Python3_Jupyter_Notebook

Importing the libraries

In [1]:

```
import cv2
import matplotlib.pyplot as plt
import matplotlib.image as mpimg
import numpy as np
```

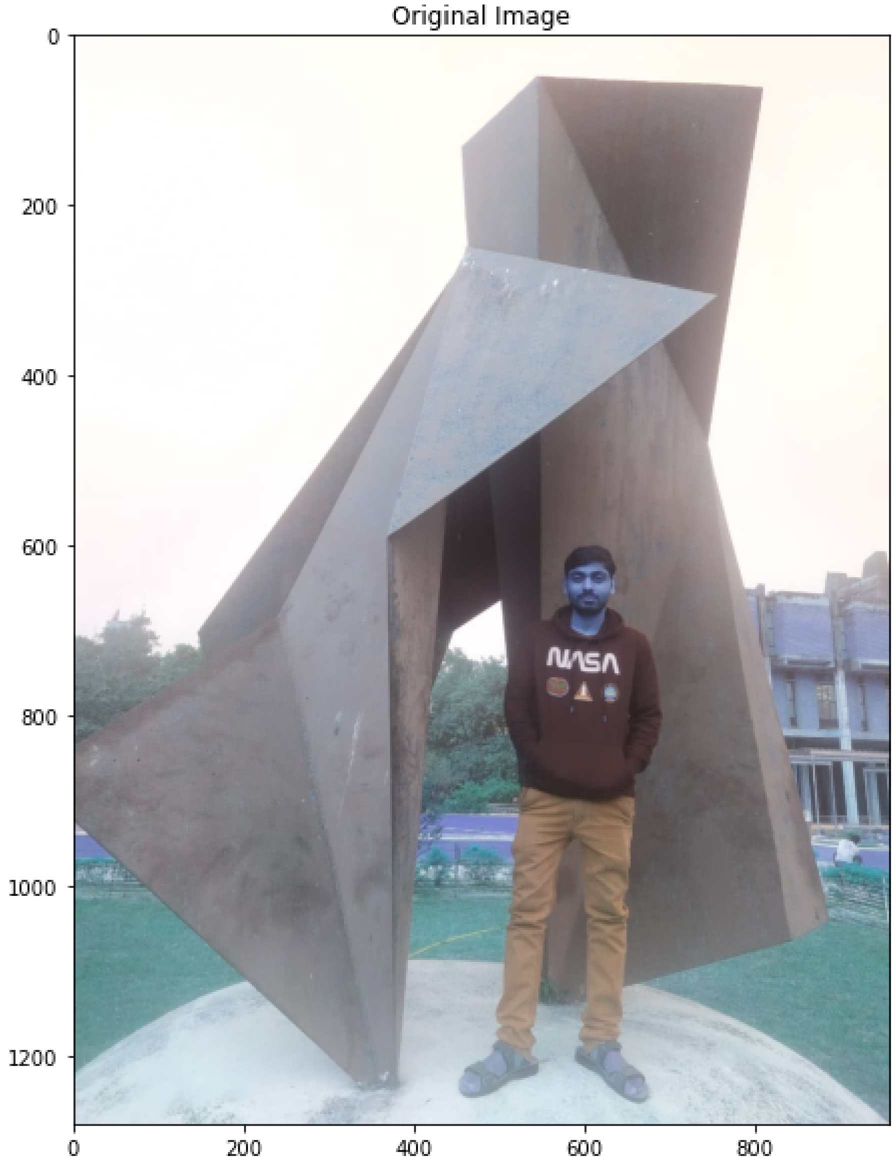
Feeding raw image

In [2]:

```
image = cv2.imread('img1.jpeg')
plt.figure(figsize=(10,10))
plt.title('Original Image')
plt.imshow(image)
```

