

EDGE DETECTION



*Edge detection using
Canny filtering*

Common gradient operators

	H1	H2
Roberts	$\begin{bmatrix} \boxed{0} & 1 \\ -1 & 0 \end{bmatrix}$	$\begin{bmatrix} \boxed{1} & 0 \\ 0 & -1 \end{bmatrix}$
Prewitt	$\begin{bmatrix} -1 & 0 & 1 \\ -1 & \boxed{0} & 1 \\ -1 & 0 & 1 \end{bmatrix}$	$\begin{bmatrix} -1 & -1 & -1 \\ 0 & \boxed{0} & 0 \\ 1 & 1 & 1 \end{bmatrix}$
Sobel	$\begin{bmatrix} -1 & 0 & 1 \\ -2 & \boxed{0} & 2 \\ -1 & 0 & 1 \end{bmatrix}$	$\begin{bmatrix} -1 & -2 & -1 \\ 0 & \boxed{0} & 0 \\ 1 & 2 & 1 \end{bmatrix}$
Isotropic	$\begin{bmatrix} -1 & 0 & 1 \\ -\sqrt{2} & \boxed{0} & \sqrt{2} \\ -1 & 0 & 1 \end{bmatrix}$	$\begin{bmatrix} -1 & -\sqrt{2} & -1 \\ 0 & \boxed{0} & 0 \\ 1 & \sqrt{2} & 1 \end{bmatrix}$

Gradient operators

- Image $f(x,y)$
- Magnitude of $\text{Grad}(f)$:
 - a) $\left[\left(\partial f / \partial x \right)^2 + \left(\partial f / \partial y \right)^2 \right]^{1/2}$
 - b) $|\partial f / \partial x| + |\partial f / \partial y|$
 - c) $\text{Max} \left(|\partial f / \partial x|, |\partial f / \partial y| \right)$
- Direction of $\text{Grad}(f)$: $\arctan \left(\frac{\partial f / \partial y}{\partial f / \partial x} \right)$

1st and 2nd derivatives

