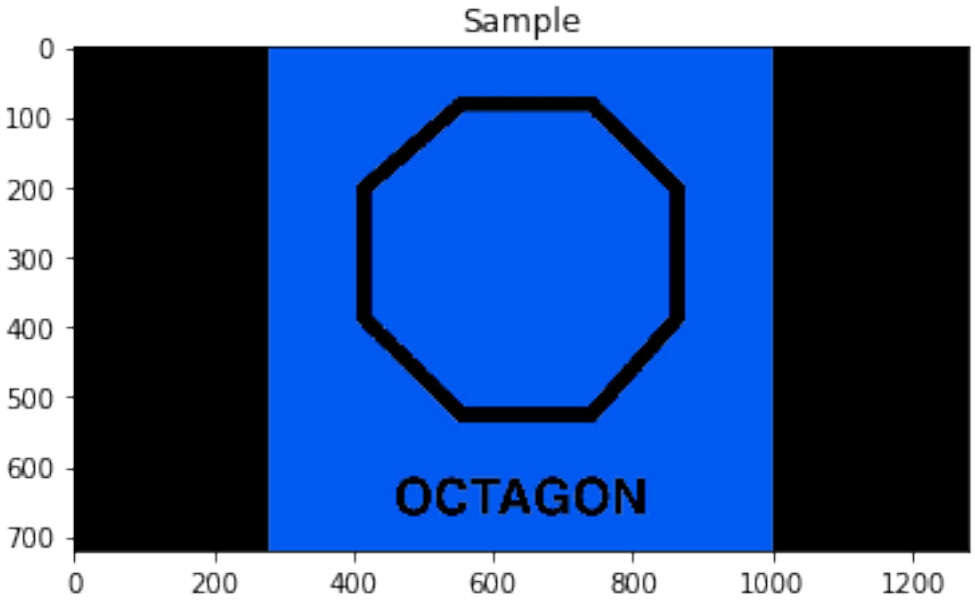
Edge Detection

April 28, 2019

0.0.1 Edge Detection

In [1]:
```
import cv2
import numpy as np
from matplotlib import pyplot as plt
```

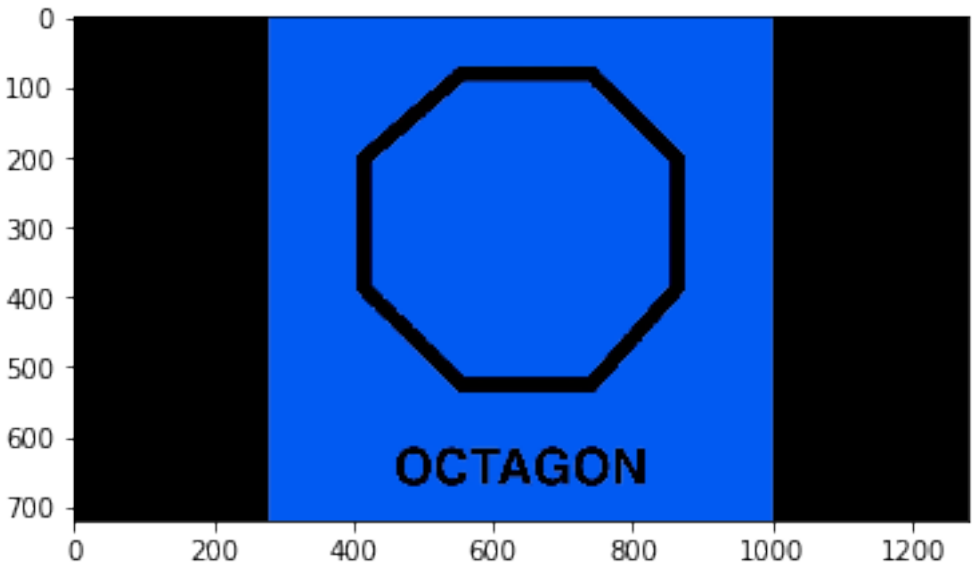
In [2]:
```
img = cv2.imread('sample5.jpg')
plt.imshow(img)
plt.title('Sample')
plt.show()
```



