FEATURE/CORNER DETECTION

<u>Question</u>: HOW TO MEASURE IF A PIXEL $\bar{x}$ IS A GOOD CORNER?

intensity at pixel $x+\delta$

$$\min_{\|\delta\|=\varepsilon} \sum_{x \in W(\bar{x})} \| I(x+\delta) - I(x) \|^2$$

box centered on $\bar{x}$

We have a good corner when

has high value.

<u>Closed formula for *:</u>

$$I(x+\delta) \approx I(x) + [\nabla I(x)]^T \delta$$

$$\Rightarrow I(x+\delta) - I(x) \approx [\nabla I(x)]^T \delta \quad (*)$$

Given (*), then *, gives:

$$\min_{\|\delta\|=\varepsilon} \sum_{x \in W(\bar{x})} \| [\nabla I(x)]^T \delta \|^2$$

$$\underset{(\|z\|^2 = z^T z)}{=} \min_{\|\delta\|=\varepsilon} \sum_{x \in W(\bar{x})} \delta^T \nabla I(x) \nabla I(x)^T \delta$$

$$= \min_{\|\delta\|=\varepsilon} \delta^T \left[\sum_{x \in W(\bar{x})} \nabla I(x) \nabla I(x)^T \right] \delta$$

$$\equiv G$$

$$= \min_{\|\delta\|=\varepsilon} \delta^T G \delta$$

$$= \varepsilon^2 \min_{\|z\|=1} z^T G z$$

$$= \lambda_{\min}(G)$$

$$= \varepsilon^2 \lambda_{\min}(G)$$ Shi-Tomasi score

↳ remember that G is a function of the candidate corner $\bar{x}$

An alternative score is the Harris corner score:

$$C(G) = \det(G) - k\left[\mathrm{tr}(G)\right]^2$$