Lab 5 Task 1: Rotation Fixing of document ([hint material](#))
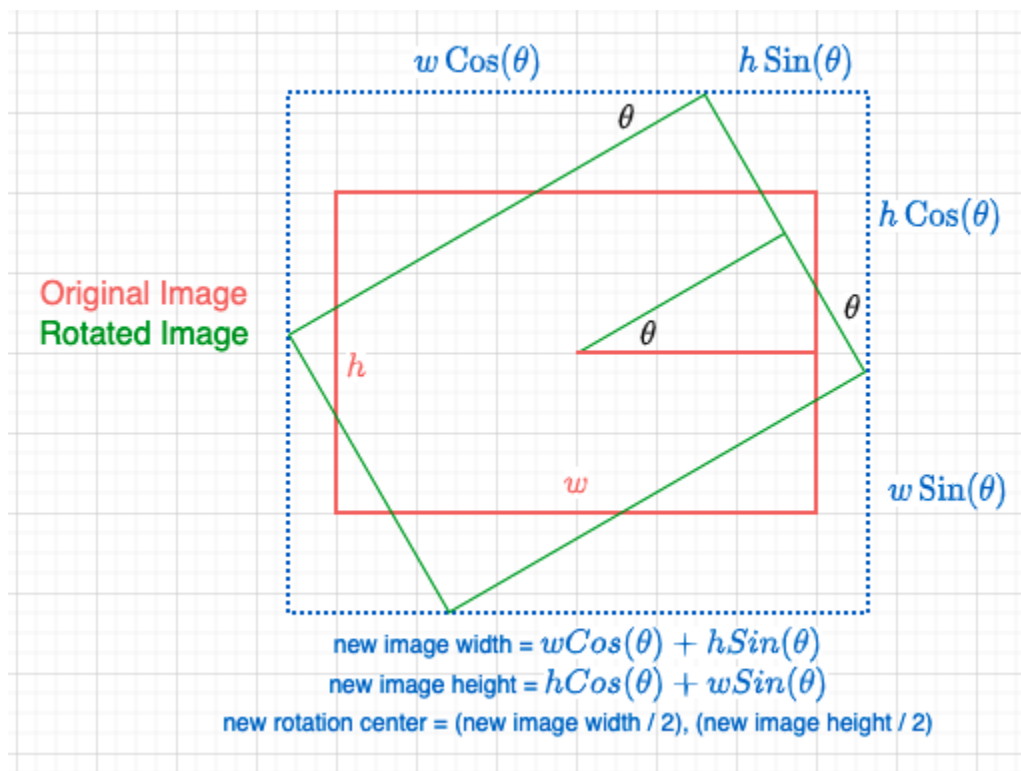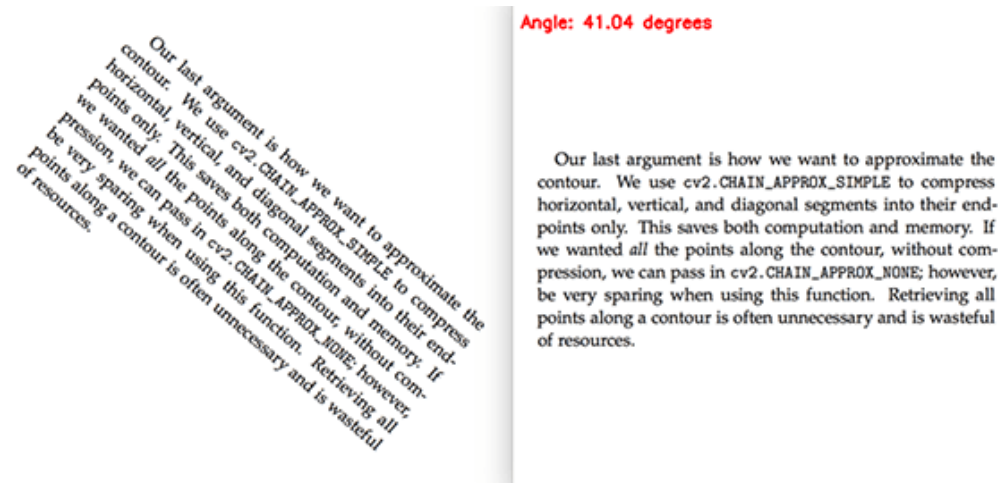
Pre-requisites:
- **Thresholding**
- **Morphological Image Transformation**

$$\text{new image width} = wCos(\theta) + hSin(\theta)$$
$$\text{new image height} = hCos(\theta) + wSin(\theta)$$
$$\text{new rotation center} = (\text{new image width} / 2), (\text{new image height} / 2)$$

Goal: Use of Morphological tools along with geometric transformations to create a desired image.