In [3]:
```
blur = cv2.fastNlMeansDenoisingColored(img,None,10,10,7,21)
```

In [4]:
```
plt.imshow(blur,cmap='gray')
```

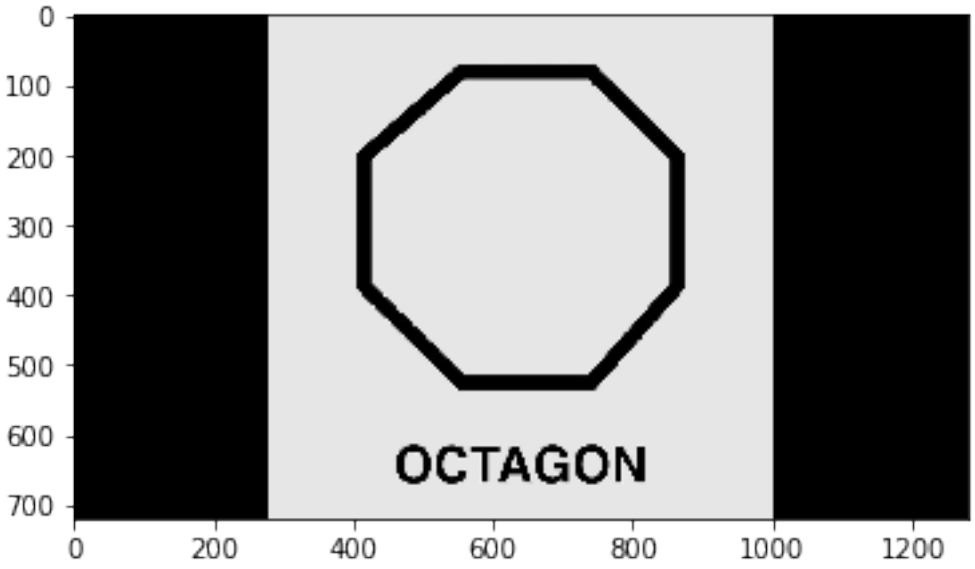
Out[4]:
```
<matplotlib.image.AxesImage at 0x11a1daf28>
```



In [5]: `gray = cv2.cvtColor(blur, cv2.COLOR_BGR2GRAY)`

In [6]: `plt.imshow(gray,cmap='gray')`

Out[6]: `<matplotlib.image.AxesImage at 0x11bf20e80>`



In [7]: `print(gray.shape)`

```
(720, 1280)
```

```
In [8]: def pad(img,shp):
            p=np.zeros((shp[0]+2,shp[1]+2))
            p[1:-1,1:-1]=np.copy(img)
            p[0,1:-1],p[-1,1:-1]=img[0],img[-1]
            p[1:-1,0],p[1:-1,-1]=img[:,0],img[:,-1]
            p[0,0],p[0,-1]=img[0,0],img[0,-1]
            p[-1,0],p[-1,-1]=img[-1,0],img[-1,-1]
            return p
```

```
In [9]: def sobel_filter(img):
            sabel_x = np.array([[-1,0,1],[-2,0,2],[-1,0,1]])
            sabel_y = np.array([[-1,-2,-1],[0,0,0],[1,2,1]])
            shp = img.shape
            shpm=(3,3)
            padded_img=pad(img,shp)
            grad_matrix=np.zeros(shp)
            out=np.zeros(shp)
            exp = np.zeros(shp)
            for i in range(shp[0]):
                for j in range(shp[1]):
                    g_x=np.multiply(padded_img[i:i+shpm[0],j:j+shpm[1]],sabel_x).sum()
                    g_y=np.multiply(padded_img[i:i+shpm[0],j:j+shpm[1]],sabel_y).sum()
                    if g_y!=0 or g_x!=0:
                        if g_x==0:
                            rad=np.arctan2(g_y,g_x)
                        else:
                            rad=np.arctan2(g_y,g_x)
                        deg=rad*(180/np.pi)
                        rad_rev = deg*(np.pi/180)
                        #print(rad*(180/np.pi),end=" ")
                        #print(rad_rev)
                        grad_matrix[i][j]=deg
                        if grad_matrix[i][j]<0:
                            exp[i][j] = grad_matrix[i][j]
                        out[i][j] = np.sqrt(np.square(g_x)+np.square(g_y))
                    else:
                        out[i,j]=255
                        grad_matrix[i][j]=255
            out=np.array(out, dtype = np.uint8)
            grad_matrix=np.array(grad_matrix,dtype= np.uint8)

            return out,grad_matrix,exp
```

```
In [10]: def prewitt_filter(img):
             prewitt_x = np.array([[-1,0,1],[-1,0,1],[-1,0,1]])
```

