

# Computer Vision

## Assignment N<sup>o</sup>6

Theoretical Questions  
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### 1 Hough Transform

The image contains two sets of dots, each set with a total number of 6 dots which are in a single direction (each set of points can be modeled with a straight line).

The two lines modeled for two sets of points are approximately  $60^\circ$  to each other.

Two hypothetical lines have an intersection near the center of each line.

### 2 Circle detection using RANSAC

$$K = \frac{\log(1-p)}{\log(1-w^3)}$$

$$p = 0.99 \Rightarrow 1 - p = 0.01$$

$$w = 0.4, \text{ for a circle we need at least 3 points, so } w^3 = 0.064 \Rightarrow 1 - w^3 = 0.936$$

$$K = \frac{\log(1-p)}{\log(1-w^3)} \Rightarrow K = \frac{\log(0.01)}{\log(0.936)} \Rightarrow K = \frac{-2}{-0.0287} = 69.68 \approx 70$$

### 3 Hough VS. LSD

1. LSD takes a grayscale image as input but Hough takes a binary image as input.<sup>1</sup>
2. Hough transform has some hyperparameters which should be tuned before use, But LSD is designed to work without any hyperparameter so it doesn't need any kind of tuning.<sup>1</sup>

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<sup>1</sup>[StackOverflow](#)

3. LSD finds line endpoints i.e. start and ending of a line in contrast with Hough Transform that detect the whole line passing through the image.<sup>2</sup>
4. LSD uses 4 parameters for line definition  $(x_0, y_0, x_1, y_1)$  but Hough Transform uses two ( $\theta$  and  $\rho$ ).<sup>2</sup>
5. LSD used gradient direction but Hough Transform doesn't.<sup>2</sup>

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<sup>2</sup>Computer Vision Class, Dr. Mohammadi, Lecture 11