to Intelligent Systems, ECE173: Theory and Applications of Neural Networks and Fuzzy Logic, and ECE187: Introduction to Biomedical Imaging and Sensing.

6 References

[1] L. Dlagnekov. Video-based Car Surveillance: License Plate, Make, and Model Recognition. *Master's Thesis*, University of California, San Diego, 2005.

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[4] B. Leung. Component-based Car Detection in Street Scene Images. *Master's Thesis*, Massachusetts Institute of Technology, 2004.

[5] B. Morris and M. M. Trivedi, Robust Classification and Tracking of Vehicles in Traffic Video Streams, *IEEE International Intelligent Transportation Systems Conference*, Sep. 2006.