CS 216 Homework 4

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Single Scale Detector Output

Output for test1.jpg

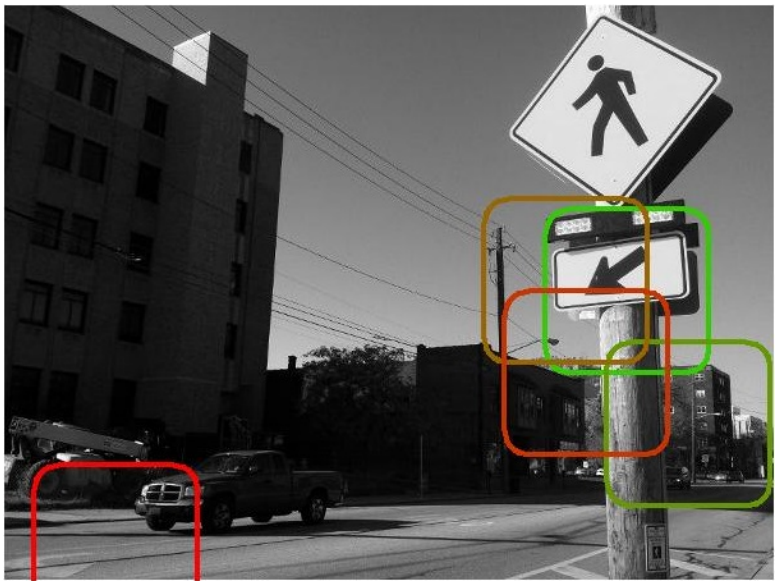

Figure 1: Detector Output with single positive template

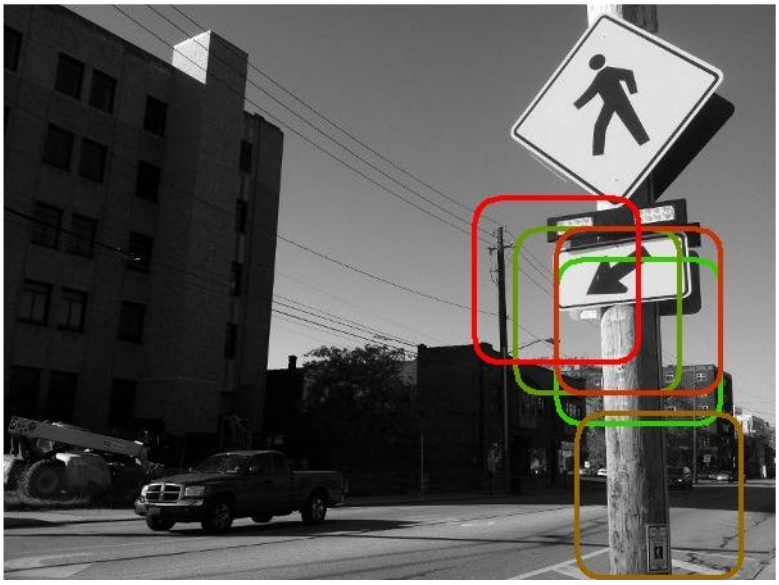

Figure 2: Detector Output with 5 positive templates

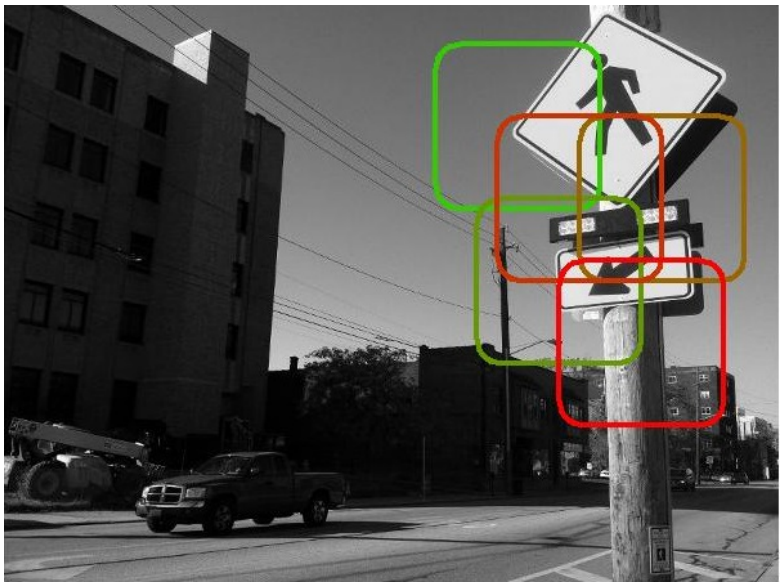

Figure 3: Detector Output with 5 positive templates and 100 negative templates

Output for test4.jpg

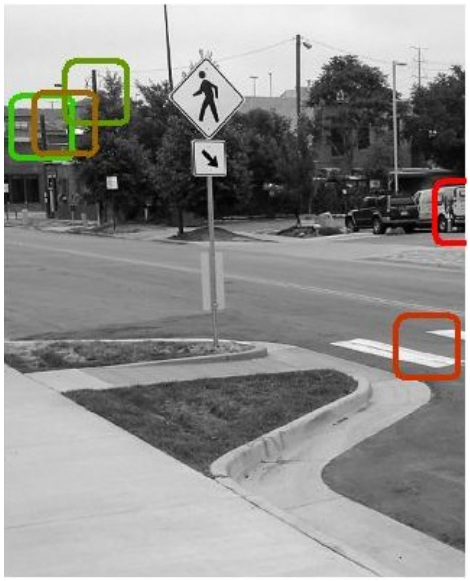

