

Edge Detection

Method that aims to identify edges defined as curves in a digital image at which image brightness changes sharply or “has discontinuities”

Identifying points in an image where brightness or color intensity changes sharply which indicates “edge” or a boundary of objects

Similar to tracing outlines of objects in a picture

Useful in

- Object recognition
- Image Segmentation
- Medical Imaging
- Self driving Cars
- Facial Recognition

How it Works

- An image is a landscape of brightness values (pixels), some areas are “flat” which there no change in brightness while others have “steep slopes” sudden changes
- The gradient measures how steep the slope is, so the rate of change of brightness at a pixel
- A large gradient is likely an edge and if its small, its not an edge
- In order for it to work smoothly, we reduce noise by smoothing nan image using a gaussian blur, which blends pixel values together slightly, this is to remove unwanted variations in intensity, rather than removing it, it blends the noise with surrounding pixels to reduce the chances of it being detected as an edge
- We calculate the gradient using things like derivatives, how much pixel intensity changes in different directions
- not all gradients are significant, so there is a threshold with the function to consider, brightness can make a great difference
- non-maximum suppression ensures edges are thin by removing multiple detections of the same edge
- edge linking - edge fragments are connected to form continuous boundaries

The code is ChatGPT generated for educational purposes