Nagham Dahi

YCH3Y3

Image and signal processing

Hough Transform

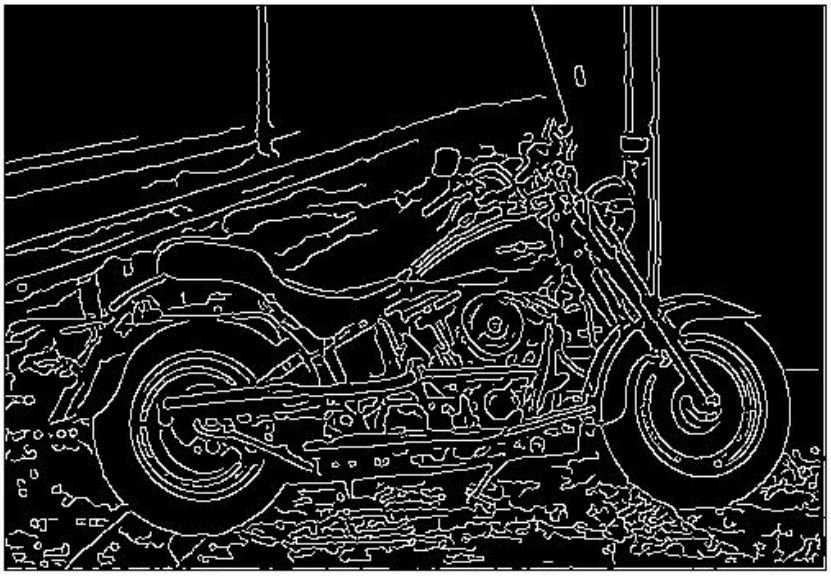
- The Hough Transform (HT) is a robust method used to detect lines circles or other parametric curves.

- It can give robust detection under noise and partial occlusion.

Example: to find aligned points in image that create lines :

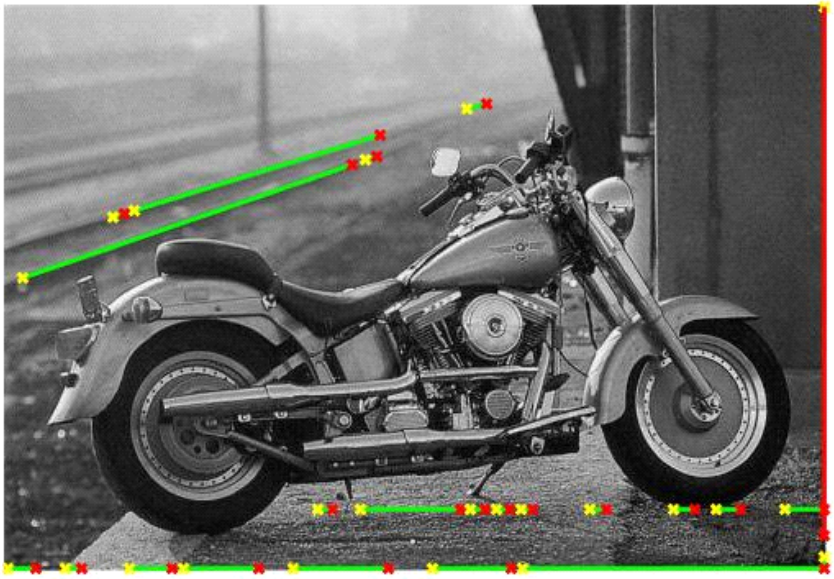
input image

we apply edge extraction algorithm which highlights the main edges of the image.



edge image

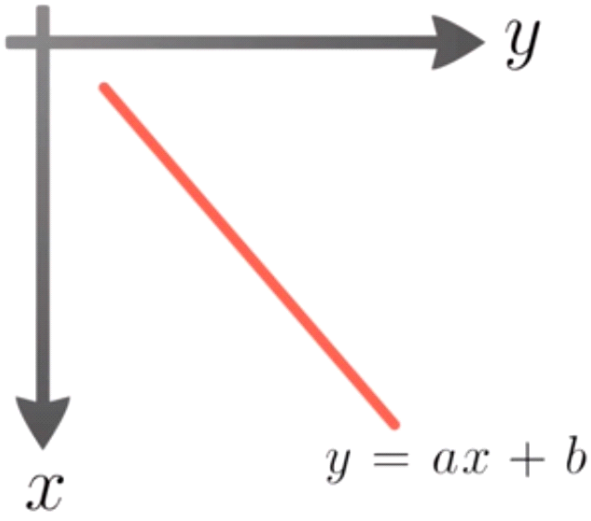
we apply Hough transform in order to detect points in image that create these lines highlighted in colors.