Out[2]:

```
<matplotlib.image.AxesImage at 0x212bd6304c0>
```



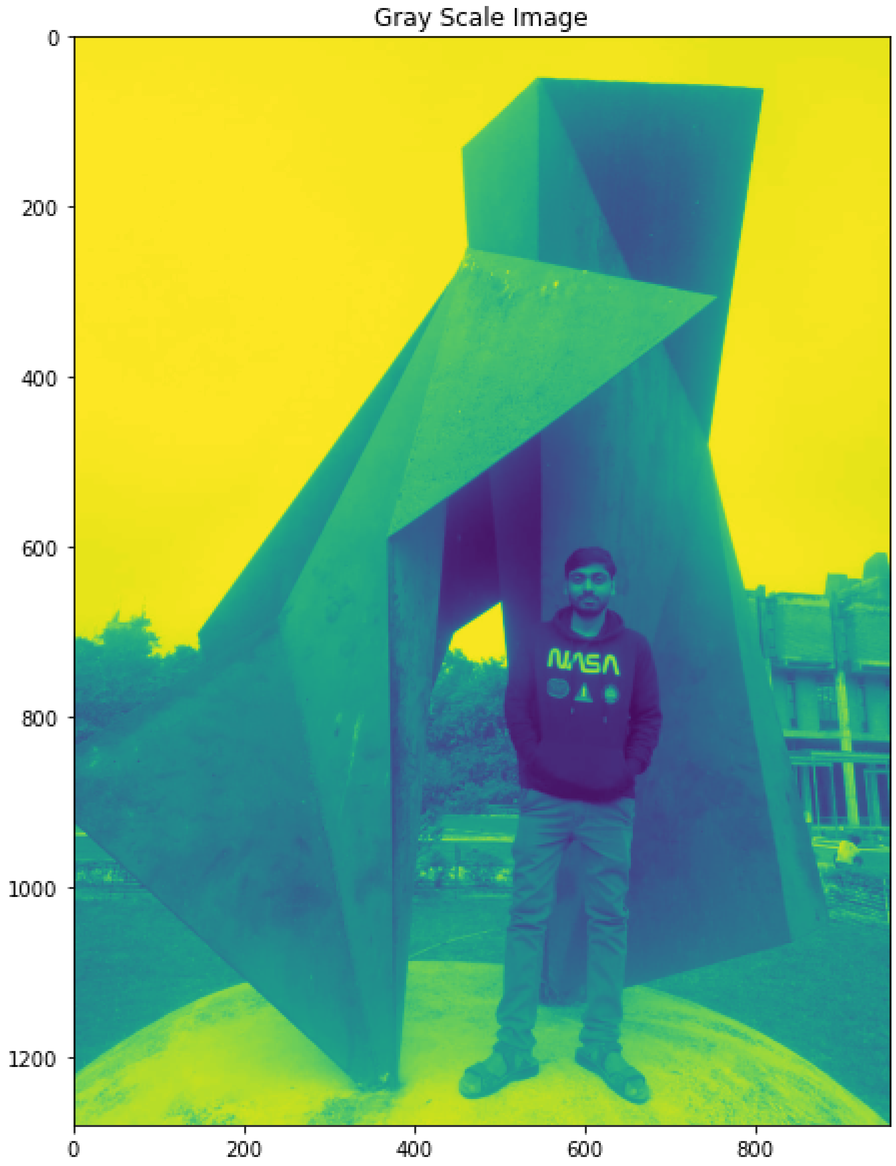
Converting raw image to greyscale image

In [3]:

```
image = cv2.cvtColor(image,cv2.COLOR_BGR2GRAY)
plt.figure(figsize=(10,10))
plt.title('Gray Scale Image')
plt.imshow(image)
```

Out[3]:

```
<matplotlib.image.AxesImage at 0x212c0b456a0>
```



Why canny?

We can not do any stable operation on the image obtained by Sobel, SAR or Laplacean filter since these provides noisy image. We can do any stable operation on image obtained by canny edge detection.

Five steps of cannyedge detection

1. Noise reduction :

Since edge detection is susceptible to noise in the image so we remove this using Gaussian filter(using Gaussian matrix)

2. Gradient Calculation :

Smoothened image is then filtered with a sobel kernel in both X and Y direction to get derivatives Gx and Gy. From this we can get Gradient Intensity matrix and Gradient Angles.

