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README

The goal of this project is to use image-blending techniques to seamlessly merge information from multiple images.

The first technique was used is Laplacian blending. To do this, I first got the Gaussian pyramids by convolving the original image with a Gaussian filter and then downsampling. Then the Laplacian pyramids were generated by: Laplacian [level (a-1)]=Gaussian [level (a-1)]+ interpolate (Gaussian [level a]). After I got the Laplacian pyramids for both the target and the source images, I first interpolated all images to Level 0 size, then for each Laplacian level, I blended them using: blended image= Gaussian (mask)*Laplacian(source)+(1- Gaussian(mask))* Laplacian(target).

There are two tips in this method: firstly, we have to padding the image so that the image size is 2**n; secondly, the mask must be normalized before blending, which means that 0=0 (black) and 1=255 (white).

The second technique is copy and paste blending, using Blended image=mask * Source + (1-mask)* Target.

The third technique is two-band blending. To do this, I first separate the low pass (using a large Gaussian filter) and high pass (original image-low pass) information. This process is done in Fourier domain.

For low pass image, using alpha blending: blended image=smoothed mask*Source+(1-mask)*Target. For high pass image, using binary blending (copy and paste): Blended image= mask*Source+(1-mask)*Target.

Comparison of the three methods:

Copy and paste: "worst method", with easily detective blending boundaries.

Laplacian pyramids: "best method", with almost seamless blending boundaries. Still, it has two shortages. 1) When the backgrounds of the target image and source image are very different, this method is not suitable (it will create clear boundaries). 2) When the size of the pyramids (e.g. Gaussian pyramid level 9) is smaller than the Gaussian kernel, it will lose some low-pass information.

2-band blending: Compared to "copy and paste", this method will make boundaries less discernible. Compared to "Laplacian pyramids", this method will "sharpen" the boundaries.