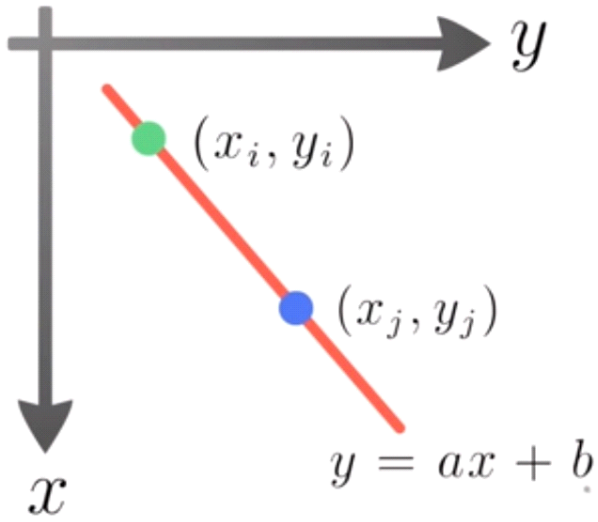
detected lines

<u>How Hough transform works:</u>

if we consider this x and y plane

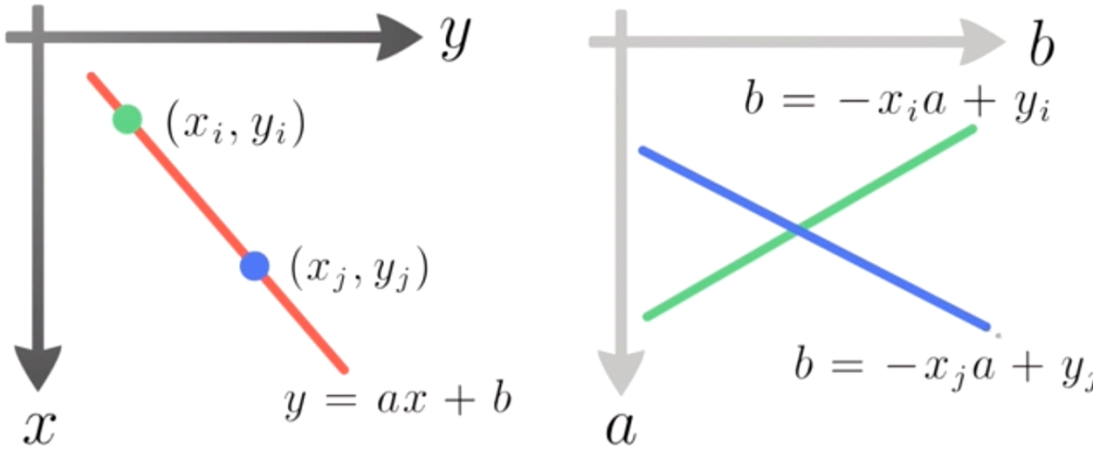


a, b are used here to define the angulation of this line.



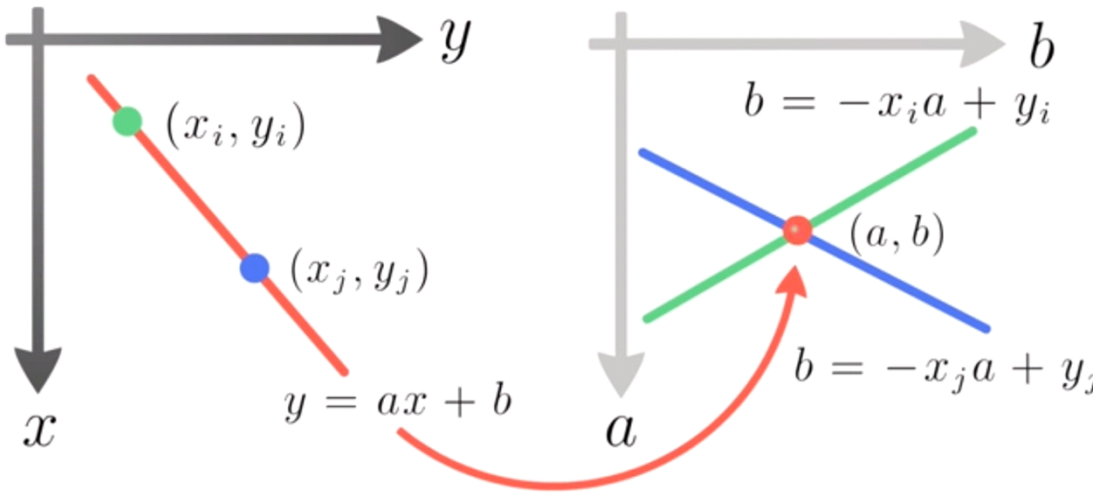
in this line we have lot of combimations of values of x and y

