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| |  |  | | --- | --- | | **Technical Presentation:**  **Done By:**  **Sanjay Hemant**  **18bcs041**  **3rd Cs “A”**  **Sri Krishna Arts And Science College** |  | |  |

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**Canny Edge Detector**

**Theory**

The *Canny Edge detector* was developed by John F. Canny in 1986. Also known to many as the *optimal detector*, the Canny algorithm aims to satisfy three main criteria:

* **Low error rate:** Meaning a good detection of only existent edges.
* **Good localization:** The distance between edge pixels detected and real edge pixels have to be minimized.
* **Minimal response:** Only one detector response per edge.

**Steps**

1. Filter out any noise. The Gaussian filter is used for this purpose. An example of a Gaussian kernel of size=5 that might be used is shown below:

K=1159⎡⎣⎢⎢⎢⎢⎢⎢245424912945121512549129424542⎤⎦⎥⎥⎥⎥⎥⎥

1. Find the intensity gradient of the image. For this, we follow a procedure analogous to Sobel:
   1. Apply a pair of convolution masks (in x and y directions:

Gx=⎡⎣⎢−1−2−1000+1+2+1⎤⎦⎥

Gy=⎡⎣⎢−10+1−20+2−10+1⎤⎦⎥

* 1. Find the gradient strength and direction with:

G=G2x+G2y−−−−−−−√θ=arctan(GyGx)

The direction is rounded to one of four possible angles (namely 0, 45, 90 or 135)

1. *Non-maximum* suppression is applied. This removes pixels that are not considered to be part of an edge. Hence, only thin lines (candidate edges) will remain.
2. *Hysteresis*: The final step. Canny does use two thresholds (upper and lower):
   1. If a pixel gradient is higher than the *upper* threshold, the pixel is accepted as an edge
   2. If a pixel gradient value is below the *lower* threshold, then it is rejected.
   3. If the pixel gradient is between the two thresholds, then it will be accepted only if it is connected to a pixel that is above the *upper* threshold.