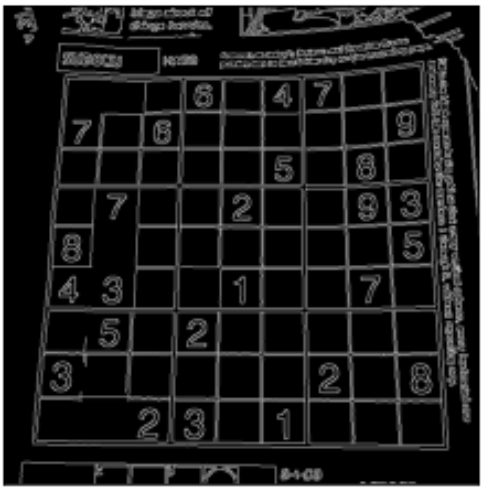
190639B

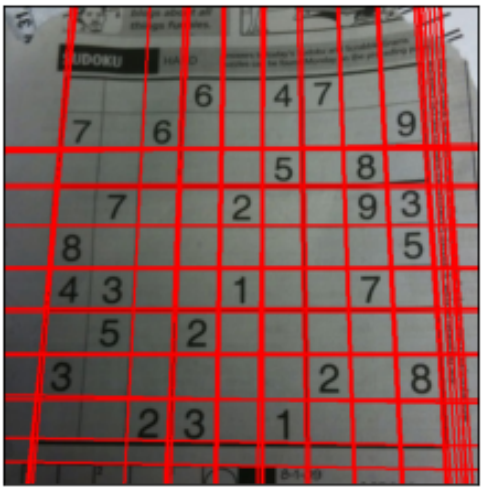
In [ ]:
```
import numpy as np
import matplotlib.pyplot as plt
import cv2 as cv
%matplotlib inline
```

In [ ]:
```
#1
sudukoimage=cv.imread(r'sudoku.png',cv.IMREAD_COLOR)
assert sudukoimage is not None
gray=cv.cvtColor(sudukoimage,cv.COLOR_BGR2GRAY)
edges=cv.Canny(gray,50,150,apertureSize=3)
lines=cv.HoughLines(edges,1,np.pi/180,175)

for line in lines:
    rho,theta=line[0]
    a=np.cos(theta)
    b=np.sin(theta)
    x0,y0=a*rho,b*rho
    x1,y1=int(x0+1000*(-b)),int(y0+1000*a)
    x2,y2=int(x0-1000*(-b)),int(y0-1000*a)
    cv.line(sudukoimage,(x1,y1),(x2,y2),(0,0,255),2)
cv.namedWindow("Image",cv.WINDOW_NORMAL)
cv.imshow("Image",gray)
cv.waitKey(0)
cv.imshow("Image",edges)
cv.waitKey(0)
cv.imshow("Image",sudukoimage)
cv.waitKey(0)

cv.destroyAllWindows()
plt.imshow(cv.cvtColor(gray,cv.COLOR_BGR2RGB))
plt.xticks([]),plt.yticks([])
plt.show()
plt.imshow(cv.cvtColor(edges,cv.COLOR_BGR2RGB))
plt.xticks([]),plt.yticks([])
plt.show()
plt.imshow(cv.cvtColor(sudukoimage,cv.COLOR_BGR2RGB))
plt.xticks([]),plt.yticks([])
plt.show()
```





In [ ]:

