CS5175 Assignment - 1 Report

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11 February, 2024

1 Introduction

he assignment report details the implementation of image transformation operations—translation, rotation, and scaling—employing bilinear interpolation. Utilizing OpenCV and NumPy libraries, the code reads images, applies the transformations, and visualizes the results. Throughout the assignment , we have done Target to Source transformation so that we don't get any holes after the processing.

2 Bilinear Interpolation

It gives the value of one pixel from the four neighbouring pixels. Target is first initialised to a 2D zero array . Then each pixel is filled by taking bilinealy interpolated values from the source image. The x and y axis of the source is found from the geometric transformations.

3 Question 1: Translation

The given image of lena has to be translated by $tx = 3.75$ and $ty = 4.5$ pixels.

3.1 Result

The image has translated by the given pixels . In the translation function , a translation matrix is created . The source coordinates x and y and obtained by multiplying the inverse of this matrix with the target matrix coordinates. The thus obtained x and y axis values are then send to bilinear interpolation function.

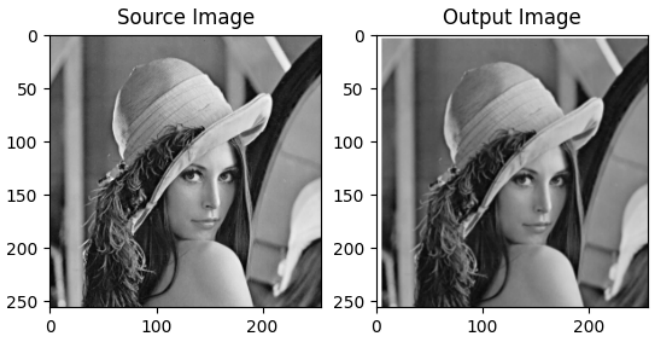

Figure 1: Translation

3.2 Conclusion

The obtained image is a little blurry because of the averaging effect brought in by bilinear interpolation.

4 Question 2: Rotation

The given image of The Leaning Tower of Pisa has to be rotated until it looks straight.

4.1 Results

The source coordinates were obtained by matrix multiplication of rotation matrix and target matrix coordinates.But here since we have to rotate with respect to center, we first shift our starting point to center by subtracting half of the axes. After rotation it is brought back to same coordinates as we started with by adding the half of the axes. These source coordinates are then passed to bilinear interpolation function.

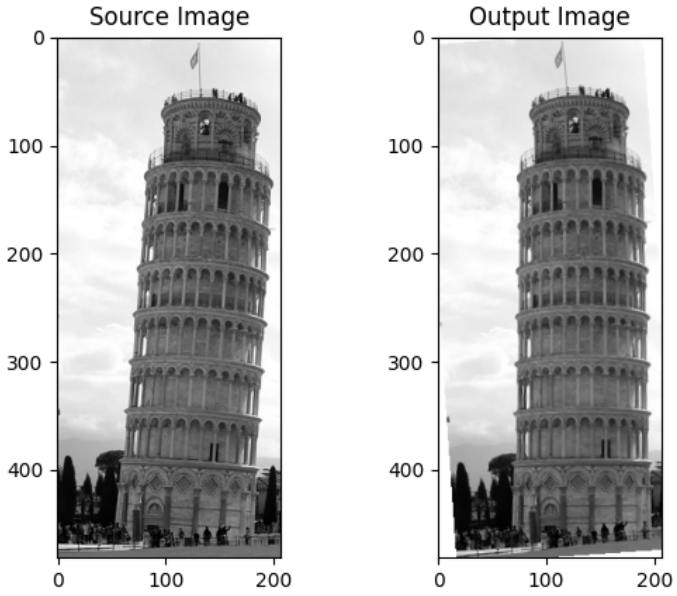

Figure 2: Rotation

4.2 Conclusion

The tower is straightened as per the requirement. For positive values of theta, the image was found to be rotating clockwise. Therefore , a -4 degree was given to rotate it anti clockwise .A few adjustments had to be made to rotate it from the center. Else it would start rotating from origin, which wont fetch us the desired output.

5 Question 3: Scaling

We were asked to scale the image by 0.8 and 1.3.

5.1 Results

The image was scaled from the center. Since the output was going out of the canvas, the target matrix was initialized as a bigger canvas (450, 450). The output was scaled by 0.8 on the x (vertical) axis and by 1.3 on the y (horizontal) axis. The source coordinates were obtained similar to the previous questions, and the origin was shifted to the center as well. After scaling, the coordinates were brought back, and bilinear interpolation was done.

5.2 Conclusion

The output image was scaled as per the scaling factors given.

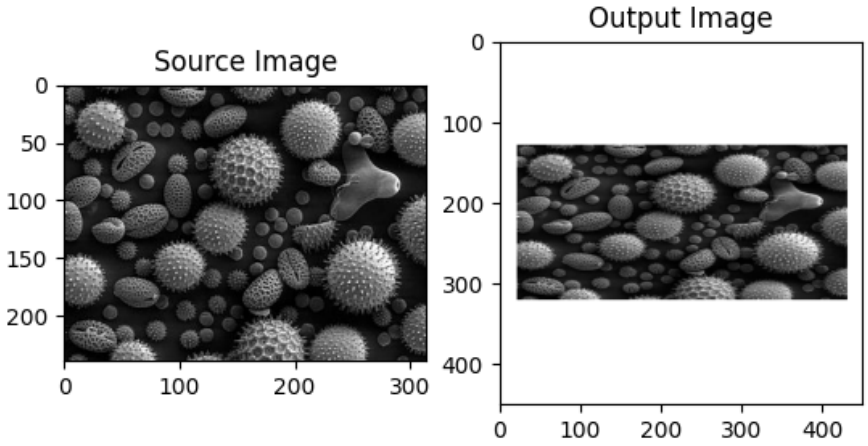

Figure 3: Scaling