Digital Image Processing

Assignment 1

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(Spring 1402)

Task 1:

In this task we want to do ***Face Detection*** with ***OpenCv*** and find face of humans in image. After face detection we should apply ***Spatial Transformation*** on faces.
For face detection we use ***Haar Cascade Classifiers*** method. The idea behind this mrthod involves using a cascade of classifiers to detect different features in an image. These classifiers are then combined into one strong classifier that can accurately distinguish between samples that contain a human face from those that don't.
We use ***haarcascade_frontalface_default.xml*** for detecting frontal faces. After applying Haar Cascade Classifier we call detectMultiScale() method of Cascade Classifier for detect faces. This method has different parameters such as: scaleFactor, minNeighbors and minSize. ***scaleFactor*** parameter is used to scale down the size of the input image to make it easier for the algorithm to detect larger faces. Initially, the classifier will capture a large number of false positives. These are eliminated using the ***minNeighbors*** parameter, which specifies the number of neighboring rectangles that need to be identified for an object to be considered a valid detection. ***minSize*** parameter sets the minimum size of the object to be detected.
For part Spatial Transformation we implemented three kind of transformation such as: Mirroring, Reverse and Rotate

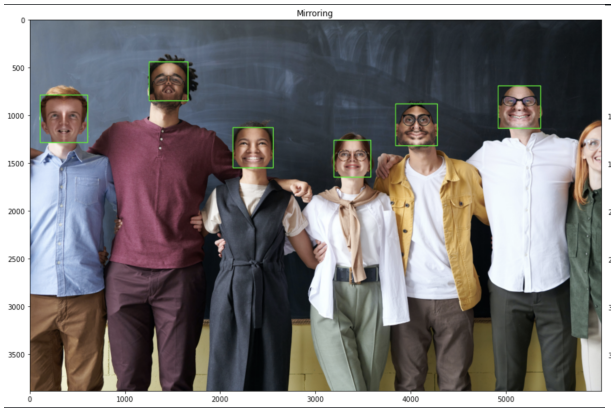

Figure 1: Mirroring

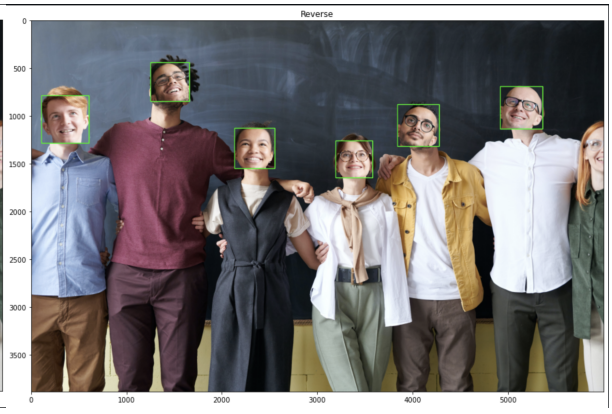

Figure 2: Reverse

Figure 1: Rotate 45

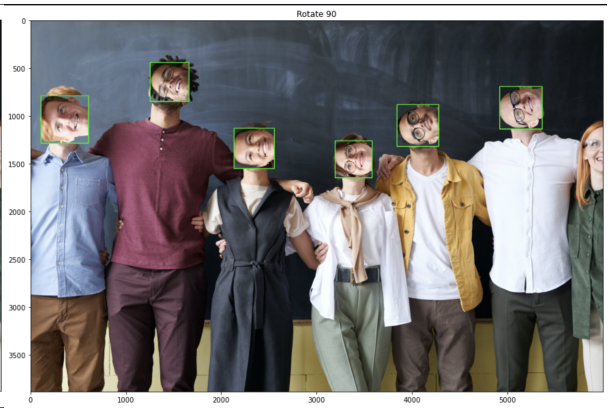

Figure 2: Rotate 90

Task 2:

In this task we must convert image to indexed image and applying kmeans clustering on indexed image to limit number of colors. In the following, we must use different color spaces and see the results. We compare image of different color spaces in 22 clusters. We understand that we see the best quality when we use the XYZ color space. The quality when using LAB and YCrCb is almost the same, but the quality when using HSV is much worse than the other cases.

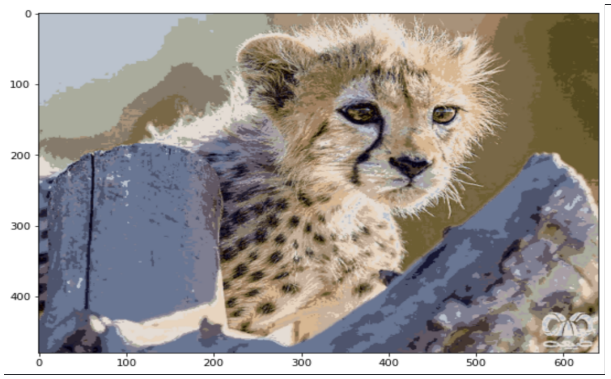

Figure 1: BGR to HSV to RGB

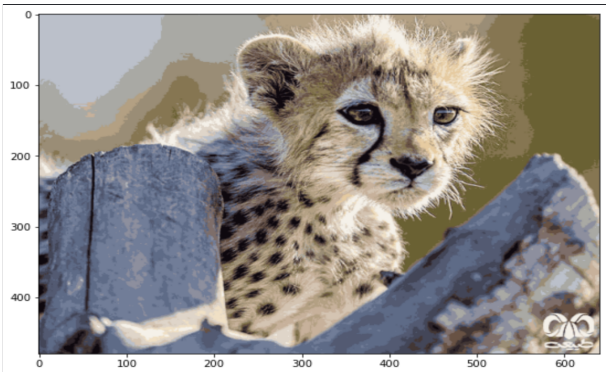

Figure 2: BGR to LAB to RGB

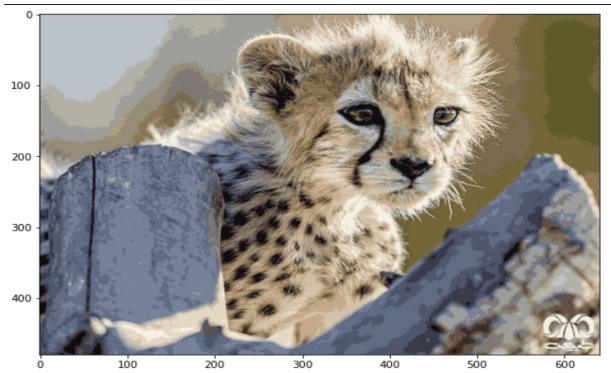

Figure 1: BGR to YCrCb to RGB

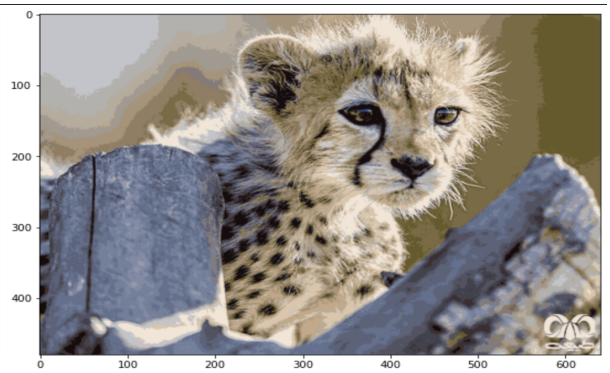

Figure 2: BGR to XYZ to RGB