if we consider the plane a and b which is called the feature space



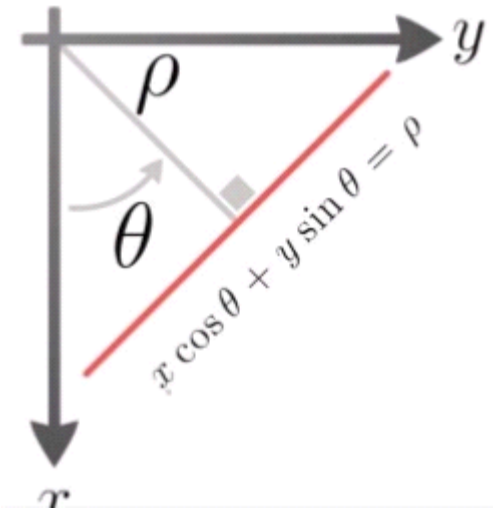
the point (xi , yi) defines a lot of possibilities (the green line)

the point (xj, yj) defines a lot of possibilities (the blue line)



if we intersect these two lines we will defines the point (a,b) where the two lines match.

*Another way to consider this feature space by considering the theta and rho parameters



ρ (rho): is the distance from the coordinate system's center to the straight line.

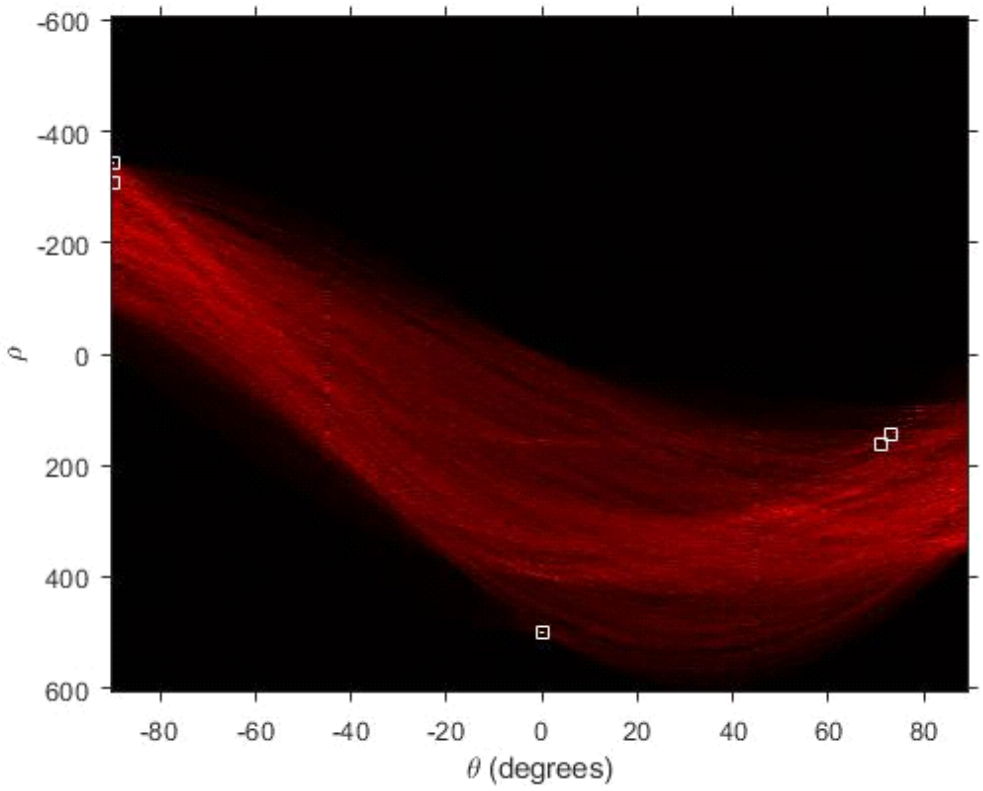
θ (theta): is the angle with one of the axes.

* every point in the straight line will hold this equation.

- the algorithm start looking for all the points looking for edge image

- when it finds edge point it starts to iterate over all possible theta and rho values

- at the end we will see peaks in terms of values in the hough space, these peaks stand for the detected lines in the hough space.



the peak is based on lot of detected points.