Hough Transform

Project for Introduction to Image Processing

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Image Processor manual

After starting the program you will notice a grey scale image loaded as a default image. You can load and save your own images by going to **File** in the top menu bar. In this menu you'll also notice the ***Quit*** option to shut down the program. Loaded images will be resized to 800x600 if they are too large and the user will be warned when loading images that can harm the stability of the program.

Right of the **File** menu in the menu bar there's the **Kernel** menu. In here you'll find number of kernels that can be applied to the image in a cascading fashion. Kernels include simple low-pass and high-pass filters up to more complex Hough Transform kernels. In this menu you'll also find the ***Revert*** option to undo all changes made to the original loaded image.

The **View** menu provides you with options regarding the display image. It's possible to magnify or demagnify the image. Additionally, there's an option to normalize the image to 800x600 in case of larger images.

Finally the **Help** menu contains the ***About*** option, which displays some information regarding the program.

Applying the Hough Transform

To apply the Hough Transform simply go to **Kernel**->***Hough transform*** and pick your desired output; the Hough space graph, Hough lines on a black background or Hough lines as an overlay. The execution of these last two methods should take no longer than a few seconds, whereas the Hough space graph is likely to consume more time. When applying either of the latter two options you'll be prompted to give a Sobel threshold and a Hough space threshold. The default values suffice for the test image given in the reader. More details as to why these values are required are given below.

Hough Transform method

I've chosen to execute all four steps of the Hough Transform. The first task was to apply a Sobel kernel to the image. Second, I was forced to apply a threshold to the result image because not doing so would result in 'noise' in the Hough space graph in the form of dotted lines running over the vertical axis causing problems when determining peak values. The third step was to generate a Hough space graph from the Sobel image. This was done by adding up the grey values. Lastly the maxima were located by performing another threshold, this time on the Hough space graph. The remaining values were used to determine the distance and angle.

By modifying the formula given to generate the Hough space, I was able to determine the y coordinate depending on the x-coordinate, distance and angle. As such, running the x-value over the image width I was able to reconstruct the lines.