IE 590 – Homework II

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Q1. Instrument recognition using SURF features.

Attributes:

Features: *SURF*

K-Fold: *20 Folds*

Filename: *hw2_q1.py*

Results:

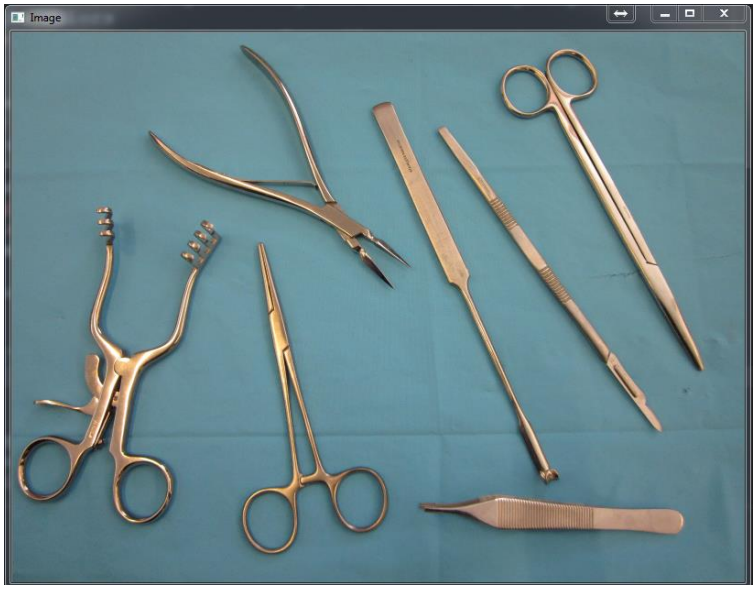

Figure 1. Color image of instruments

Figure 2. Thresholding using color histogram and clustering of pixels

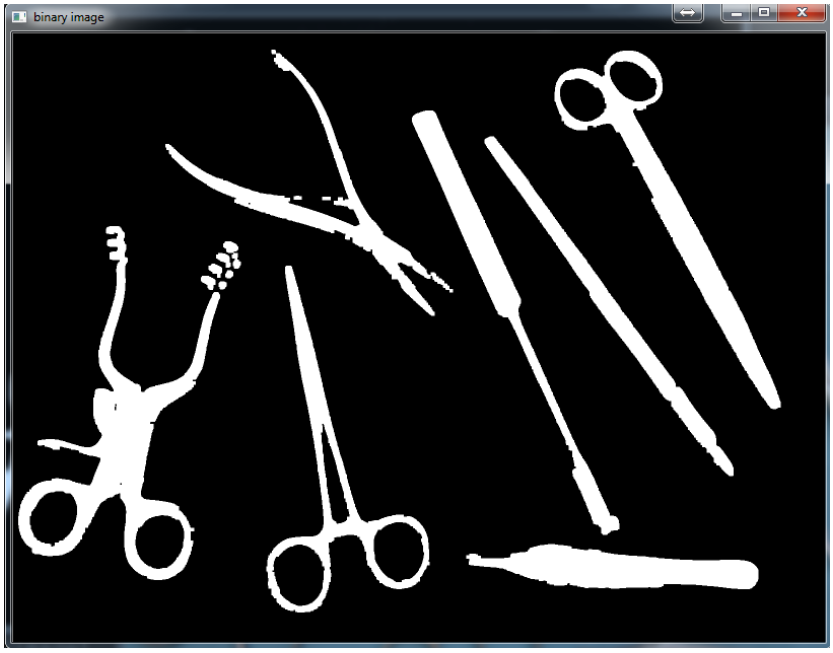

Figure 3. Applying erosion and dilation to get an enhanced image

Figure 4. Identifying the contours and drawing the bounding boxes

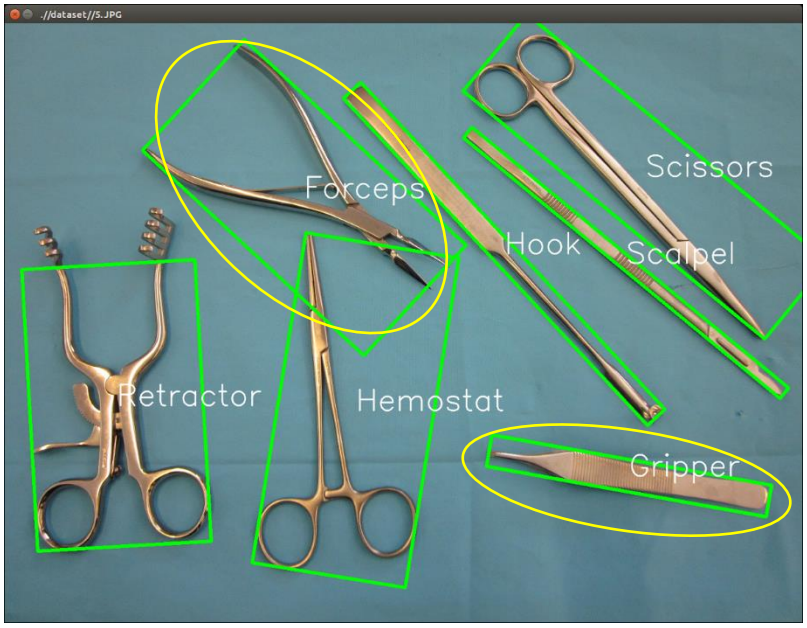

Figure 5. Predicted image of instruments highlighting the false positives in yellow color

```
---- Confusion Matrix ----
[[ 0.75  0.    0.    0.    0.    0.    0.25]
 [ 0.    0.25  0.75  0.    0.    0.    0.  ]
 [ 0.    0.    1.    0.    0.    0.    0.  ]
 [ 0.    0.    0.    1.    0.    0.    0.  ]
 [ 0.    0.    0.    0.    1.    0.    0.  ]
 [ 0.    0.    0.5   0.    0.    0.5   0.  ]
 [ 0.    0.    0.    0.    0.    0.    1.  ]]
Overall Accuracy 0.785714285714
[Finished in 7.5s]
