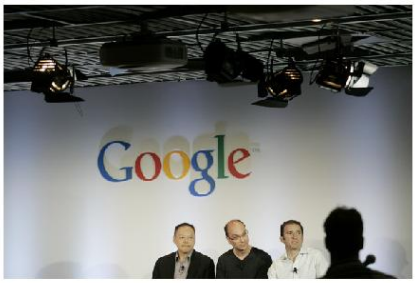
CIS581, Computer Vision, Fall 2013
Final Project, Logo Replacement
Checkpoint December 10
Presentation December 16, 6pm-8pm
Code Due December 21, 11:59 PM

Overview

The goal of this project is the automatic detection and replacement of embedded advertising logos in images and videos. With the increase in popularity of digital video recorders and online streaming of movies and television, traditional commercials are becoming easier and easier to skip. As a result, some advertisers are increasingly turning towards embedded product placement for marketing. Product placement is the featuring of a specific brand in the context of a television show or movie, such that a product is used by the characters, often accompanied by a closeup shot of the logo. These types of advertisements are embedded in the entertainment and, as a result, very difficult to avoid. The goal of this project is to create an automated product placement blocker. this blocker can be used to scrub an input video, such that product logos detected from a banned list are replaced seamlessly with neutral logos or fictional brands, thereby blocking the advertisement without requiring pixelation or blurring. There is a similar iphone/android App called WordLens for automatic text translation and replacement.

Automatic logo replacement with seamlessly rendered replacement logo is a non-trivial process. First, a logo from a 'to-be-replaced' list should be detected in an input video frame, which requires feature detection and matching between imagery and a logo model. Next, the warping of the logo must be estimated. Logos may appear on locally planar surfaces (e.g. pizza box tops) or on deformable surfaces (e.g. t-shirts), so in order for the replacement logo to have the same warping, this warping must be estimated. Then a replacement logo must be appearance matched to the detected logo to compensate for shadowing and lighting, the banned logo must be cropped out, the replacement logo inserted, and the final image blended seamlessly.



Concentration Options

This year we provide you with options for the project. You can either go deep into certain topics or use 3rd party library to produce full logo replacement result.

- **Option 1** Focus on a certain topic (eg. SIFT, HOG and etc), implement it on your own, apply it on the logo replacement project and analyze the results. For this option you don't necessarily have to achieve a full logo replacement result on other parts (such as blending). But we expect you to go deep into the certain algorithm. We will compare your result with the 3rd party implementation.
- **Option 2** You are allowed to use standalone 3rd party libraries (that can be compiled directly on Windows 7/Linux/Mac OS X) to achieve satisfactory overall results for logo replacement. You will be facing challenges on exposure, multiple logo instances and logo distortion, etc. We will evaluate your performance based on overall visual results.

  Please specify your option in your checkpoint/presentation/submission. You are welcome to talk about it with us at the beginning of the project.

Procedure

Included on the course webpage is a practice set containing a logo to replace and several frames containing the logo. You can use these to develop your code. Three days before the project presentations we will release a new test set containing a different logo and images to replace. Those are the images youll be graded on. Ideally, changing your code to work with the new set should not take much effort, but the 3 days should allow you some time for tweaking. Your final code will be due 5 days after the presentations.

You are encouraged to work with a partner on this assignment.

Schedule

- **Dec.10: Checkpoint** We expect some progress to be made on logo detection at this point. You need to submit 3 slides to cis581.fall2013@gmail.com, showing your progress. Please zip your slides as 4_pennid1_pennid2_cp.zip.
- **Dec.13: Official Test Set** The official test set is released. It contains both easy and very difficult cases. Please run your code on this for your presentation.
- **Dec.16: Presentations** Each team will present the results at 6pm - 8pm on December 16th. The presentations should be 7 minutes/7 slides.
- **Dec.21: Code Due** E-mail your final assignment files to cis581.fall2013@gmail.com. Include a **readme.txt** file containing your names, and anything we should notice to compile/run your code. Include a **script** that runs your replacement code on each of the test set files.

Tasks

Specific tasks are as follows

1. **Replacement Logo Selection** Select the logo you will ll be inserting over the test set.
2. **Target Logo Detection** Attempt to locate all instances of the target logo in the test set using an automated detector. The lectures provide some details on HoG, Shape Context, Harris Corners, SIFT features that may be useful here. You may use 3rd party libraries (Option 2) or implement it yourself (Option 1).
3. **Logo Deformation** For each instance of the target logo in the test set, find a deformable image transform that warps the reference image to the detected instance. Apply this transform to the replacement logo.
4. **Logo Replacement** Compute the convex hull of the detected logo and the warped replacement logo. Replace the convex hull of the detected logo with the convex hall of the warped replacement logo in the test image.
5. **Refinement (compulsory for Option 2, extra credit for Option 1)**
   Here are some directions to make the replacement more natural.

(a) Use Laplacian image blending/Gradient domain blending to get a seamless integration of the new logo.

(b) Find the appearance difference of the detected logo to the warped version of the detected logo. This could be a per pixel additive offset due to shadowing and lighting of the surface with the logo. Apply this brightness/color offset to the warped replacement logo to achieve a better appearance match.

6. **(Optional) Spiffy** Eternal glory will be awarded for teams that implement detection and replacement of their logo in a short video of product placement in a television show or movie.

Scoring

- To receive full credit your code must perform well on the easy images in the test set by your presentation time.
- The optional tasks and successfully replacing the logos in the difficult set will receive extra credit.
- Replacing the logos in the difficult set successfully will also compensate for not having working code at the presentation time, but this will be difficult and is not a recommended alternative to finishing before the presentation

FAQ

Q: We use 3rd party exe file in our project. Gmail seemed to block emails with executable files. How can we make submission?

A: You can share it with us via any cloud service. Or you can do it by zipping the files and then changing the extension from .zip to .piz and having me rename it on my end.