Figure 4: Detector Output with single positive template

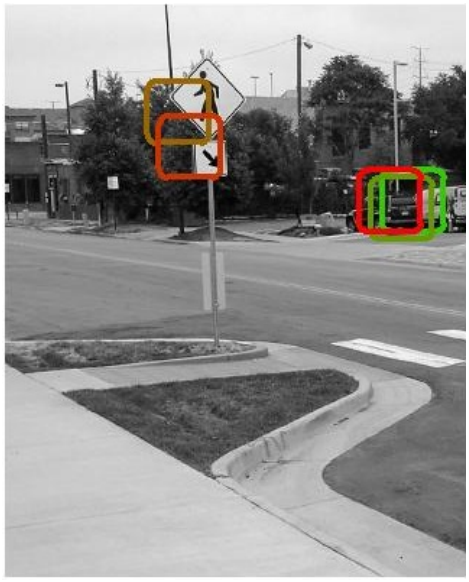

Figure 5: Detector Output with 5 positive templates

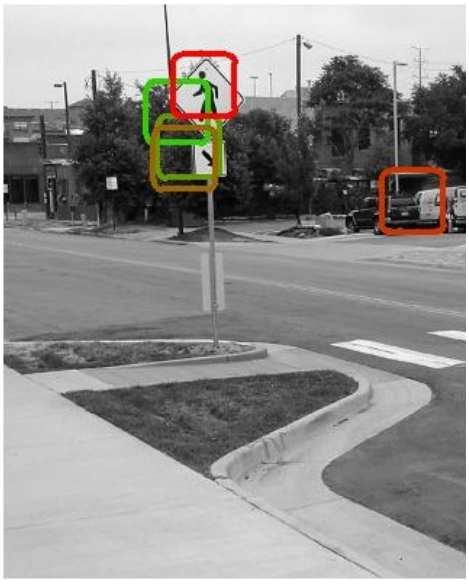

Figure 6: Detector Output with 5 positive templates and 100 negative templates

Multiscale Detector Output

Final Output for test images

I used 0.7 as a scale factor. The best results ended up being at the first level in the image pyramid, so in the next section are the detected results at each of the other levels of the pyramid.

