

ECE 661 Homework 1

Due: 09/09/2008 Tuesday (before the class)

An important goal of this homework is to make you familiar with the OpenCV library that is available at 'www.intel.com/technology/computing/opencv/'.

The homework requires you to remove perspective distortion from camera images of planar scenes. You must record such images with your own digital camera and also use the images that are available at 'web.ics.purdue.edu/~kim497/ece661/homework.htm'. The solution that you submit must show the 'before' and 'after' images as well as your code. You are encouraged to solve the problem in C. Feel free to look at the solution posted at 'cobweb.ecn.purdue.edu/~kak/courses-i-teach/ECE661/index.html', but the code you turn in must be your own. In other words, you can use the posted code to learn how to solve the problem, but then try not to look at it when you construct your own solution.

About the problem itself, you can remove perspective distortion from a planar image if you can establish correspondences between four non-collinear points in the image and in the world. When you use the images that are at the website 'web.ics.purdue.edu/~kim497/ece661/homework.htm', the points that you can use for such correspondences are highlighted in those images. When using your own photographs, you have to select your own points. In Linux/Unix, this you can do with either the XV tool or the ImageMagick tool. On Windows platforms, you can use the IrfanView or XnView. With both these tools, you can figure out the pixel coordinates of a pixel by letting your mouse pointer linger on the point. Subsequently, you can enter world information related to these coordinates by using prompts from your program.

Note that when you do this homework with the photographs taken by your own digital camera, the images are likely to be in JPG format. You would need to convert the images from this format to a more pixel-array like format (such as

PPM) before you can process the images as an array of numbers. You can use a variety of tools for this conversion. In Linux/Unix, probably the most commonly used tools is the convert function of the ImageMagick library. In Windows, IrfanView or XnView library can be used to do the same.

For removing the perspective distortion, what the program needs to know from you is the distance between four pairs of non-colinear points. As mentioned above, for the images downloaded from 'web.ics.purdue.edu/~kim497/ece661/homework.htm', these distances are directly available from the information posted at the site. For your own images, you will have to use some sort of a ruler.

For creating high-quality output, you may wish to use some sort of an interpolation technique such as bilinear interpolation, nearest neighbor interpolation, backprojction etc..

Show your results on at least four images downloaded from 'web.ics.purdue.edu/~kim497/ece661/homework.htm' and four images taken with your own camera.