Edge_Gradient = sqrt(Gx^2+Gy^2) Approximation of gradients

Angle(theta) = tan^-1(Gy/Gx) In which direction intensity changes

3. Non-maximum Suppression:

The final image should have thin edges.

So we perform non-maximum suppression to thin out the edges

The algorithm goes through all the points on the image and finds the pixels with the maximum value of gradient in the edge directions.

4. Double thresholding:

For this step we need two threshold values, minVal and maxVal.

Any edges with intensity gradient more than maxVal are sure to be edges and those below minVal are non-edges, so discarded.

Those who lie between these two thresholds are classified edges or non-edges based on their connectivity

5. Edge tracking by hysteresis:

If they are connected to "sure-edge" pixels, they are considered to be part of edges. Otherwise, they are discarded.

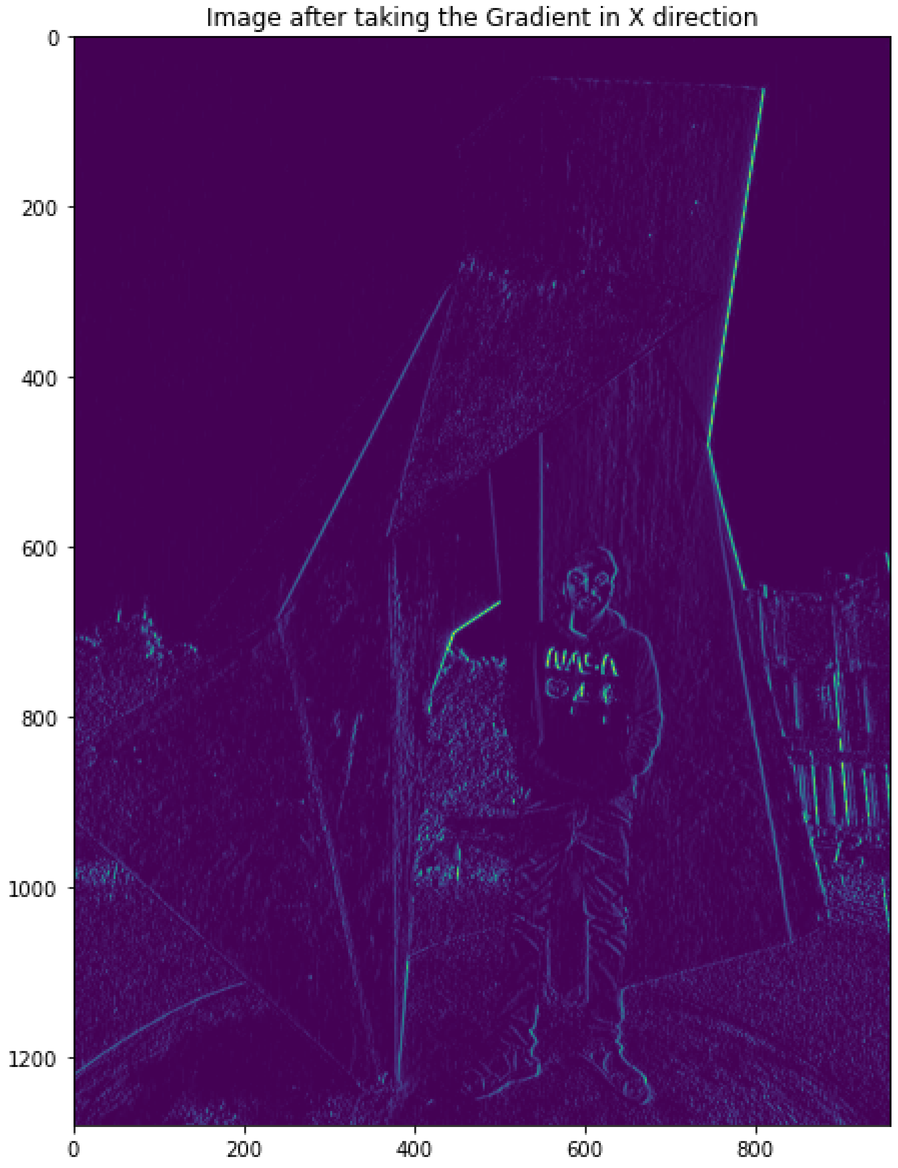
Taking Gradient of image in X direction

In [4]:

```
gradients_sobelx = cv2.Sobel(image,-1,1,0)
plt.figure(figsize=(10,10))
plt.title('Image after taking the Gradient in X direction')
plt.imshow(gradients_sobelx)
```

