Hybrid Images (15%)

Overview

The goal of this project is to create hybrid images using the approach described in the references. *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.

1. Build the Gaussian Pyramid and the Laplacian Pyramid (5%)

   Reference 1: P.J.Burt and E.H.Adelson, (1983). *The Laplacian Pyramid as a Compact Image Code.* IEEE Transactions on Communications. Vol.COM-31(4).532-540.

2. Create hybrid images (at least three image pairs for different types of hybrid images, e.g., change of expression, morph between different objects) (5%)

   Reference 2: A.Oliva, A.Torralba, and P.G.Schyns, (2006). Hybrid Images. ACM Transactions on Graphics, ACM Siggraph, 25-3, 527-530.

   http://cvcl.mit.edu/papers/Oliva-HybridImages-ArtPerception2013.pdf

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).

3. Region blending (5%).

Reference 3: P.J.Burt and E.H.Adelson, A Multiresolution Spline With Application to Image MosaicsACM Transactions on Graphics, Vol. 2. No. 4, October 1983, Pages

217-236.

Request:

1. Draw the algorithm flow charts
2. Develop the program for three algorithms. Submit the codes and the outputs results

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