HOUGH TRANSFORM

- Given the shape and size of the edge, edge point can be obtained by transferring initial image space to a new space by using Hough transform.
- Consider a point (x,y) in the xy plane and equation of a

straight line y=ax+b where a-> slope and b- >intercept.

- Many lines pass through (x,y) but they all satisfy the equation y=ax+b for varying values of a and b. • We can write the above equation as follows in the ab plane which yields the equation of a single line for fixed pair (x,y)

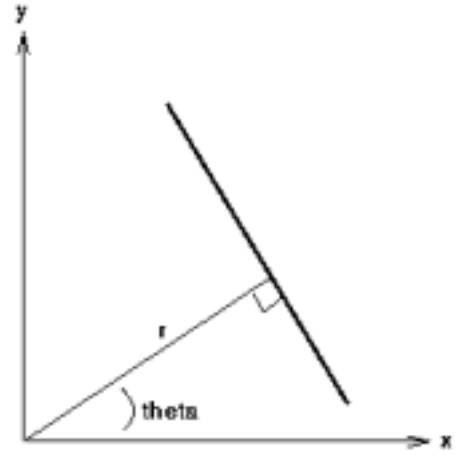
$$b=-ax+y$$

- We can analytically describe line segments in number of forms.
- Convenient equation for describing set of lines uses normal notation as follows:-

$$x \cos\theta + y \sin\theta = r$$

where r is the length of a normal from the origin to this line and θ is the orientation of r with respect to the X-axis.

For any point (x, y) on this line, r and θ are constant.


y
r
theta
x

Algorithm 4.5: Line detection using the Hough transform

Given the binary image $f(i, j)$: $0 \le i \le m-1, 0 \le j \le n-1$

Quantize the parameter space (ρ, θ): $\rho_{\min} \le \rho \le \rho_{\max}$, $0 \le \theta \le 180$ where ρ and θ are intergers;

Initialize the accumulator $A(\rho, \theta) = 0$ for all (ρ, θ): $\rho_{\min} \le \rho \le \rho_{\max}$, $0 \le \theta \le 180$.

For $i = 0$ to $m-1$

For $j = 0$ to $n-1$

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For $\theta = 0$ to 180

{ $\rho = i\cos\theta + j\sin\theta$

quantize ρ to the quantisation value ρ';

$A(\rho', \theta) = A(\rho', \theta) + 1$;

}

}}

Obtain the maximal value of the accumulator:

$A(\rho^*, \theta^*) = \max\{A(\rho, \theta): p_{\min} \le \rho \le \rho_{\max}, 0 \le \theta \le 180\}$;

For $i = 0$ to $m-1$

For $j = 0$ to $n-1$

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If ($\rho^* = i\cos\theta^* + j\sin\theta^*$) then mark (i, j) as a pixel of the line border.

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End-Algorithm