19CSE367 Digital Image Processing

SARATH TV

Last lecture

- Segmentation
- Edge pixel, edges and lines
- Isolated points

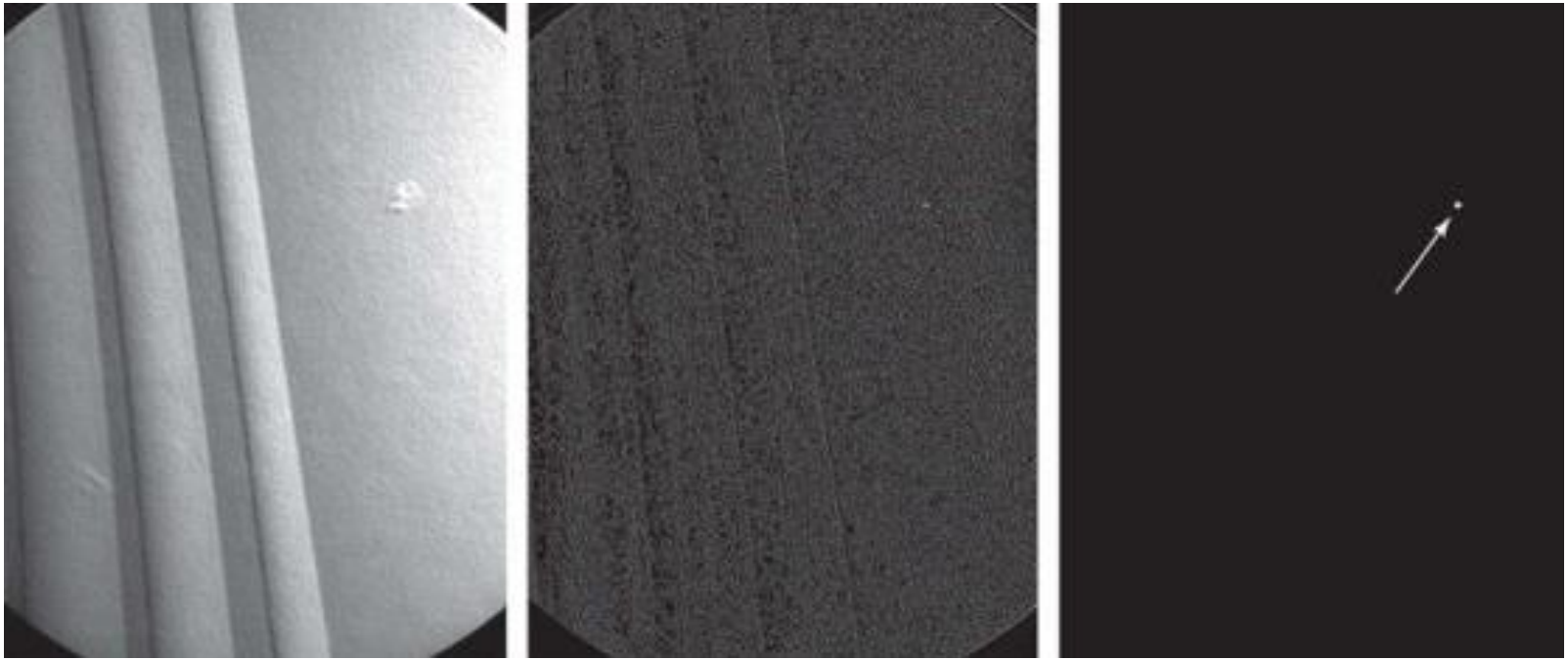
Detection of Isolated points

- Second order derivatives.
- Isolated point –different from its surroundings
- Intensity wise its different from surroundings
- Use kernel -->
- If the absolute value of the response of the filter at that

Point exceed a specific threshold

1	**1**	**1**
1	-8	**1**
1	**1**	**1**

$$g(x,y) = \begin{cases} 1 & \text{if} |Z(x,y)| > T \\ 0 & \text{otherwise} \end{cases}$$