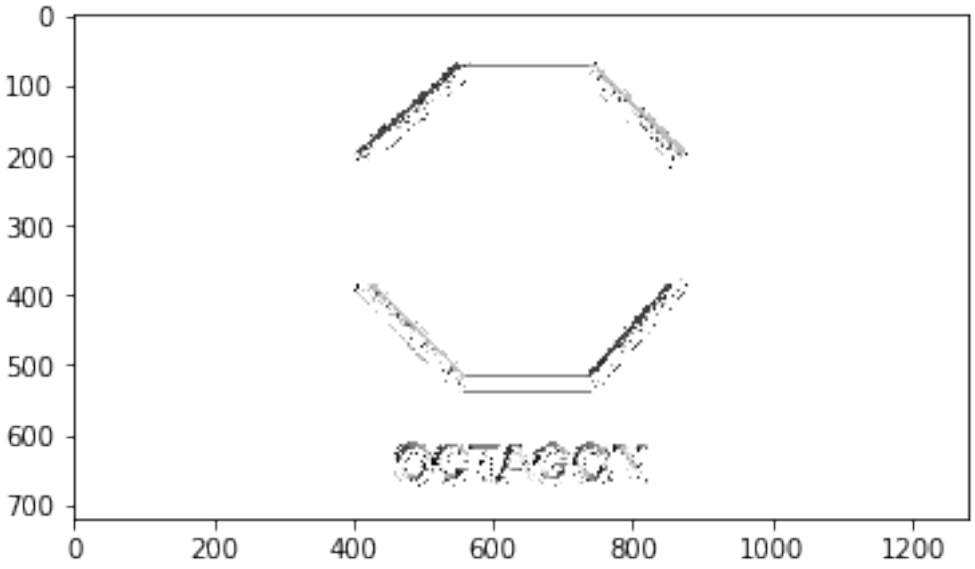
```
            prewitt_y = np.array([[1,1,1],[0,0,0],[-1,-1,-1]])
            shp = img.shape
            shpm=(3,3)
            padded_img=pad(img,shp)
            grad_matrix=np.zeros(shp)
            out=np.zeros(shp)
            exp = np.zeros(shp)
            for i in range(shp[0]):
                for j in range(shp[1]):
                    g_x=np.multiply(padded_img[i:i+shpm[0],j:j+shpm[1]],prewitt_x).sum()
                    g_y=np.multiply(padded_img[i:i+shpm[0],j:j+shpm[1]],prewitt_y).sum()
                    if g_y!=0 or g_x!=0:
                        if g_x==0:
                            rad=np.arctan2(g_y,g_x)
                        else:
                            rad=np.arctan2(g_y,g_x)
                        deg=rad*(180/np.pi)
                        rad_rev = deg*(np.pi/180)
                        #print(rad*(180/np.pi),end=" ")
                        #print(rad_rev)
                        grad_matrix[i][j]=deg
                        if grad_matrix[i][j]<0:
                            exp[i][j] = grad_matrix[i][j]
                            print(exp[i][j])
                        out[i][j] = np.sqrt(np.square(g_x)+np.square(g_y))
                    else:
                        out[i,j]=255
                        grad_matrix[i][j]=255
            out=np.array(out, dtype = np.uint8)

            return out,grad_matrix,exp
```

In [11]:
```
output, grad_matrix,exp = sobel_filter(gray)
```

In [ ]:

