Automated vehicle make, model, color, and license plate detection and classification

EE 368/ CS232: Digital Image Processing
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Automated licence plate detection is a solved problem. Open source libraries such as OpenALPR[1] exist that quickly and accurately recognize license plates and commercial license plate scanners have been deployed to governmental agencies worldwide. License plate scanners are extremely useful for the detection of improperly registered or stolen vehicles and while both powerful and accurate, these scanners do not have the ability to detect other important features about vehicles. This project proposes to extend the capability of these scanners by using convolutional neural networks and other advanced image processing techniques to detect vehicle make, model, model year, and color and to build a web interface capable of running on any smartphone to identify vehicles. The normally extraneous information this project aims to detect can useful in cases where license plates are not attached to the vehicles they were registered to, or to build demographic information.

Several datasets of images of vehicles with labeled make, model, and years exist. With the Stanford Cars Dataset, Jonathan Krause et al.[2] were able to report accuracies of 67.6% in 2013 using advanced computer vision techniques. More recently with the proliferation of convolutional neural networks, Linjie Yang et al.[3] was able to report 91.7% top 5 accuracy using the googlenet[4] architecture in a similar dataset of single car images. These algorithms are finally to the level of accuracy where they can be deployed in production

Challenges in solving this problem include: developing a robust algorithm to segment cars into single car images in order to feed them into an ALPR library and training a convolutional neural network to identify vehicle make, and model. Furthermore an algorithm will be developed to identify vehicle color. This project will expand upon existing research and build a product that is capable of properly classifying images with multiple cars. The final paper will report training error results from a generated test set and examples from deployment of this algorithm in the real world.

References:

[1] "Openalpr/openalpr." *GitHub*. Web. 30 Oct. 2015. https://github.com/openalpr/openalpr
[2] Jonathan Krause et al. (2013) 3D Object Representations for Fine-Grained Categorization.
[3] Linjie Yang et al. (2015). A Large-Scale Car Dataset for Fine-Grained Categorization and Verification. *CoRR, abs/1506.08959*
[4] Christian Szegedy and (2014). Going Deeper with Convolutions. *CoRR, abs/1409.4842*, .