Out[4]:

```
<matplotlib.image.AxesImage at 0x212c07dfa60>
```



Taking Gradient of image in Y direction

In [5]:

```
gradients_sobely = cv2.Sobel(image,-1,0,1)
plt.figure(figsize=(10,10))
plt.title('Image after taking the Gradient in Y direction')
plt.imshow(gradients_sobely)
```

Out[5]:

```
<matplotlib.image.AxesImage at 0x212bfed3370>
```

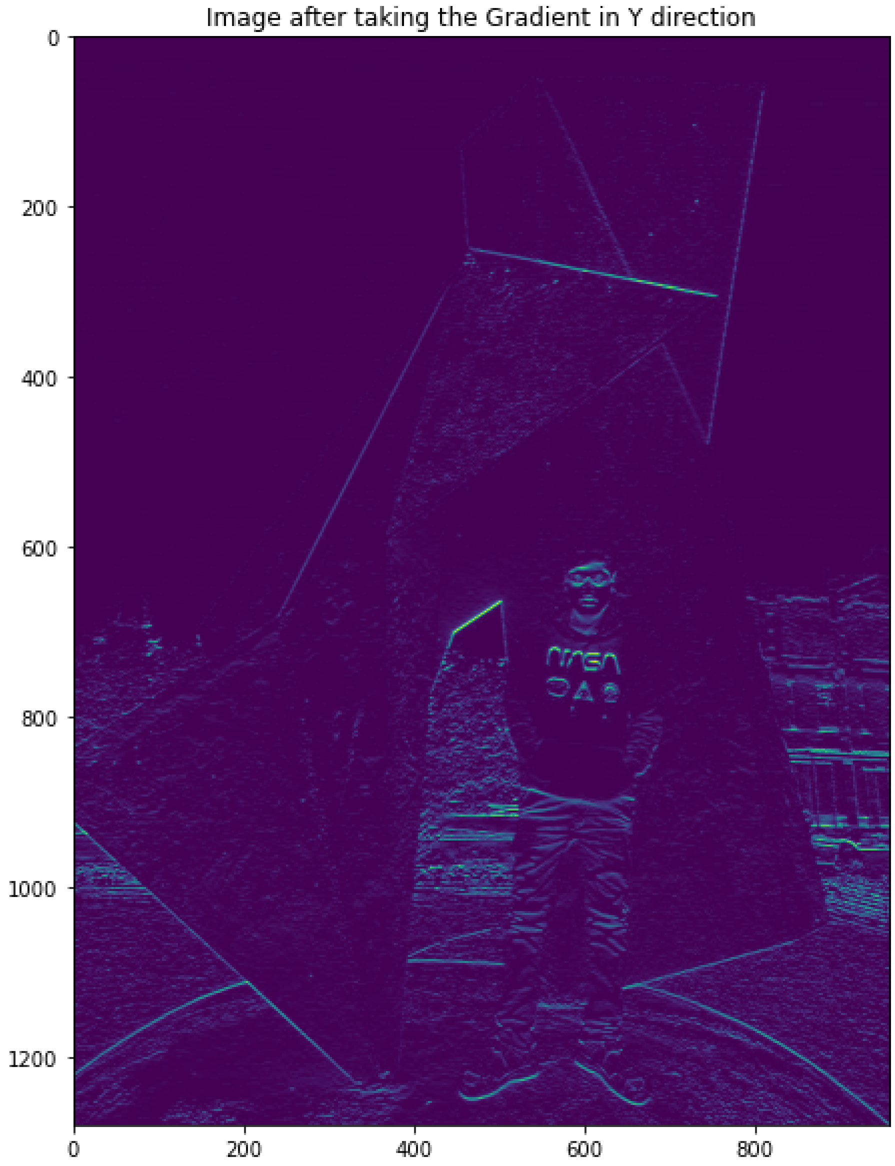