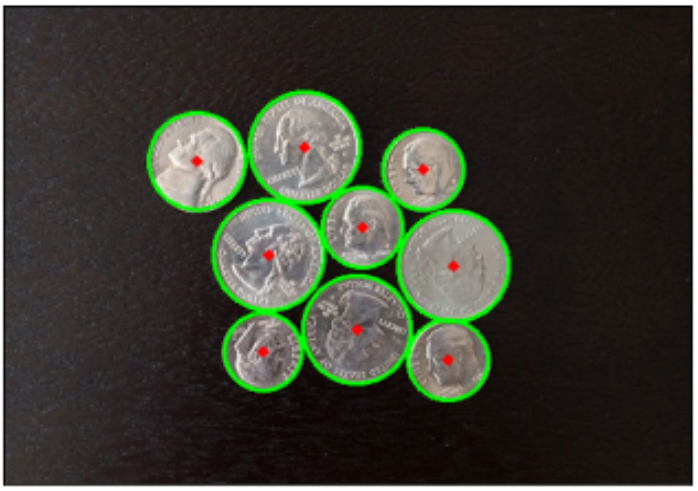
```
#2
coinsimage=cv.imread(r'coins.jpg',cv.IMREAD_COLOR)
assert coinsimage is not None
gray=cv.cvtColor(coinsimage,cv.COLOR_BGR2GRAY)

circles=cv.HoughCircles(gray,cv.HOUGH_GRADIENT,1,50,param1=150,param2=20,
circles=np.uint16(np.around(circles))

for i in circles[0,:]:
    cv.circle(coinsimage,(i[0],i[1]),i[2],(0,255,0),2)
    cv.circle(coinsimage,(i[0],i[1]),2,(0,0,255),3)


#cv.namedWindow("Image",cv.WINDOW_NORMAL)
cv.imshow("Detected circles",coinsimage)
cv.waitKey(0)

cv.destroyAllWindows()
plt.imshow(cv.cvtColor(coinsimage,cv.COLOR_BGR2RGB))
plt.xticks([]),plt.yticks([])
plt.show()
```



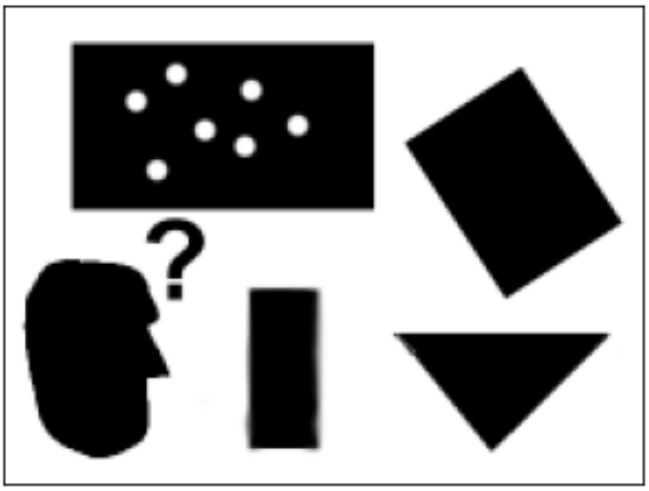
In [ ]:

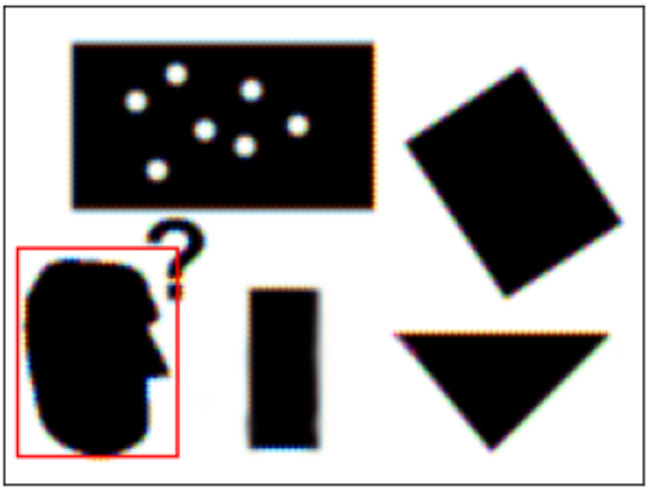
```
#3
im = cv.imread(r'pic1.png', cv.IMREAD_REDUCED_GRAYSCALE_2)
temp1 = cv.imread(r'templ.png', cv.IMREAD_REDUCED_GRAYSCALE_2)
assert im is not None
assert temp1 is not None

im_edges = cv.Canny(im,50,250)
temp1_edges = cv.Canny(temp1,50,250)
alg = cv.createGeneralizedHoughGuil()
alg.setTemplate(temp1_edges)
alg.setAngleThresh(100000)
alg.setScaleThresh(40000)
alg.setPosThresh(1000)
alg.setAngleStep(1)
alg.setScaleStep(0.1)
alg.setMinScale(0.9)
alg.setMaxScale(1.1)
positions, votes = alg.detect(im_edges)

out = cv.cvtColor(im,cv.COLOR_BAYER_BG2BGR)
for x,y,scale,orientation in positions[0]:
    halfHeight = temp1.shape[0]/ 2.* scale
    halfWidth = temp1.shape[1]/ 2.* scale
    p1 = (int(x - halfWidth),int(y - halfHeight))
    p2 = (int(x + halfWidth),int(y + halfHeight))
    print("x  = {}, y= {},scale = {},orientation = {}, p1 = {}, p2 = {}".
    cv.rectangle(out,p1,p2,(0,0,255))
cv.namedWindow("Image",cv.WINDOW_NORMAL)
cv.imshow("Image",im)
cv.waitKey(0)
cv.imshow("Image",out)
cv.waitKey(0)
cv.destroyAllWindows()
plt.imshow(cv.cvtColor(im,cv.COLOR_BGR2RGB))
plt.xticks([]),plt.yticks([])
plt.show()
plt.imshow(cv.cvtColor(out,cv.COLOR_BGR2RGB))
plt.xticks([]),plt.yticks([])
plt.show()
```

```
x  = 29.0, y= 109.0,scale = 1.0,orientation = 0.0, p1 = (4, 76), p2 = (5
4, 141)
```