In [12]:
```
plt.imshow(exp,cmap='gray')
```

Out[12]:
```
<matplotlib.image.AxesImage at 0x11c227dd8>
```



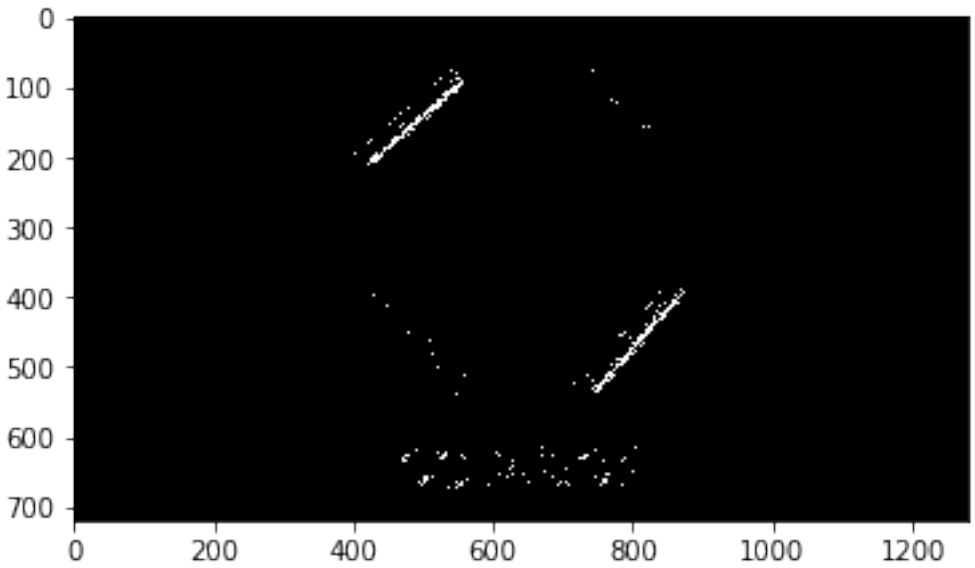
In [13]: output2, grad_matrix2,exp2 = prewitt_filter(gray)

```
-45.0
-63.43494882292201
-116.56505117707799
-135.0
-45.0
-63.43494882292201
-90.0
-116.56505117707799
-90.0
-90.0
-90.0
-90.0
-90.0
-90.0
-90.0
-90.0
-90.0
-90.0
-90.0
-90.0
-90.0
-90.0
-90.0
-90.0
-90.0
-90.0
-90.0
-90.0
```

-48.03403964694501
-34.99202019855866
-47.48955292199916
-40.91438322002513
-57.10767025676035
-40.539151741483444
-45.0
-57.885169399703265
-38.736509385665464
-43.97696981133217
-41.18592516570965
-45.0
-49.899092453787766
-45.0
-45.0
-57.52880770915151
-45.0
-45.0
-39.472459848343824
-44.13194855025446
-45.0
-49.899092453787766
-47.48955292199916
-45.0
-58.10920819815429
-32.9052429229879
-45.0
-45.0
-45.0
-45.0
-50.19442890773481
-33.690067525979785
-45.0
-45.0
-45.0
-59.03624346792648
-45.0
-45.0
-53.13010235415598
-55.00797980144134
-47.12109639666146
-45.0
-30.96375653207352
-56.309932474020215
-45.0
-45.0
-56.309932474020215
-56.309932474020215

