# 3D Computer Vision
# Assignment-1

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**Canny Edge Detector:**

The code has been written on the basis of the Algorithm taught in the lectures of Computer Vision.

***Algorithm Step by Step:***

1) Sobel edge detection of the Gaussian Blurred image.
2) Magnitude and Direction of the Gradient obtained from the outputs of Step-1.
3) Non-minimal Suppression.
4) Hysterisis thresholding.
5) Edge linking

The output image is not as accurate as the inbuilt function as shown below.

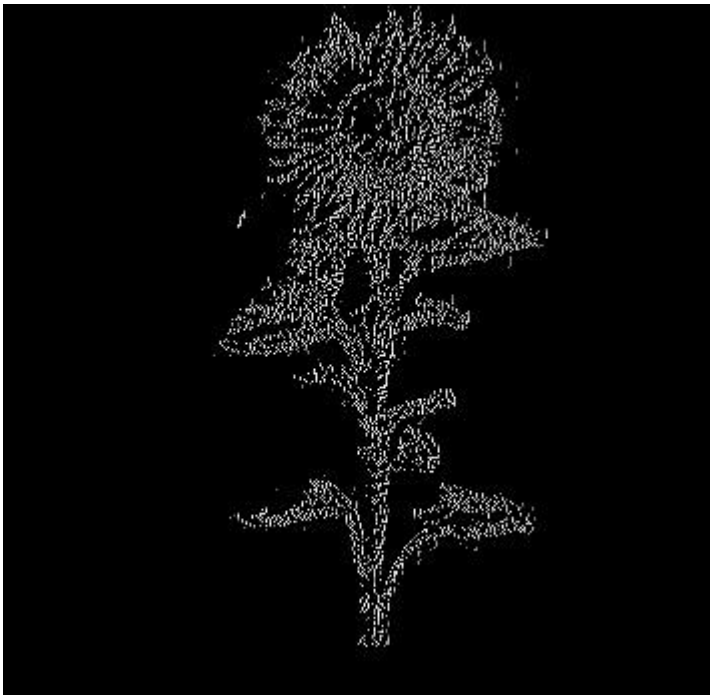

Fig.1 Output of Canny edge detector

**Harris Corner Detection:**

The code has been written on the basis of the Algorithm taught in the lectures of Computer Vision.

***Algorithm Step by Step:***

1) Getting the filtered images.
2) Squaring the elements of the formed array.

3) Getting the box filtered images from the output of Step-2
4) Forming the 2x2 matrix from the elements of output of Step-3 to get the eigen values
5) Applying the following formula:

$$R(x,y) = \lambda_1\lambda_2 - k(\lambda_1 + \lambda_2)^2$$

Where $\lambda_1$ and $\lambda_2$ are the eigen values of matrix in Step-4 and k is constant (in code taken as 0.06)
If R > 0, then it implies that there is a corner at that (x,y) location in the image.

In the demo example the code was even able to detect the corners that were not been able to be detected by the inbuilt function. The results as a binary image is as shown below.

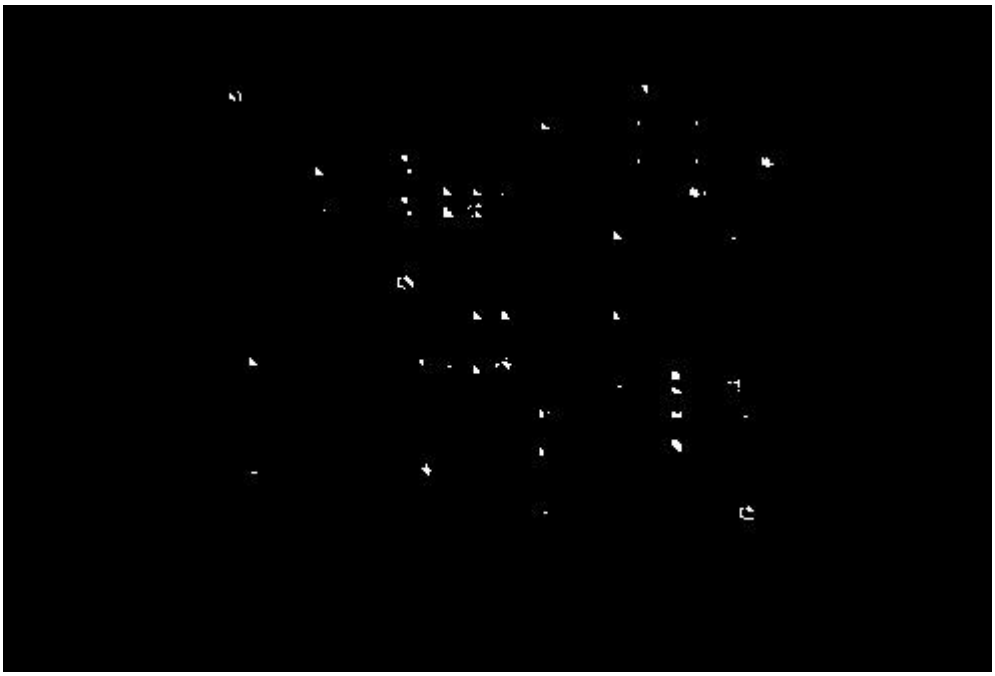

Fig.2 Output as binary image for Harris corner detection

References:


- Classnotes
- Open CV tutorial for the Harris corner detection – https://opencv-python-tutroals.readthedocs.io/en/latest/py_tutorials/py_feature2d/py_features_harris/py_features_harris.html
- Open CV tutorial for the Canny edge detection- https://docs.opencv.org/trunk/da/d22/tutorial_py_canny.html
- Open CV tutorial for Smoothening images- https://opencv-python-tutroals.readthedocs.io/en/latest/py_tutorials/py_imgproc/py_filtering/py_filtering.html