

Real-Time Hand Gesture Recognition Project: Deliverable 4

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1 Recap

I trained classifiers using the height, width, center of mass, area, perimeter, normalized compactness, length of major axis, length of minor axis, orientation, eccentricity, and Hu moments. The best classifier is the Bagged Trees classifier. All the aforementioned features were used except for lengths of major and minor axes, orientation, and eccentricity, so a total of 14 features. Accuracy on the training data is 88.7%. This classifier is chosen because it uses fewer features than other classifiers that I trained and has the largest area under the curve. It is slightly slower than SVM classifiers but it boasts a higher accuracy.

The target classes include 7 different gestures: Rock, Scissors, OK, Metalhead, Paper, Phone, and Pistol (as shown in figures 1-7). In the training data, they are labeled from 1 to 7 in the specified order, respectively. A classification example is shown in Figure 8.

2 Performance Evaluation

My gesture recognition code was able to recognize Rock, Paper, and Phone gestures very well. When presented the other gestures, the code may get confused at times. The average numbers of correct classifications of each gesture in 20 attempts are recorded in Table 1.

Timing-wise, from Figure 8 we can see that the average time from image acquisition to classification is approximately 1.8 seconds. The most time-consuming part is classification, which takes about 1 second.

3 Challenges

There is nothing too challenging about this part of the project. The only thing I had to pay much attention to is counting the number of accurate classifications because they are relatively fast.