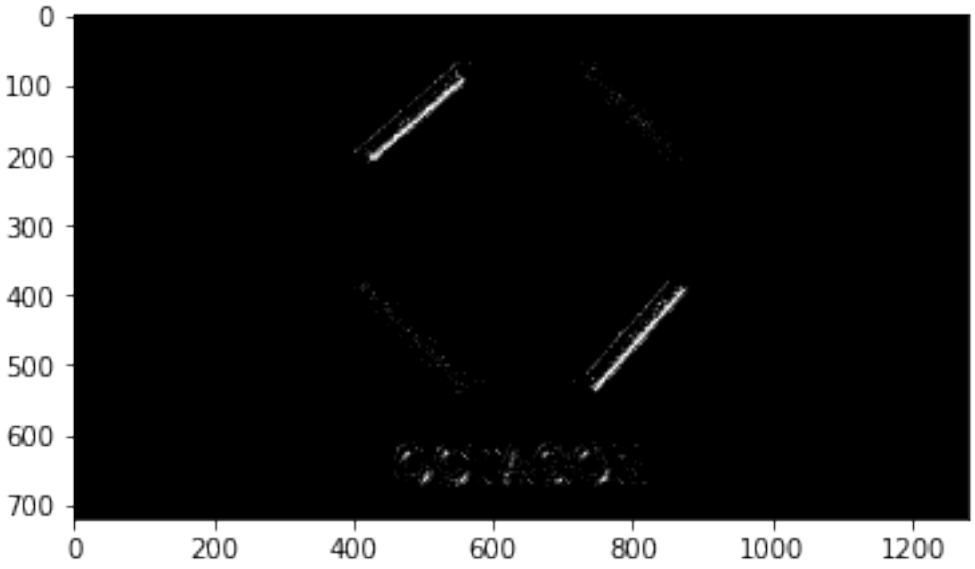
```
-33.690067525979785
-45.0
-36.86989764584402
-45.0
-45.0
-45.0
-45.0
-56.309932474020215
-45.0
-45.0
-45.0
-45.0
-59.03624346792648
-45.0
-45.0
-53.13010235415598
-45.0
```

In [25]:
```
plt.imshow(filtered2,cmap="gray")
cv2.imshow('image',filtered2)
cv2.waitKey()
cv2.destroyAllWindows()
```



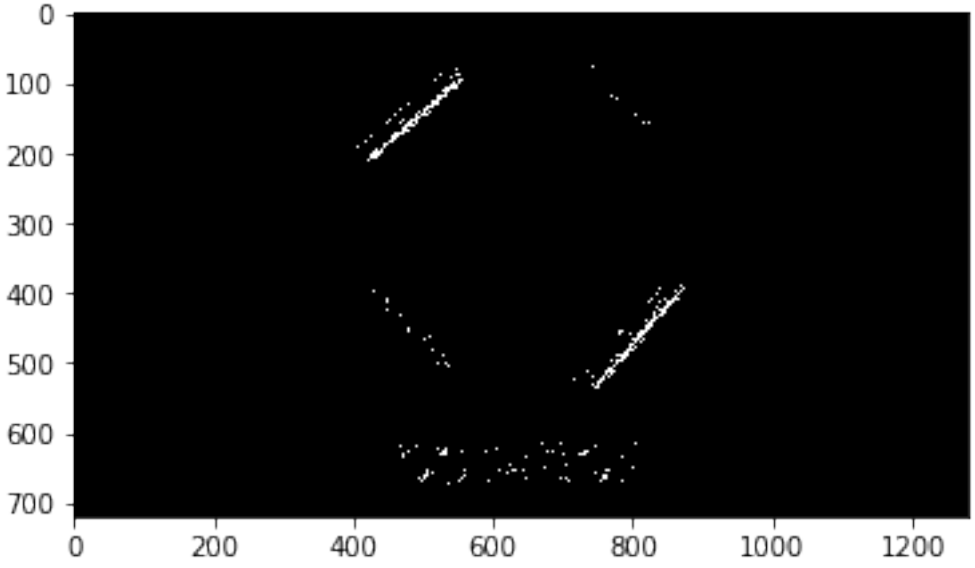
In [26]:
```
smo_fil = cv2.GaussianBlur(filtered2,(5,5),0)
```

In [27]:
```
plt.imshow(smo_fil,cmap='gray')
plt.imsave('output_edge.png',smo_fil,cmap='gray')
```



In [ ]:

In [28]:
```
plt.imshow(filtered,cmap="gray")
cv2.imshow('image',filtered)
cv2.waitKey()
cv2.destroyAllWindows()
```



```
In [29]: x = np.array([-1, +1, +1, -1])
         y = np.array([-1, -1, +1, +1])

         np.arctan2(y,x)*180/np.pi

Out[29]: array([-135.,  -45.,   45.,  135.])

In [ ]:

In [ ]:
```