Computer Vision – Corner Detection and Image Transformations

You can talk with each other, but submit your own independent work. You are responsible for understanding everything you submit. As homework submissions go along, things get more open-ended. This is an example.

Submission:

1. A ZIP file that contains a directory named HW_NN_Firstname_Secondname_DIR
   a. The zip file must contain all of your well commented code.
   b. The zip file must expand to a directory with your work inside it.
   c. The zip file might also contain a screen capture (see getframe()) of your results as a *.png file.
   d. Inside the directory, have your write-up in a file called HW_NN_Firstname_Lastname.pdf, with the obvious substitutions. (Use your own name and the current HW number.)

The Learning Objective:
The goal of this is to have the students play with imwarp, which is used to help "fix" images before further processing.
In our case you will do image rectification.

The Problem:
Image rectification is used in several contexts to make further processing possible. For this assignment you will be given an image of a piece of paper that reads "Hello World!" but the image is not something you can run through optical character recognition.

Your goal is to use the routines to automatically find the corners on a piece of paper, then use the routines:
fitgeotrans( ), and imwarp( ) to rectify the image.

Here is an example input image. There are several made available to you for testing purposes.

Assignment:

1. (4) Write a program to use the Harris corner detection to label the corners of the piece of paper.
   The problem is that detectHarrisFeatures( ) works on small regions of the paper.
   Without pre-processing, this will find all the corners of the text.
   To remedy this, you may need to identify the text and remove it, or sub-sample the image so that it is small enough that the detectHarrisFeatures() can only find the corners you want found. Or you can find all of the corners, and then find the outside corners, and hope that they are just the piece of paper.

   (2) Fall-back. If you cannot get that working, or don't have time, use ginput() to let you pick the corners of the piece of paper.

2. (2) Create an image transformation using fitgeotrans( ) or another routine of your choice.

   Print the values in the resulting transformation matrix.
   Discuss in a paragraph, what you can learn from the transformation matrix.
   Is the transformation matrix used for pre-multiplication of columns of data, or is it used for post-multiplication of rows of data? How can it be understood?

3. (1) Rectify the image using imwarp().
   A grayscale image is sufficient for this assignment.

4. (1) Show the resulting image.

5. (2) Write a conclusion that is at least three paragraphs describing what you learned.