Information about opencv's morphological transformations and functions can be [found here](#). Assume that you are given a piece of image containing some text, your task is to fix the rotation of the original image to somewhat readable. (See figure below)

Angle: 41.04 degrees

Our last argument is how we want to approximate the contour. We use cv2.CHAIN_APPROX_SIMPLE to compress horizontal, vertical, and diagonal segments into their endpoints only. This saves both computation and memory. If we wanted *all* the points along the contour, without compression, we can pass in cv2.CHAIN_APPROX_NONE; however, be very sparing when using this function. Retrieving all points along a contour is often unnecessary and is wasteful of resources.
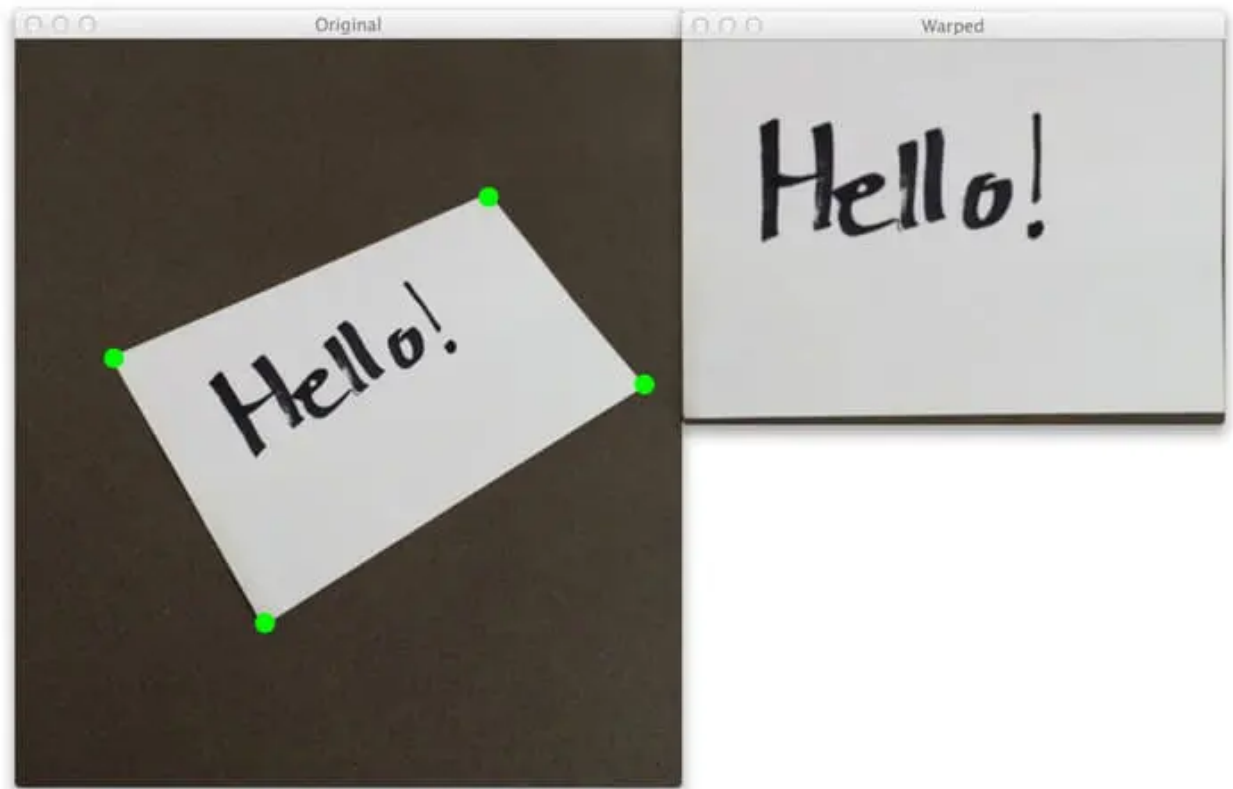
Hint material:
- Make use of following tools:
    - Thresholding
    - Morphological Image processing
    - HoughLines or HoughLinesP
    - Find the angle
    - De-rotate the image

- Hint 1
- Hint 2
- HInt 3

Make sure to create at-least 4 rotated versions of the sample image and ensure that your piece of code works!. Once you are comfortable with the simple paragraph, test your approach on the image provided with the lab (text.png).

Lab 5 Task 2: Perspective Projection based alignment ([Hint material](#))

Consider a scenario in which you are asked to develop an application similar to CamScanner in which you would like to isolate the document in question by removing all background information. (See figure below)

Hint material:
- Make use of following tools:
  - Thresholding
  - Morphological Image processing
  - HoughLines or HoughLinesP
  - Detecting corners for warpPercpective
  - Aligning the image to desired position

Motivation Material:
- [Automatic Sudoku solver](#)