Optical Character Recognition

Task1: Enrollment

As the first step, the candidate character images are stored in a dictionary using the function *Readand-Store()*. After that, for each character images, the features are extracted. The first feature under consideration is gradient histogram. First, we divide the image into 4 patches: lop left, top right, bottom left and bottom right. Then, for each patch we compute the angles and magnitudes of the gradients. As the angles lie in the range $[-2, 2]$ Radian, we quantize this range into 10 equal sized bins. For each bin, we compute the normalized gradient magnitude belonging to that particular bin. By this way we construct the *Histogram of Oriented Gradients* features. Finally the gradient histogram information for all the 4 patches of a single image are stored as a feature vector corresponding to that character. As a second feature, we considered number of transitions from background to foreground in the vertical direction.

Task2: Detection

On the given test image, the connected component labeling algorithm is implemented. All the characters are correctly separated from the other characters in the test image. Then, using a line sweep based procedure, we identify the 4 viz., top left, top right, bottom left and bottom right corner points and essentially the location and size of the character on the test image. Then, this separated character is cropped from the remaining background.

Task3: Recognition

We matched the test image characters with the candidate characters given.

- All the characters **'2'** are recognized perfectly. All the characters are detected and no other character is misclassified.
- All the characters **'a'** are recognized perfectly. All the characters are detected and no other character is misclassified.
- For the character **'c'**, some misclassification occurs. Some 'o' are detected as 'c'.
- For the character **'dot'**, some misclassification occurs. Some ',' and 'n' are detected as '.'.
- For the character **'e'**, some misclassification occurs. Some 'g' are detected as 'e'.

Overall, $F1$ score is 0.71.