CPSC 535
Assignment 2: Binary Image Processing, Correlation, and Matching Pixels

The goal of this assignment is to apply some of the basic image processing techniques covered in class in a simple pattern matching exercise. To emphasize Fourier analysis concepts, you will implement the pattern matching using correlations implemented using discrete Fourier transforms.

The data for the exercise is the two images provided with the assignment: *data00.pgm* and *data01.pgm*.

1 Extract Templates - Binary Image Processing

Write an Octave/Matlab script to extract individual characters/digits from one of the sample images and save these as separate image files. Manually identify one example of each digit (0 through 9) to use for template matching.

Hand in your code and 10 templates.

2 Matched Spatial Filter

Using basic spatial correlation only, write a script that finds instances of each of the 10 templates you created in the previous step. The script should produce 10 plots, one for each digit, with an "X" at the positions of the corresponding digits.

Hand in your code.

3 Normalize Correlation in the Fourier Domain

Repeat the previous section, but this time use normalized correlation and implement all correlations in the Fourier domain.

Hand in your code.

4 Bonus

For extra marks, write a script that produces a text file to match the source *.txt* file used to generate the image. You can check your results with the included python script.

Hand In

Hand in all files electronically using D2L. Include source files and example results. You should also include a text file to help the marker sort through the files and explain anything you think is important.

Marking

Assignment grades will be based on

1. the correctness of the plots and images, and
2. the quality of your Octave code.

Your code should be correct, readable, well-documented, and modular. Octave and Matlab are not very readable languages, but you should still be able to produce good-quality code that is maintainable.

Collaboration

The assignment must be done individually so everything that you hand in must be your original work, except for the code copied from a cited source or that supplied by your instructor. When someone else's code is used like this, you must acknowledge the source explicitly. Copying work that is not your own without acknowledgement is academic misconduct. Contact your instructor if you have problems or questions regarding this.