Image after taking the Gradient in Y direction

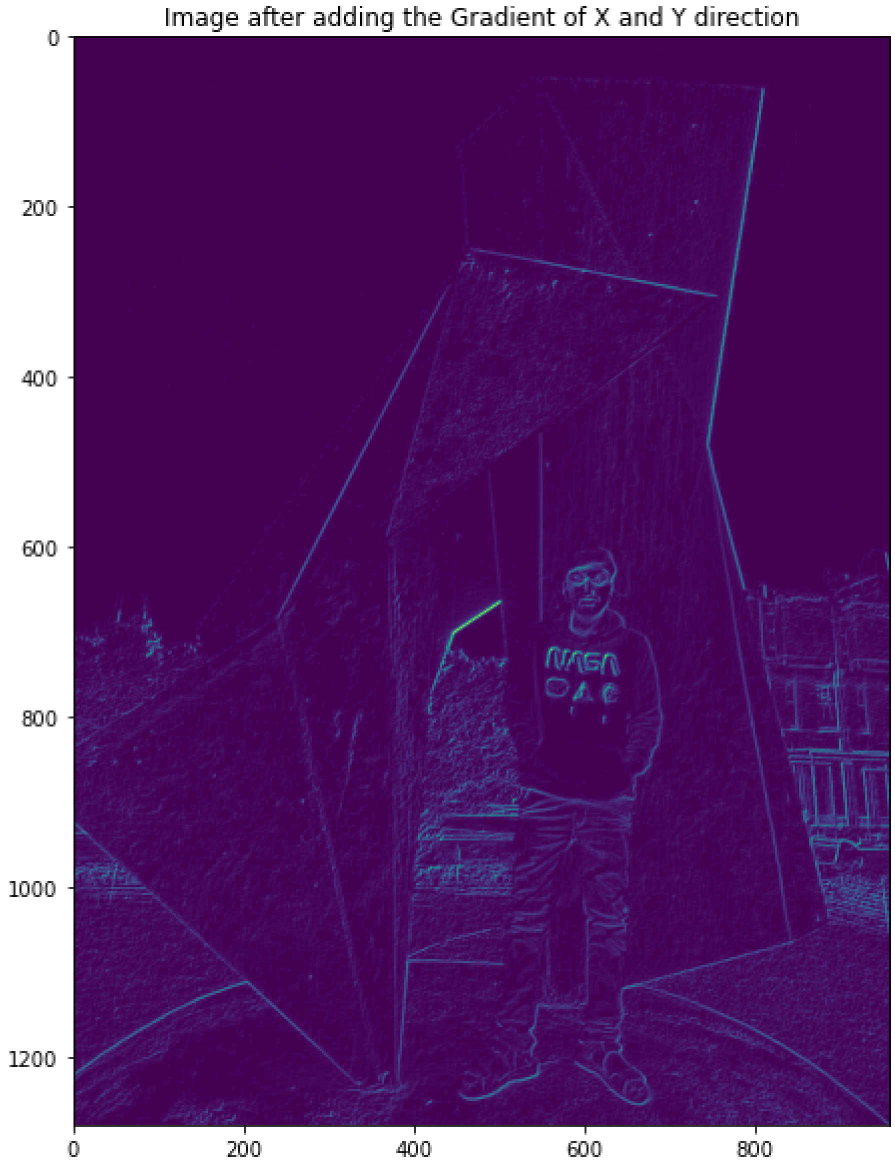
Adding the gradients of both directions X and Y

In [6]:

```
gradients_sobelxy = cv2.addWeighted(gradients_sobelx,0.5,gradients_sobely,0.5,0)
plt.figure(figsize=(10,10))
plt.title('Image after adding the Gradient of X and Y direction')
plt.imshow(gradients_sobelxy)
```

