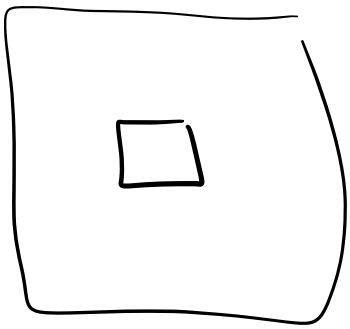
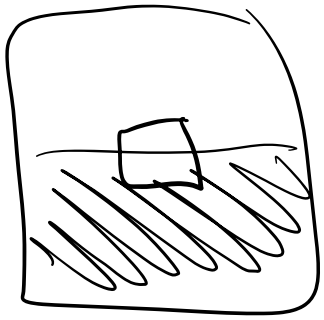
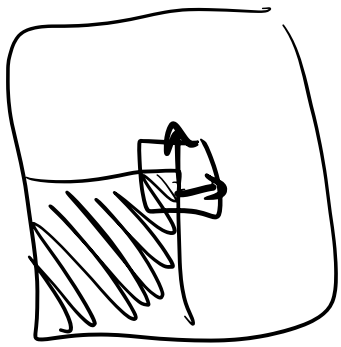
Local Uniqueness

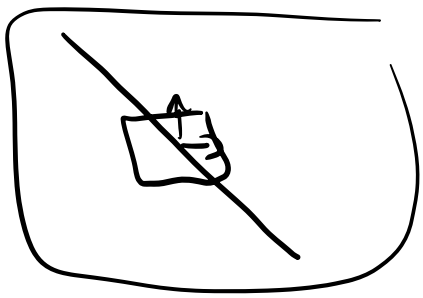






$$I_x = \frac{\partial I}{\partial x}$$

$$I_y = \frac{\partial I}{\partial y}$$



"error"

$$E(u,v) = \sum_{x,y \in W} \left[I(x+u, y+v) - I(x,y) \right]^2$$

$$f(x) = f(a) + f'(a)(x-a) + f''(a)(x-a)^2$$

$$f(x) \approx f(a) + f'(a)(x-a)$$

$$I(x+u, y+v) \approx I(x,y) + \frac{\partial I}{\partial x} u + \frac{\partial I}{\partial y} v$$

$$I(x,y) + I_x u + I_y v$$

Plug in:

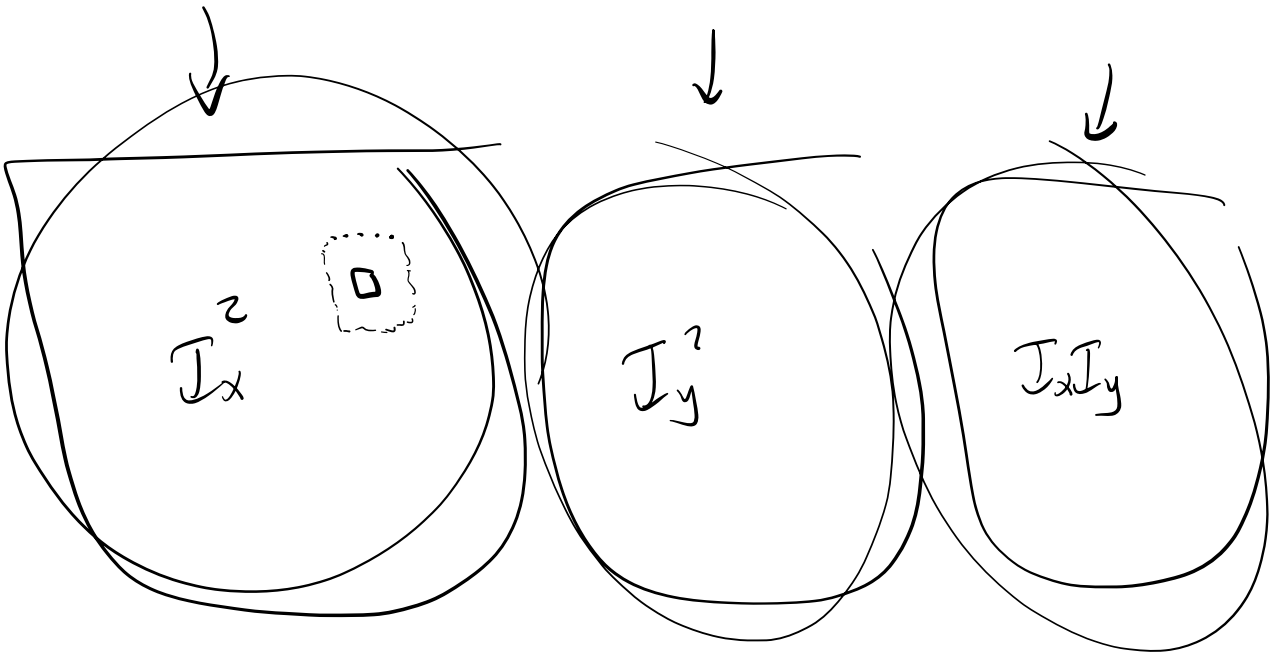
$$E(u,v) = \sum_{x,y \in W} \left[I(x,y) + I_x u + I_y v - I(x,y) \right]^2$$

$$E(u,v) = \sum_{x,y \in W} \left[I_x u + I_y v \right]^2$$

$$= \sum_{x,y \in W} I_x^2 u^2 + 2 I_x I_y uv + I_y^2 v^2$$

$$= \sum_{x,y \in W} \begin{bmatrix} u & v \end{bmatrix} \begin{bmatrix} I_x^2 & I_x I_y \\ I_x I_y & I_y^2 \end{bmatrix} \begin{bmatrix} u \\ v \end{bmatrix}$$

$$A \vec{v} = \lambda \vec{v}$$


I_x^2
I_y^2
$I_x I_y$