```

Figure. Confusion matrix

Change the input parameters block present in the code.

Q2. Building the background from a video

In this question, a python script is written to eliminate the foreground to retain the background.

Filename: *hw2_q2.py*

Change the input parameters block present in the code.

Figure 6. Obtaining the background from a video with a buffer size of 20

Figure 7. Obtaining the background from a video with a buffer size of 40

Q3. Hand tracking using RGB and depth videos from Kinect V2

Filename: *hw2_q3.py*

In this part, the following components are used to segment the hand.

- Background subtraction
- Optical flow. Only the hand is moving.
- Color segmentation near the region where there is high optical flow.

Once the background is segmented, contour features are extracted.

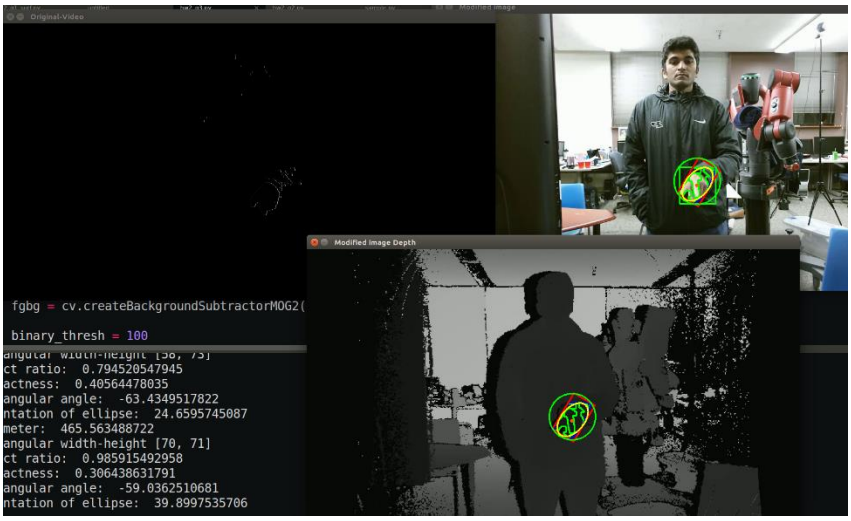

Figure 8. Automatic segmentation of hand using depth video and background subtraction

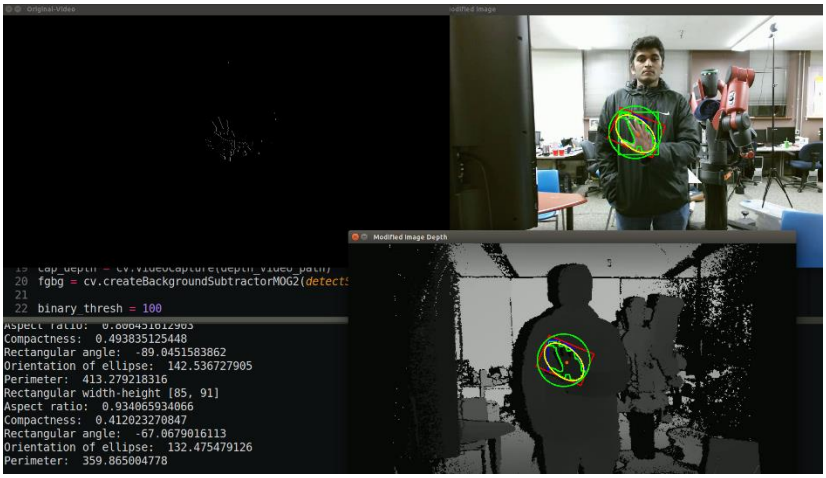

Figure 9. An instance of complex hand pose showing the segmented hand