- Threshold 90% of the highest absolute pixel value of image

Line detection

−1	−1	−1
2	2	2
−1	−1	−1

Horizontal

2	−1	−1
−1	2	−1
−1	−1	2

+45°

−1	2	−1
−1	2	−1
−1	2	−1

Vertical

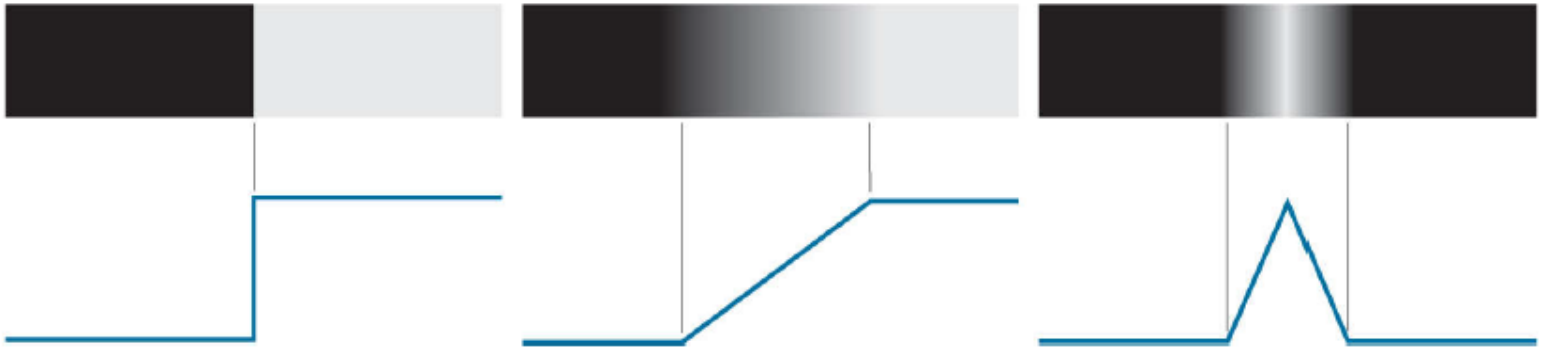
−1	−1	2
−1	2	−1
2	−1	−1

−45°

- Detecting lines in specified directions.

Edges

- Frequently used approach
- Abrupt changes in intensity.
- Edge models- intensity profiles.
- Step, ramp, roof edges

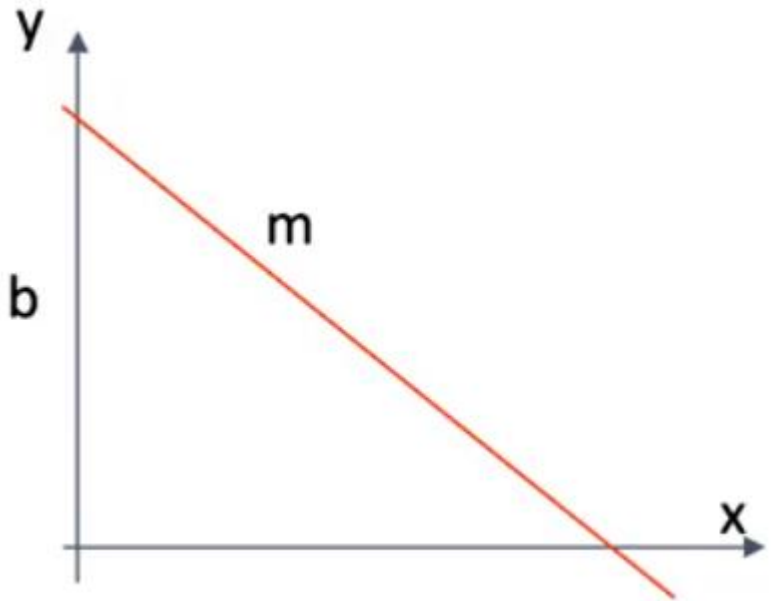


- The three steps performed typically for edge detection are
- **Image smoothing for noise reduction**
- **Detection of edge points**
- **Edge localization**

- Edge detection should yield set of pixels lying **only** on edges
- Edge detection followed by linking algorithms→ meaningful edges or boundaries.

