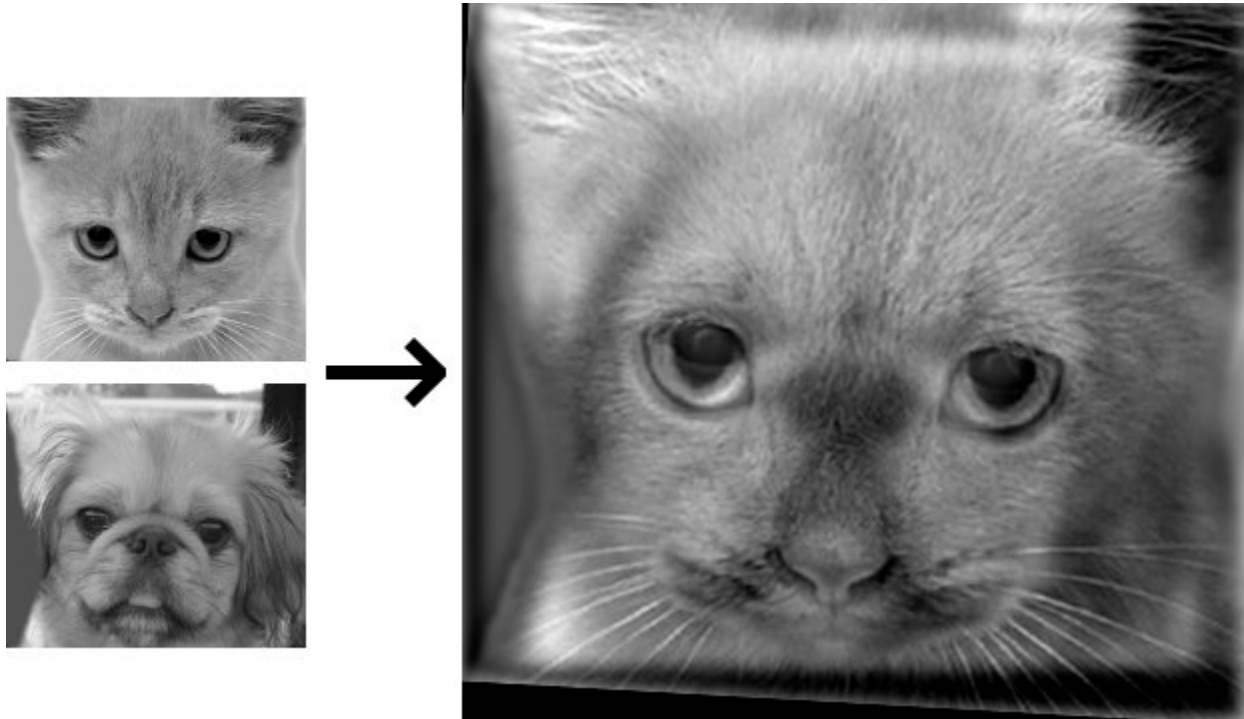


Homework 2: Hybrid Images



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

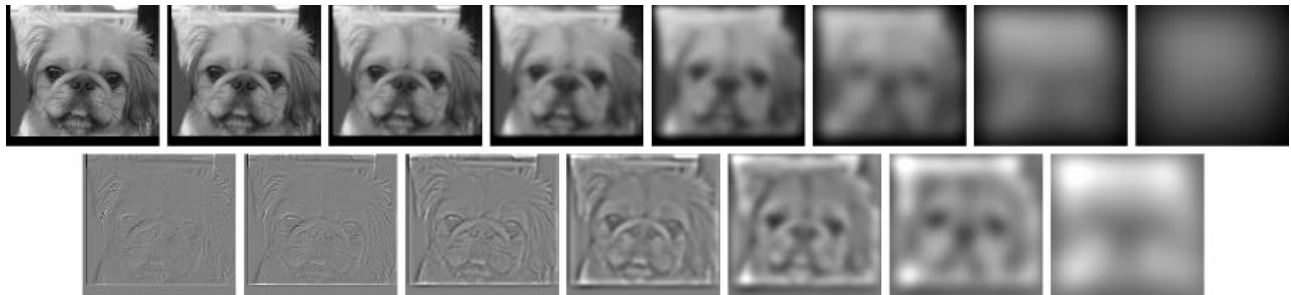
Overview

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 multi-scale frequency representations. First, you'll need to get a few pairs of images that you want to make into hybrid images and align them. The alignment is important because it affects the perceptual grouping (read the paper for details). 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 you.

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

Forbidden functions: `impyramid`

Extra Credit

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.

Submission

Turn in a zip file on Moodle by the posted deadline which contains:

1. Your source code
2. An assignment report (PDF or MS-Word) that contains:

1. A description of your algorithm and any design decisions you made. Show and discuss the results of your algorithm and discuss any extra credit you did. Feel free to add any other information you feel is relevant.
2. For your results, produce 3 hybrid images using your own (aligned) images. For each, include the input images, output image, and the image pyramids.

Academic Integrity

By submitting this assignment, you certify that you have read the course collaboration policy, and have complied with this policy in the preparation of this assignment. List anyone with whom you discussed the assignment or outside materials used, other than the professor, TA, course slides, or course textbook. This assignment has been used in other Computer Vision courses with source code and output images easily available online. Seeking out, referencing, or copying this material is a violation of course policy.

Credits

Assignment developed by Derek Hoiem