Out[6]:

```
<matplotlib.image.AxesImage at 0x212bff2e250>
```



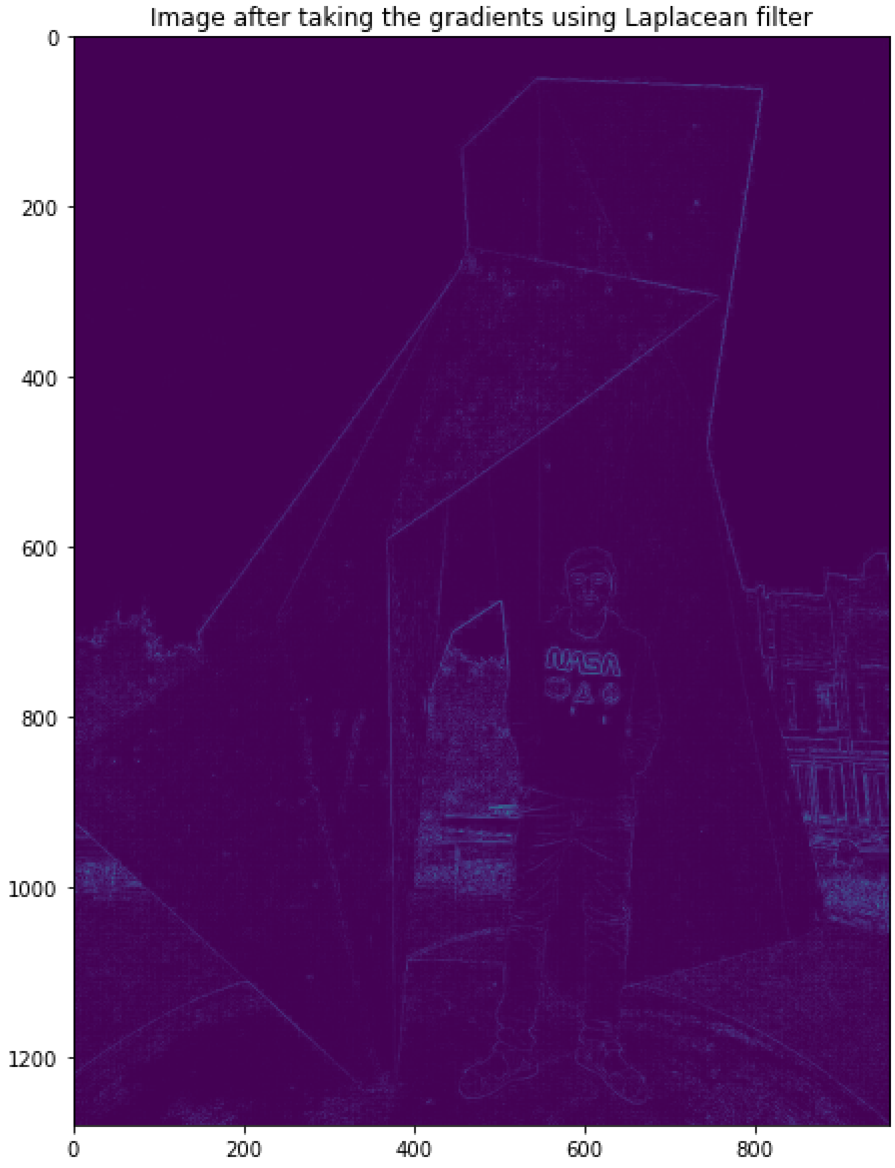
Taking the gradients using Laplacean filter

In [7]:

```
gradients_laplacian = cv2.Laplacian(image,-1)
plt.figure(figsize=(10,10))
plt.title('Image after taking the gradients using Laplacean filter')
plt.imshow(gradients_laplacian)
```