Fitting approach

- Extraneous data
- Incomplete data
- Noise

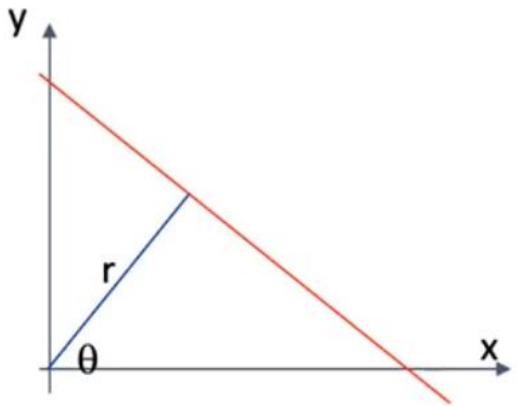


The straight line is normally parameterized as:

y = mx + b

Where m is the slope and b is the intercept.

NOTE: m goes to infinity for vertical lines.



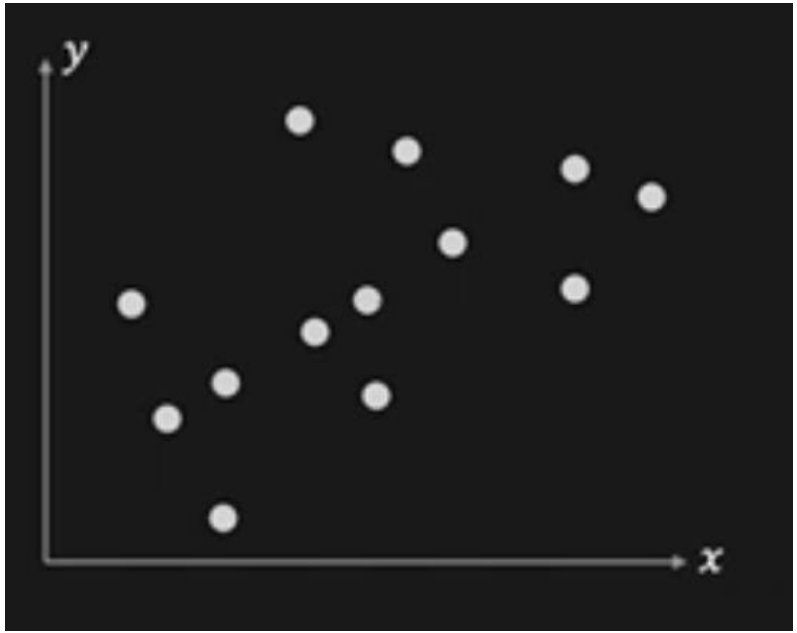
The line can also be represented as:

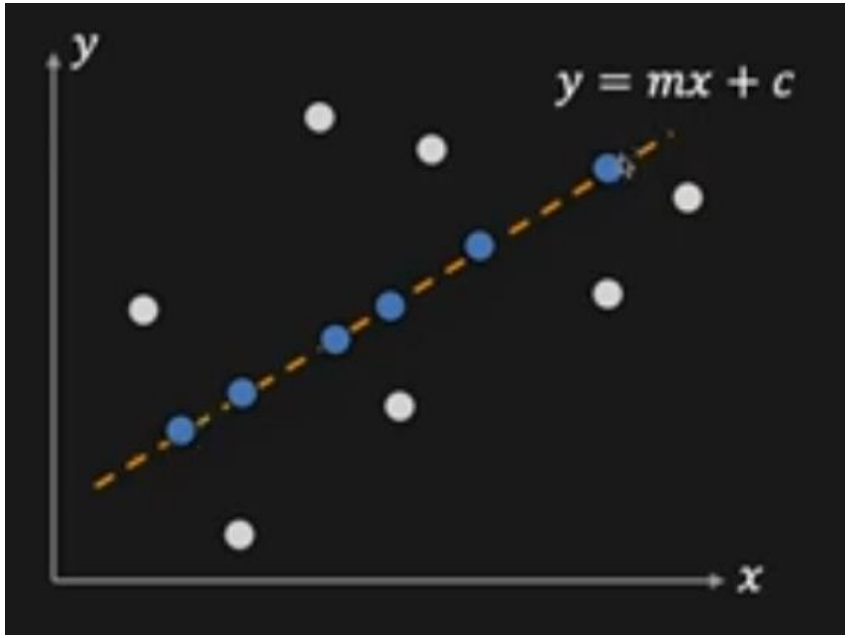
$$r = x\cos\theta + y\sin\theta$$

where r is the distance from the origin to the closest point the straight line.

