



Due Date: 27.03.2020, 11:59 P.M.

Barcode Detection by Using Hough Transform

In this assignment, you will get familiar with edge detection methods and Hough Transform. First of all, you will extract and obtain the edge points from an image simple by using an edge detection method. Then you will use these edge points to detect barcodes by giving the map including edge points as an input for the Hough Transform (See Figure 1). As a dataset, you will use a subset of [1]. Dataset will be shared later from the Piazza.

You may upload your assignment files to the link below:

Assignment1 Upload

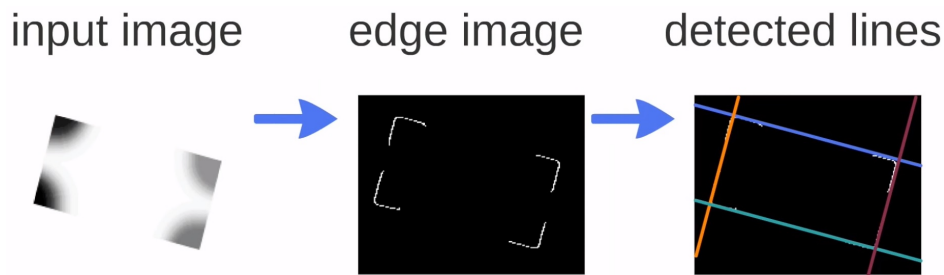


Figure 1: Hough Transform

Edge Detection and Hough Transform

Edge Detection: We can define edges as a sudden changes of brightness values in the image pixels. These sudden level of transition determines how the candidate pixel groups have potential to construct an edge. Generally several different edge detection methods are utilized to extract horizontal, vertical and diagonal edge information by constructing an edge map of an image (See Figure 2). Edge detection is a critical process because of that most of the shape information is intrinsically encoded in edges.

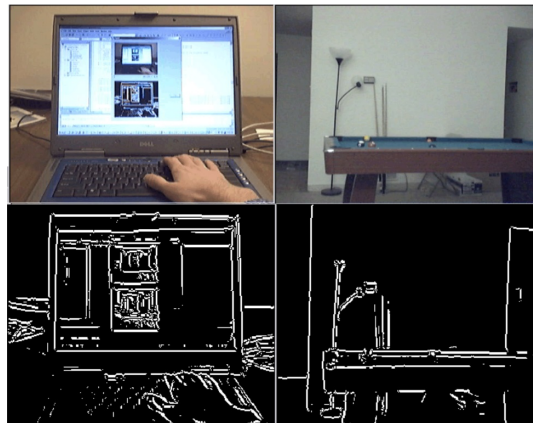


Figure 2: Example images and their corresponding edge images obtained by an edge detection methods

Hough Transform: Hough Transform is a voting method which developed to solve these issues:

1. Detection of a potential line object with respect to the given points

2. Determining the count of the potential line objects
3. Assigning the given points to the one of the potential line objects detected.

Hough Transform proposes to save vote for each potential line on which each edge point exists and search for the lines gotten.

Dataset

Dataset [1] consists of sample images including products with barcode sections. For each image there is also a ground-truth binary segmentation map showing where the barcode section of the product is exactly placed (See Figure 3).

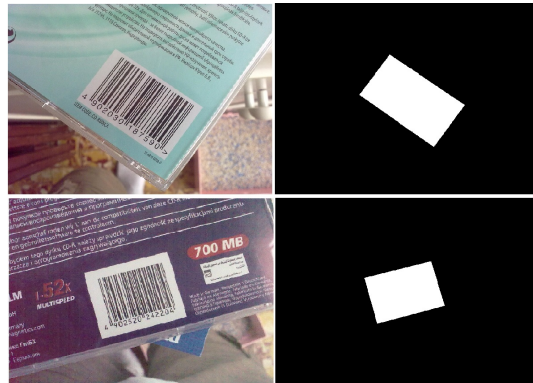


Figure 3: Sample images from the dataset (**Left**) and their corresponding ground-truth barcode segmentations (**Right**)

The Implementation Details

1. Firstly you are expected to use an edge detection method to obtain an edge map of the input image. You may use the functions from available libraries for obtaining the edge map.
2. Then you are expected to utilize Hough Transform on obtained edge map to detect possible barcode lines within the image. **You must implement your own Hough Transform method.**
3. You should use polar coordinates for the Hough space to represent potential lines.
4. You should pay attention to code readability such as comments, function/variable names and your code quality:
 - 1) no hard-coding
 - 2) no repeated code
 - 3) cleanly separate and organize your code
 - 4) use consistent style, indentation
5. Your code should read all images from a folder named "dataset" and write results to the console as the same format stated in Figure 4.

The Report

You are also expected to write a short report (maximum two pages) which including one page about your brief explanations and comments for your code and one page about your results visually again as the same format stated in Figure 4.

What to Hand In

Your submission format will be:

- README.txt (*give a text file containing the details about your implementation, how to run your code, the organization of your code, functions etc.*)
- code/ (*directory containing all your code*)



Figure 4: Sample Result Format: From left to right, original image, corresponding edge map, original image with overlapping/intersecting predicted barcode lines by Hough Transform and ground-truth segmentation map with overlapping/intersecting predicted barcode lines by Hough Transform

- report.pdf

Archive this folder as **b<studentNumber>.zip** and submit to <https://classroom.github.com/a/B17gx1r1>.

Grading

The assignment will be graded out of 100:

- CODE: 0 (no implementation), 20 (an extremely incomplete implementation), 40 (an incomplete implementation), 60 (a partially correct implementation), 80 (a correct implementation) and REPORT: 20

Academic Integrity

All work on assignments must be done individually unless stated otherwise. You are encouraged to discuss with your classmates about the given assignments, but these discussions should be carried out in an abstract way. That is, discussions related to a particular solution to a specific problem (either in actual code or in the pseudocode) will not be tolerated. In short, turning in someone else's work, in whole or in part, as your own will be considered as a violation of academic integrity. Please note that the former condition also holds for the material found on the web as everything on the web has been written by someone else.

References

- [1] This Reference is hidden