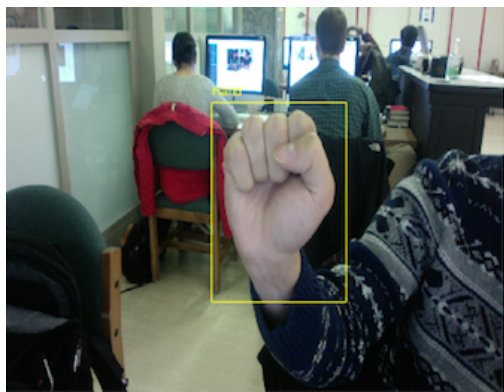


Figure 1: Rock

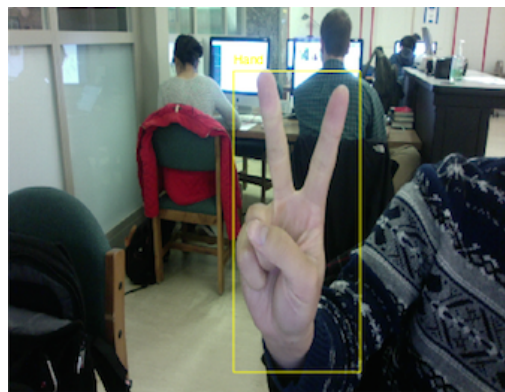


Figure 2: Scissors

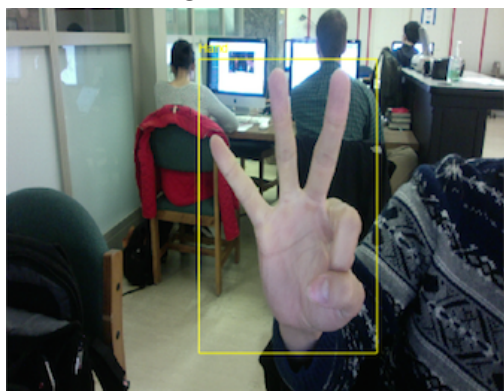


Figure 3: OK

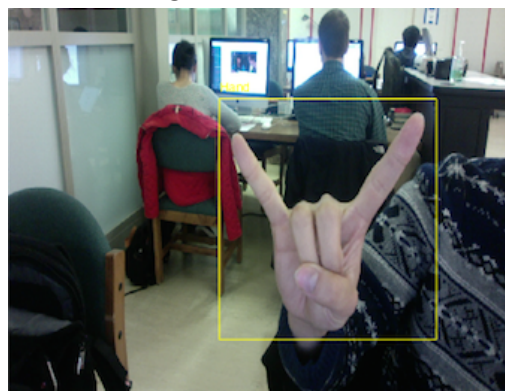


Figure 4: Metalhead

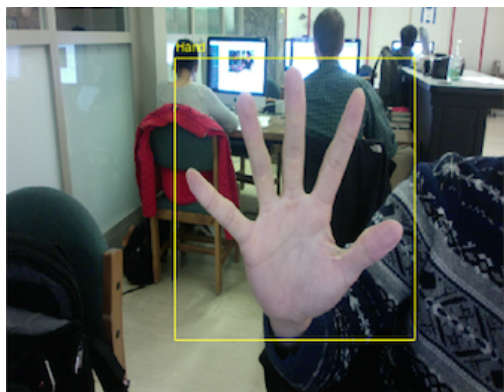


Figure 5: Paper

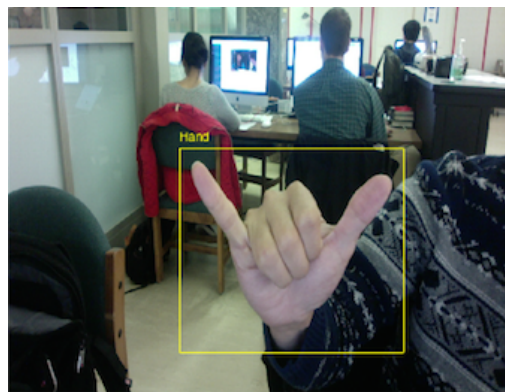


Figure 6: Phone

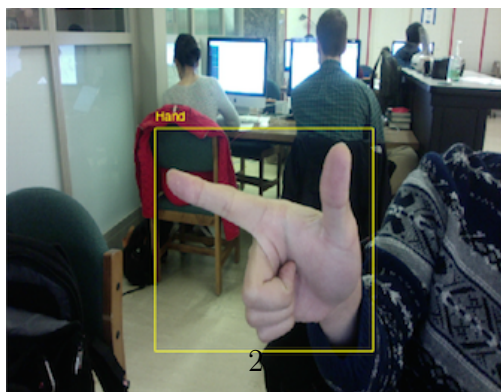


Figure 7: Pistol

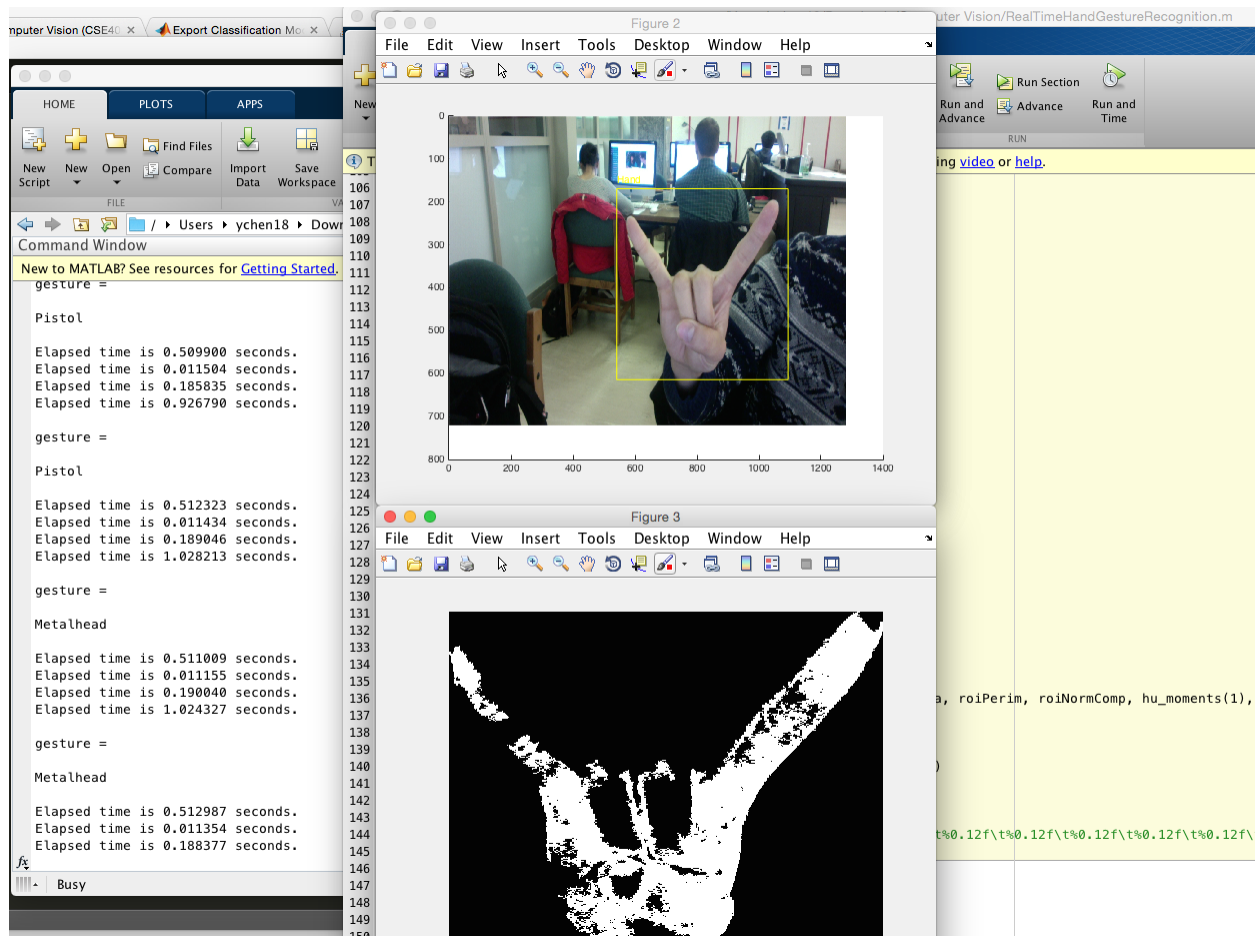


Figure 8: Classification Example

Table 1: Accuracy of Classification for each Gesture

| Gesture | # of Correct Classifications (out of 20) |
|-----------|--|
| Rock | 18 |
| Scissors | 13 |
| OK | 11 |
| Metalhead | 8 |
| Paper | 14 |
| Phone | 15 |
| Pistol | 5 |