Hough Transform

- Algorithmic approach




y
y = mx + c
x

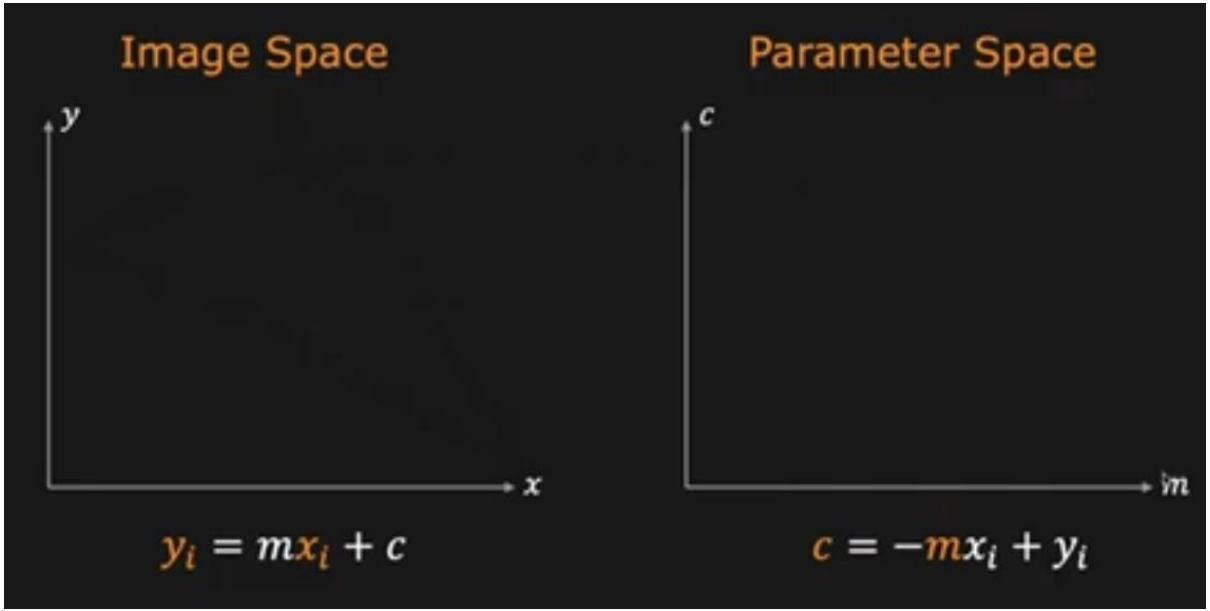


Image Space
y
x
$y_i = mx_i + c$
Parameter Space
c
m
$c = -mx_i + y_i$

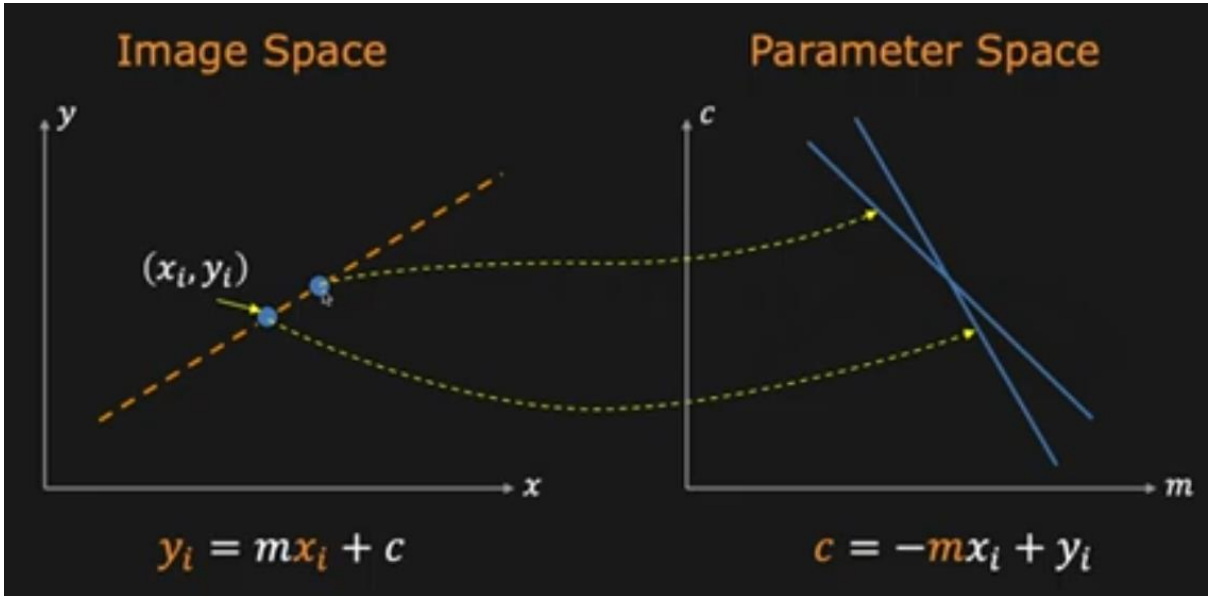