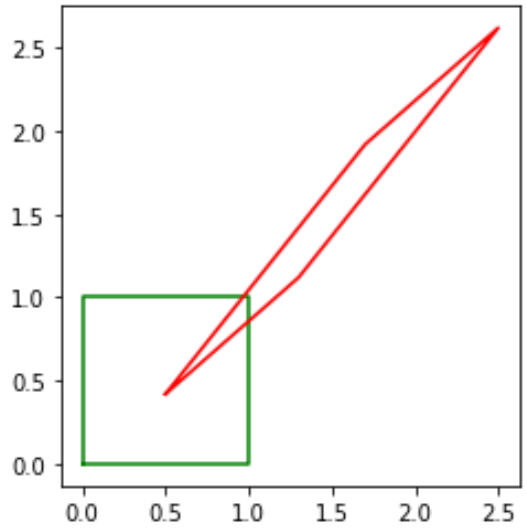




In [ ]:

```
#4
a,b,c,d,=[0,0,1],[0,1,1],[1,1,1],[1,0,1]
X=np.array([a,b,c,d]).T
theta=np.pi*30/180
s=1
tx,ty=0.5,0.42
#H=np.array([[s*np.cos(theta),-s*np.sin(theta),tx],[s*np.sin(theta),s*np.
#Y=H@X
a11, a12, a21, a22=0.8, 1.2, 0.7, 1.5
A=np.array([[a11,a12,tx],[a21,a22,ty],[0,0,1]])
Y=A@X
x=np.append(X[0,:],X[0,0])
y=np.append(X[1,:],X[1,0])
fig,ax=plt.subplots()
ax.plot(x,y,color='g')
ax.set_aspect('equal')

x=np.append(Y[0,:],Y[0,0])
y=np.append(Y[1,:],Y[1,0])
ax.plot(x,y,color='r')
ax.set_aspect('equal')
plt.show()
```



In [ ]:

```
#5
im1=cv.imread(r'D:\4th sem uom\machine vision\coding\ex6\graftar\img1.ppm
im4=cv.imread(r'D:\4th sem uom\machine vision\coding\ex6\graftar\img4.ppm
H=np.array([[6.6378505e-01, 6.8003334e-01, -3.1230335e+01],
[-1.4495500e-01,9.7128304e-01,1.4877420e+02],
[4.2518504e-04,-1.3930359e-05,1.0000000e+00]])

im1to4=cv.warpPerspective(im4,np.linalg.inv(H),(2000,2000))
cv.namedWindow('Image 1',cv.WINDOW_AUTOSIZE)
cv.imshow('Image 1',im1)
cv.waitKey(0)

cv.namedWindow('Image 2',cv.WINDOW_AUTOSIZE)
cv.imshow('Image 2',im4)
cv.waitKey(0)

cv.namedWindow('Image 3',cv.WINDOW_AUTOSIZE)
cv.imshow('Image 3',im1to4)
cv.waitKey(0)
cv.destroyAllWindows()

plt.imshow(cv.cvtColor(im1,cv.COLOR_BGR2RGB))
plt.xticks([]),plt.yticks([])
plt.show()
plt.imshow(cv.cvtColor(im4,cv.COLOR_BGR2RGB))
plt.xticks([]),plt.yticks([])
plt.show()
plt.imshow(cv.cvtColor(im1to4,cv.COLOR_BGR2RGB))
plt.xticks([]),plt.yticks([])
plt.show()
```