7- interest point detection, corner detection

local features matchin advantages = robustness to occlusion, articulation (eklleme), and intra category variations

general approach

① find and define a set of distinctive keypoints
② define a local region around the keypoint
③ extract and normalize the regional content from the area
④ compute a local descriptor from the normalized region
⑤ match local descriptors

should have (invarient to translations,)

- repeatability = lighting, and noise
- locality = small window
- quantity = enough features/regions
- distinctiveness = contains interest points
- efficency = real-time performance

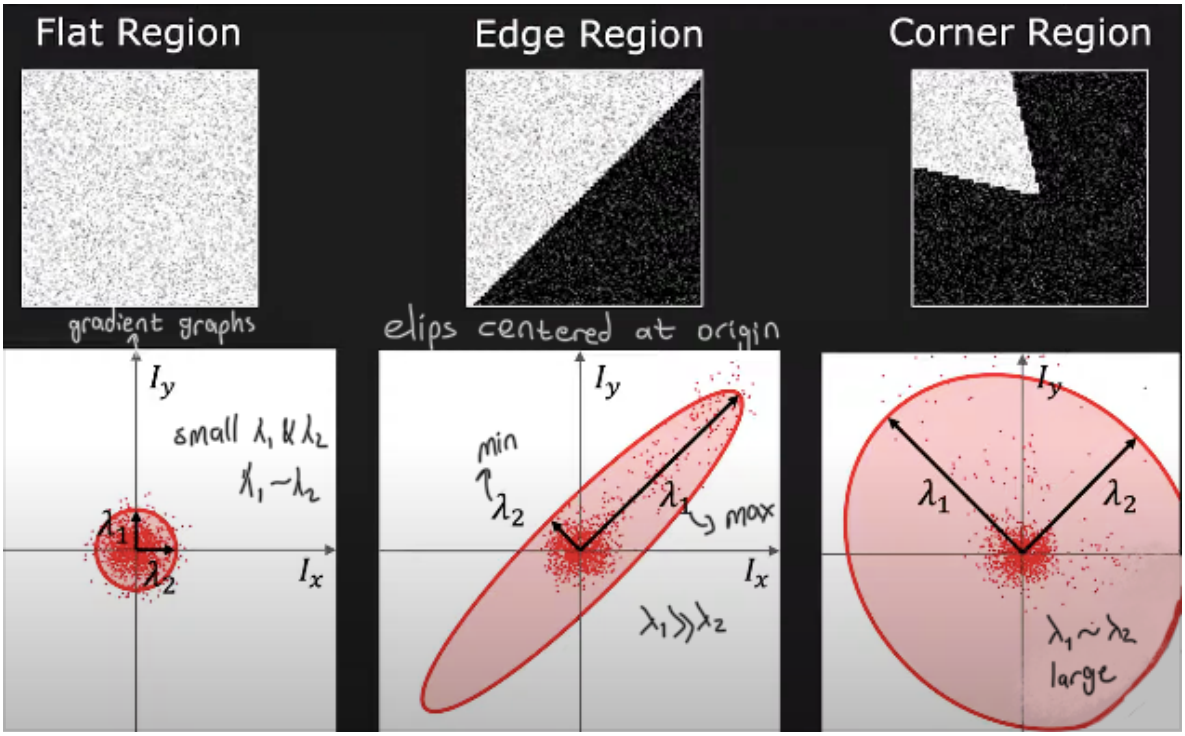
harris corner detector

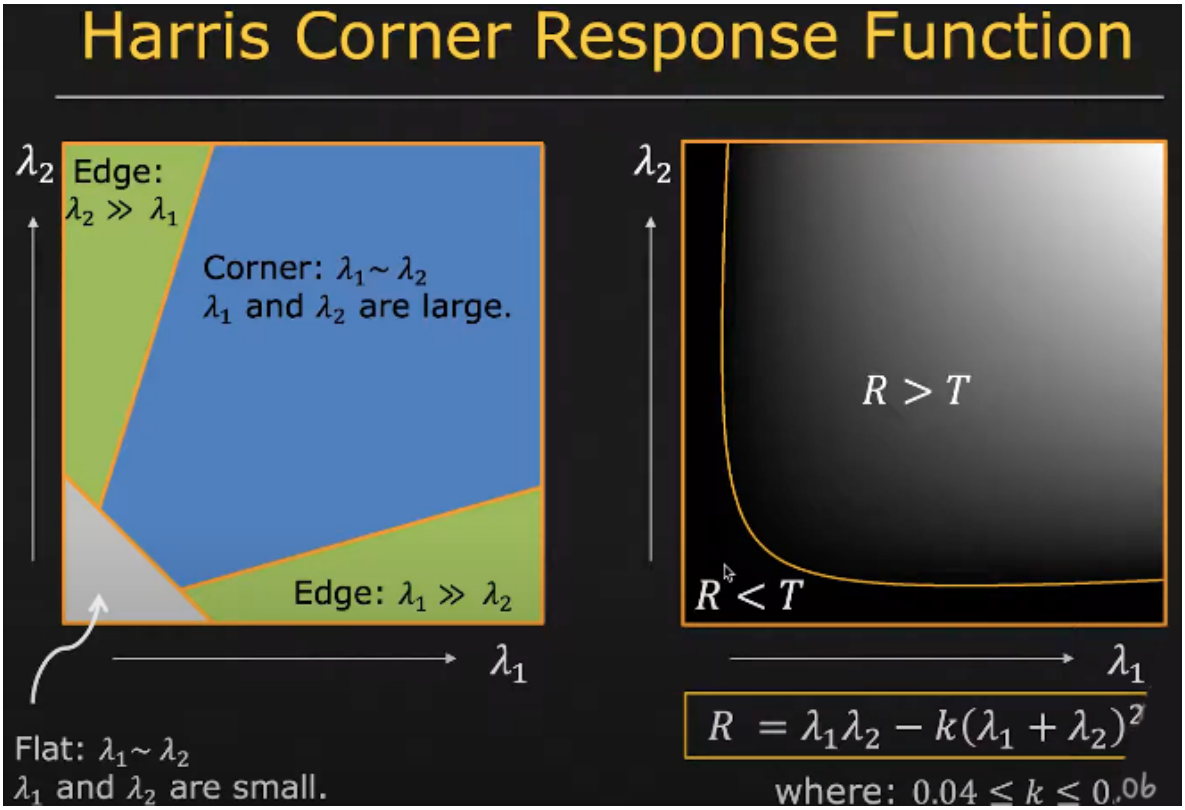
corner = the region whose gradient has two or more dominant directions (where two edges meet)
↳ only one directional changes in edges, and negligible changes at flat regions

1- compute the image gradients at each pixel
2- for each pixel, compute the products of gradients
3- calculate the sum of squared gradients within a local window between shifted version one
4- calculate the harris response using products and sum of squared gradiends (two strong λ)
5- thresholding and non-maximum suppression

* max and min values of E are eigen vectors of H (1st one → max E(u,v), 2nd one → min E(u,v))
↳ flat region = E is almost constant, λ_1 and λ_2 are small
↳ edge = $\lambda_1 >> \lambda_2$
↳ corner = E increases in all directions, λ_1 and λ_2 are large, $\lambda_1 \sim \lambda_2$

properties=
↳ invariance to rotation and translation
↳ not invariant to scaling (corners can be classified as edges)




Harris Corner Response Function
λ_2
Edge:
$\lambda_2 \gg \lambda_1$
Corner: $\lambda_1 \sim \lambda_2$
λ_1 and λ_2 are large.
Edge: $\lambda_1 \gg \lambda_2$
λ_1
Flat: $\lambda_1 \sim \lambda_2$
λ_1 and λ_2 are small.
λ_2
$R > T$
$R < T$
λ_1
$R = \lambda_1\lambda_2 - k(\lambda_1 + \lambda_2)^2$
where: $0.04 \leq k \leq 0.06$