Image Space
Parameter Space
y
x
c
m
(x_i, y_i)
$y_i = mx_i + c$
$c = -mx_i + y_i$

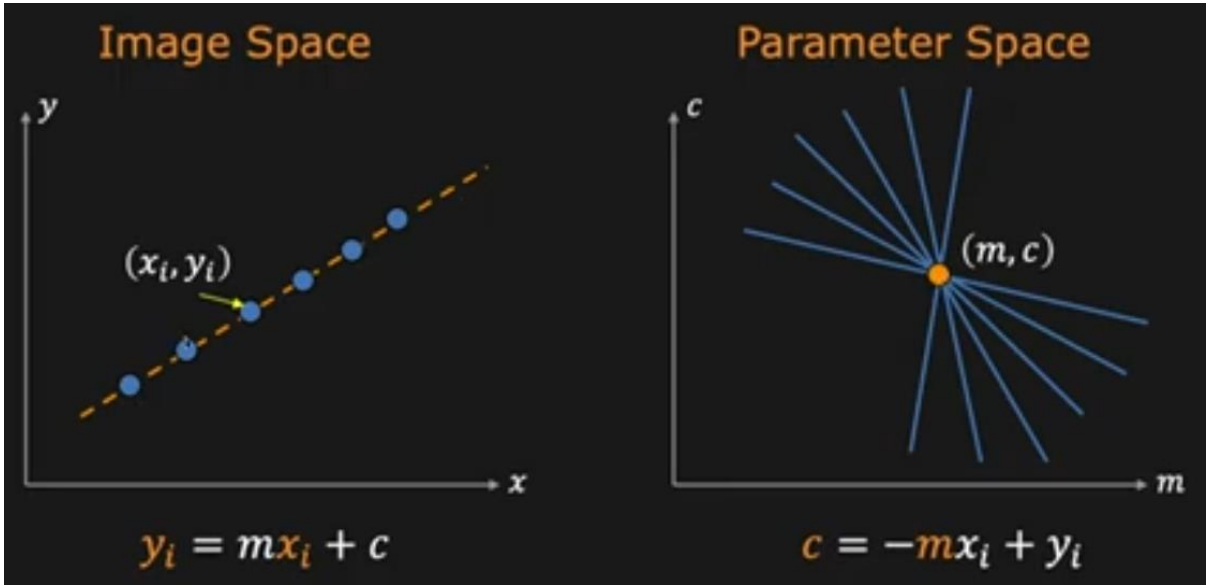


Image Space
y
x
(x_i, y_i)
$y_i = mx_i + c$
Parameter Space
c
m
(m, c)
$c = -mx_i + y_i$


THANK YOU!