Out[7]:

```
<matplotlib.image.AxesImage at 0x212c082b1c0>
```



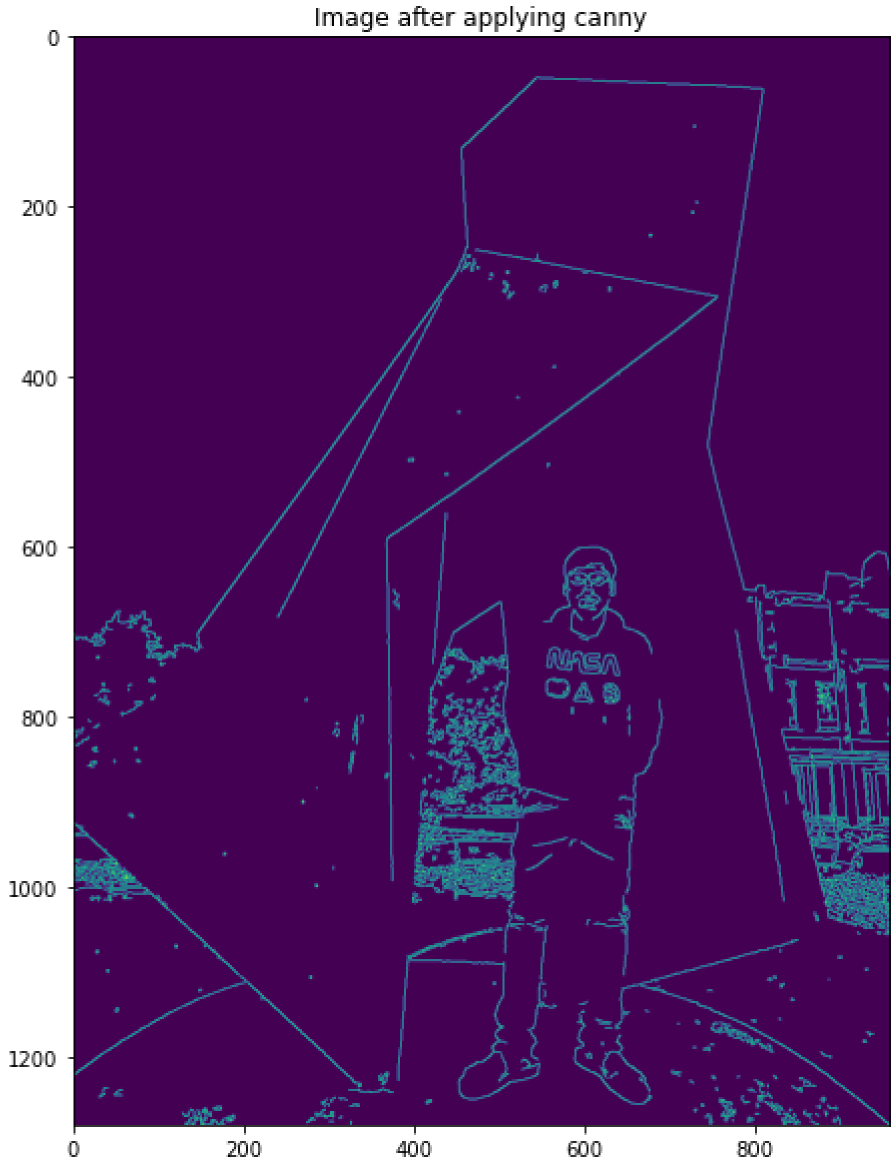
Applying the canny edge detection algorithm

In [8]:

```
canny_outut = cv2.Canny(image,80,150)
plt.figure(figsize=(10,10))
plt.title('Image after applying canny')
plt.imshow(canny_outut)
```

Out[8]:

```
<matplotlib.image.AxesImage at 0x212c0871670>
```



Live Webcam feeding

In [9]:

```
def LiveCamDetection_canny_edge(color_image):
    im_gray = cv2.cvtColor(color_image,cv2.COLOR_BGR2GRAY)
    canny_edge = cv2.Canny(im_gray,30,100)
    return canny_edge
```

Initializing webcam

In [10]:

```
# liveVideo = cv2.VideoCapture(0)
# while True:
#     ret, frame = liveVideo.read()
#     cv2.imshow("Live Edge detection",LiveCamDetection_canny_edge(frame))
#     cv2.imshow("Webcam Video",frame)
#     if cv2.waitKey(1) == 13:
#         break
# liveVideo.release()
# cv2.destroyAllWindows()
```