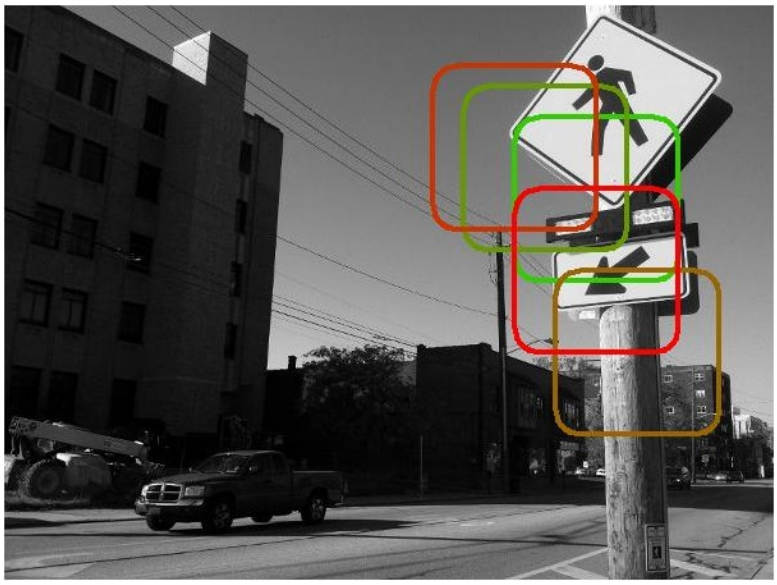

Figure 7: Final multi scale detector output for test1.jpg

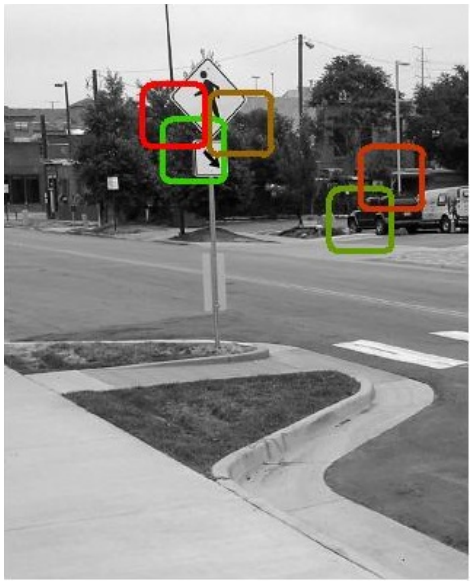

Figure 8: Final multi scale detector output for test4.jpg

Output at multiple scales for test1.jpg

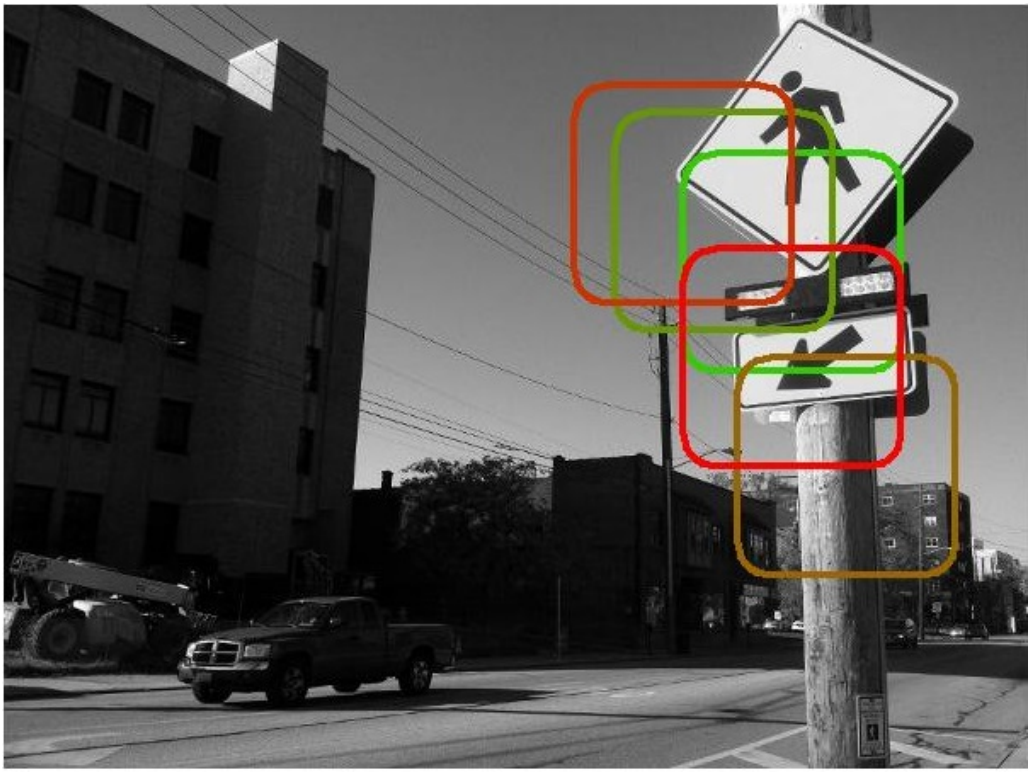

Figure 9: Detector output for test1.jpg at level 1 in image pyramid

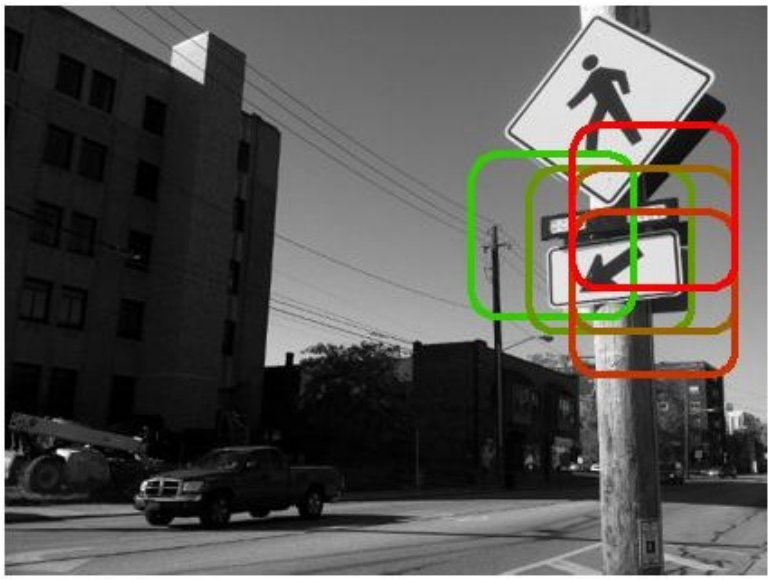

Figure 10: Detector output for test1.jpg at level 2 in image pyramid

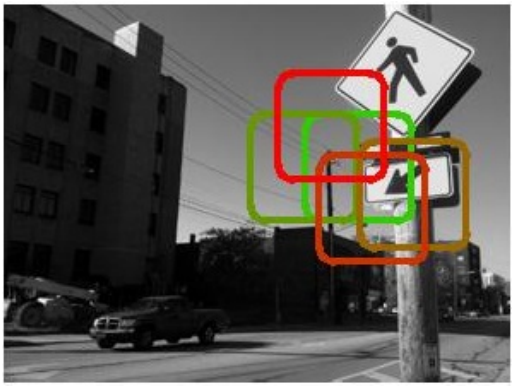

Figure 11: Detector output for test1.jpg at level 3 in image pyramid

Output at multiple scales for test4.jpg

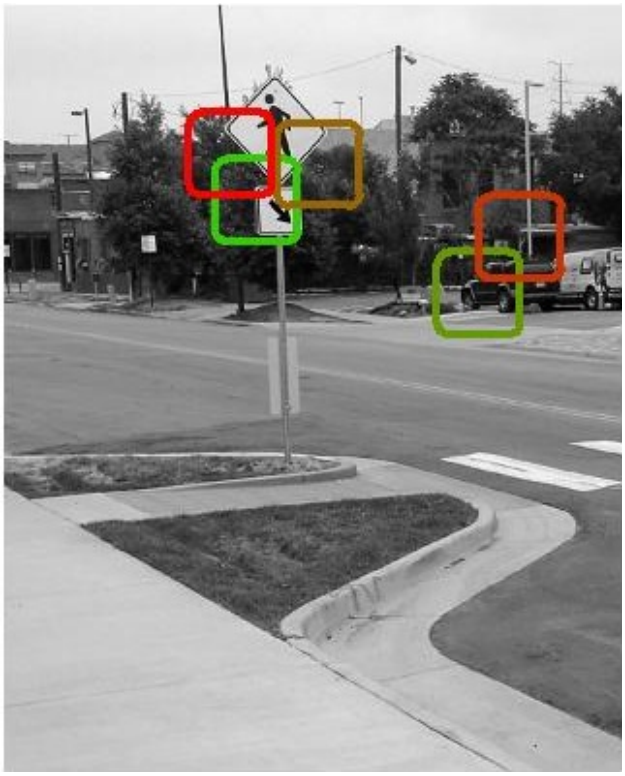

Figure 12: Detector output for test4.jpg at level 1 in image pyramid

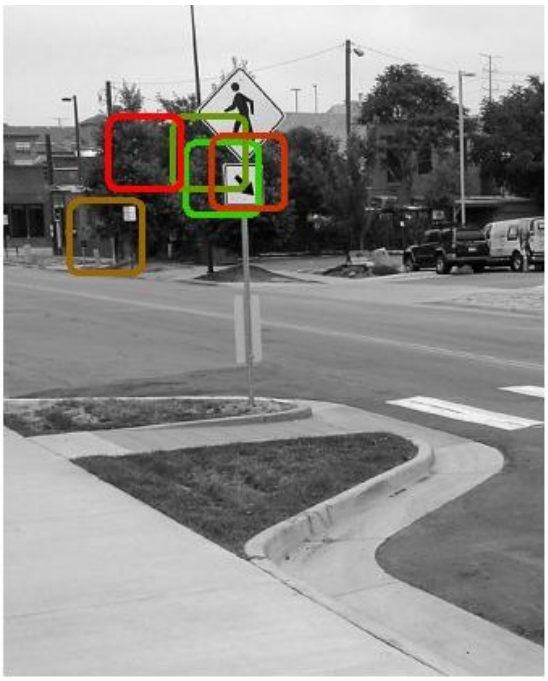

