11/27/24

Computer Vision - MP4

Gokhulnath Thirumaran
675086474

1) Q1)

Invariance	equivariance
Output remains unchanged when the input is transformed.	Input, if transmored the output changes in a predictable and corresponding way.

Harris Corner Detector Behavior:

Translation:- Equivariant. Corner locations move with the translation of the image.

Rotation: Invariant. Corner response R is invariant to image rotation.

Horizontal flipping:- Equivariant. The corner are mirored appropriately.

Scaling: Not invariant. It is not scale-invariant cause it uses fixed-size window

Adding constant pixel intensity: Invariant. Intensity shift do not affect gradient.

Q2) Benefits of using image gradients, histograms and cells in feature descriptors like SIFT

a) Image gradients capture local intensity changes, making the descriptor robust to illumination variation.

b) Histogram of gradients provide a compact representations of local image structure

c) Cells divide the image to smaller regions, allowing for spatial information to be preserved while maintaing some invariance to small geometric deformations.

Q3) Shift to right by 100 pixels

$$\begin{bmatrix} 1 & 0 & 100 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

Rotate around origin in the clockwise direction by 45°

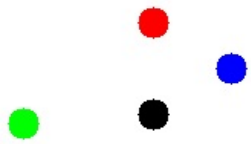
$$\begin{bmatrix} \cos(45^\circ) & \sin(45^\circ) & 0 \\ -\sin(45^\circ) & \cos(45^\circ) & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

Rotate around the point (20,20) in the counterclockwise direction by 90°

$$\begin{bmatrix} 1 & 0 & 20 \\ 0 & 1 & 20 \\ 0 & 0 & 1 \end{bmatrix} * \begin{bmatrix} \cos(-90^\circ) & -\sin(-90^\circ) & 0 \\ \sin(-90^\circ) & \cos(-90^\circ) & 0 \\ 0 & 0 & 1 \end{bmatrix} *$$

$$\begin{bmatrix} 1 & 0 & -20 \\ 0 & 1 & -20 \\ 0 & 0 & 1 \end{bmatrix}$$

2) P1)



P2)