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Local features: desired properties

- Repeatability
 - The same feature can be found in several images despite geometric and photometric transformations
- Saliency
 - Each feature has a distinctive description
- Compactness and efficiency
 - Many fewer features than image pixels
- Locality
 - A feature occupies a relatively small area of the image; robust to clutter and occlusion















What does this matrix reveal?

First, consider an axis-aligned corner:

$$M = \sum \begin{bmatrix} I_x^2 & I_x I_y \\ I_x I_y & I_y^2 \end{bmatrix} = \begin{bmatrix} \lambda_1 & 0 \\ 0 & \lambda_2 \end{bmatrix}$$

This means dominant gradient directions align with x or y axis

Look for locations where **both** λ 's are large.

If either λ is close to 0, then this is **not** corner-like.

What if we have a corner that is not aligned with the image axes?



































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Applications of local invariant features

- Wide baseline stereo
- Motion tracking
- Panoramas
- Mobile robot navigation
- 3D reconstruction
- Recognition
- ...









