(look at image on right from very close, then from very far away)

Project 1 – Hybrid Images

Overview

The goal of this assignment is to create hybrid images using a modification of the approach described in the SIGGRAPH 2006 paper by Oliva, Torralba, and Schyns. Hybrid images are static images that change in interpretation as a function of the viewing distance. The basic idea is that high frequency tends to dominate perception when it is available, but, at a distance, only the low frequency (smooth) part of the signal can be seen. By blending the high frequency portion of one image with the low-frequency portion of another, you get a hybrid image that leads to different interpretations at different distances.

Details

This project is intended to familiarize you with MATLAB, image filtering, and multiscale frequency representations. If you don't already know MATLAB, you will find this **tutorial on MATLAB**

helpful. The alignment of images is important because it affects the perceptual grouping (read the paper for details).

First, you'll need to get a few pairs of images that you want to make into hybrid images. You will be generating Gaussian and Laplacian pyramids for both images and merging them to produce the hybrid image. The hybrid will be the sum of a low-pass filtered version of the first image and a high-pass filtered version of the second image. The **cutoff-frequency** of each filter can be set by choosing the first or last N levels of the Laplacian pyramid to include in the sum, where N is a configuration parameter that you can vary per image to produce the best results. This creates a new pyramid from the top of one pyramid and the bottom of the other pyramid, which is then used to construct the hybrid image using the exact reverse of the pyramid construction process. Don't forget to include the last level of the Gaussian pyramid in the sum for the low-pass filter (it contains all lower frequencies after the end of the pyramid). Your image pyramid should look similar to Figure 7 in the Oliva et al. paper:
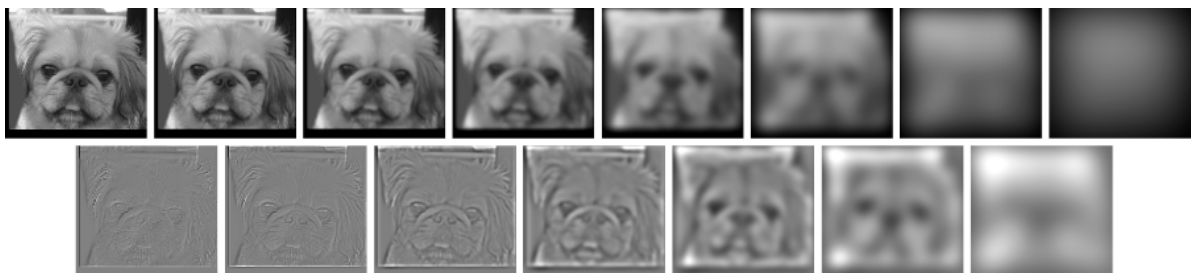
The images for the Laplacian pyramid were visualized by adding 0.5, so light gray values are positive and dark gray values are negative. Try creating different types of hybrid images (change of expression, morph between different objects, change over time, etc.). The **site** has several examples that may inspire.

Useful MATLAB functions: `imfilter`, `imresize`, `imwrite`, `cell` Forbidden functions: `impyramid`

Bells & Whistles (Extra Points)

Try using color to enhance the effect. Does it work better to use color for the high-frequency component, the low-frequency component, or both?

Think of your own clever extensions to get more extra credit.

Writeup

For this project, and all other projects, you must do a project report in PDF. In the report you will describe your algorithm and any decisions you made to write your algorithm a particular way. Then you will show and discuss the results of your algorithm. Also discuss any extra credit you did. Feel free to add any other information you feel is relevant.

Handing in

The dossier you hand in must contain the following:

- README - text file containing anything about the project that you want to tell the TAs
- code/ - directory containing all your code for this assignment
- PDF/ - directory containing all your PDF report for this assignment (including images)

Credits

Assignment adapted from the one developed by Derek Hoiem