Figure 13: Detector output for test4.jpg at level 2 in image pyramid

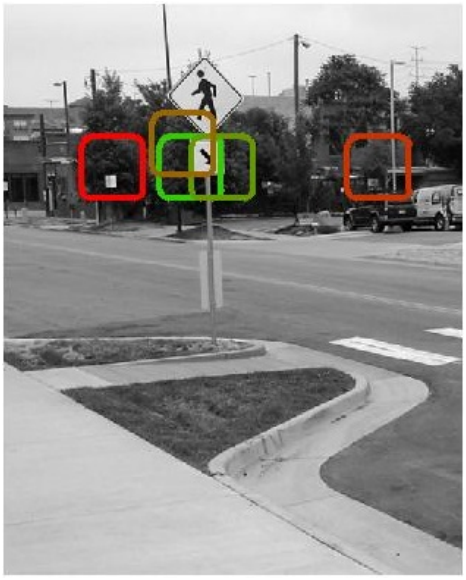

Figure 14: Detector output for test4.jpg at level 3 in image pyramid

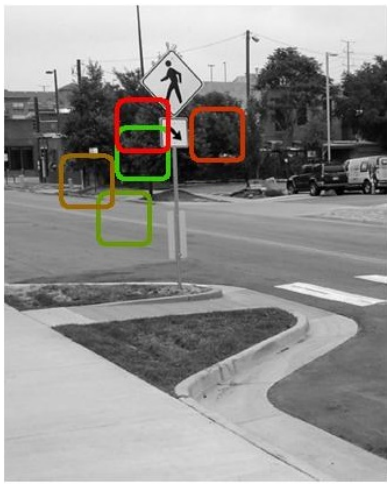

Figure 15: Detector output for test4.jpg at level 4 in image pyramid

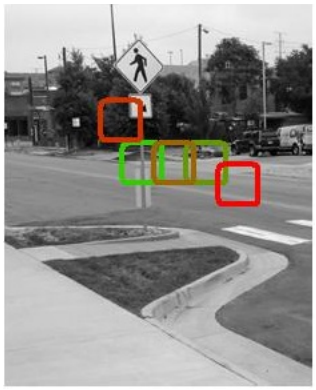

Figure 16: Detector output for test4.jpg at level 5 in image pyramid

Templates Used for Detection

The Five Positive Templates

Figure 17: Pedestrian sign image from internet

Figure 18: Pedestrian sign image from test3.jpg

Figure 19: Pedestrian sign image from test4.jpg

Figure 20: Pedestrian sign image from test5.jpg

Figure 21: Pedestrian sign image from test6.jpg

The 100 negative examples

These are in the zip file containing the code inside a folder entitled ṗrob4negTrain..

Comparison to simple cross-correlation

When we want to detect an object, we really care about the shape of the object. In homework 2, when we were doing correlation of the image with the template, we were only correlating where the pixel values matched. Pixel values by themselves only tell us what should be displayed at a particular point and not necessarily the shape. There could also be noisy pixels that could easily skew the results. With our correlation here we are using the histogram of gradients and the gradients tell us information about the shape of the objects in an image. Because of this, we are correlating on the shape information here and not just pixel values thus we get better results.