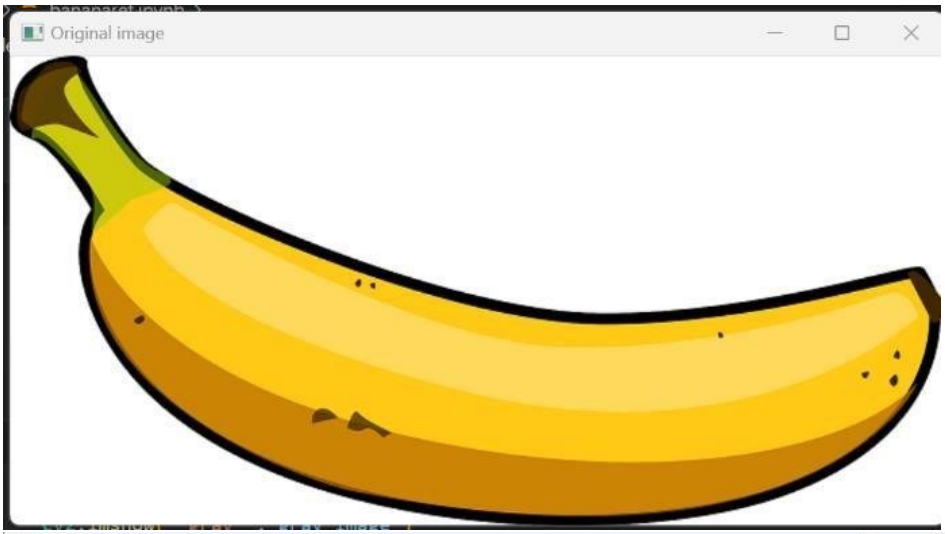
Nama: Riski probo asdewo

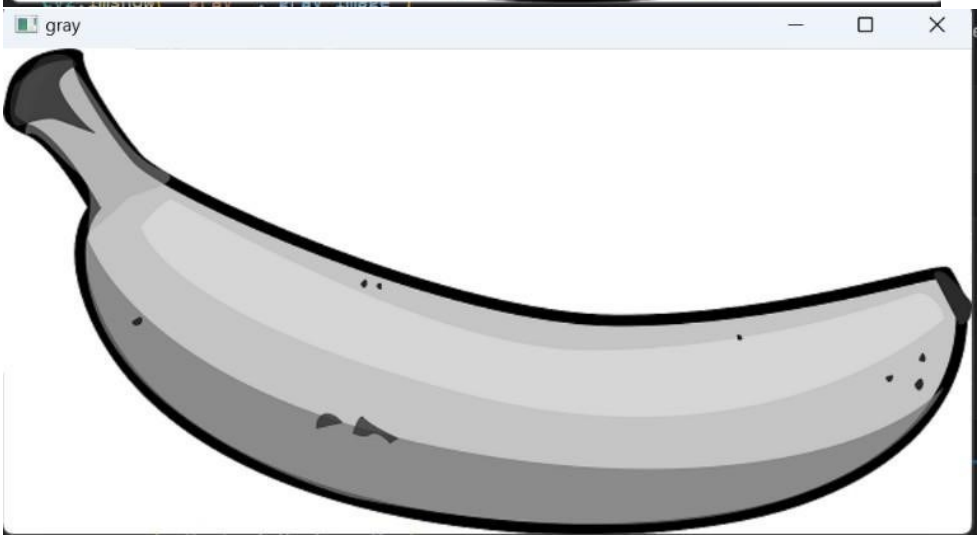
NIM: 312210191

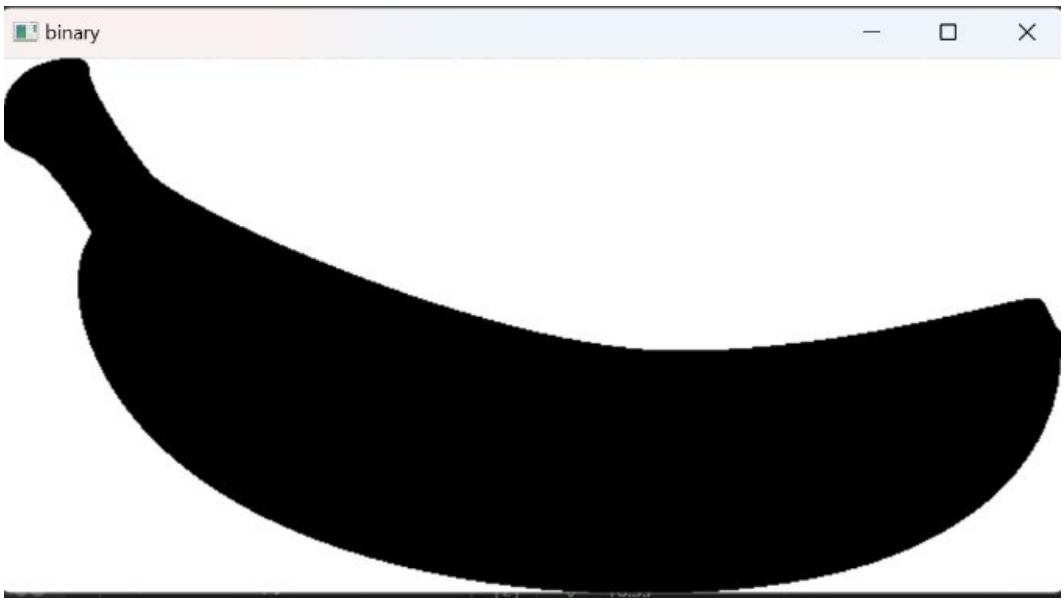
Kelas: TI.22.A.2

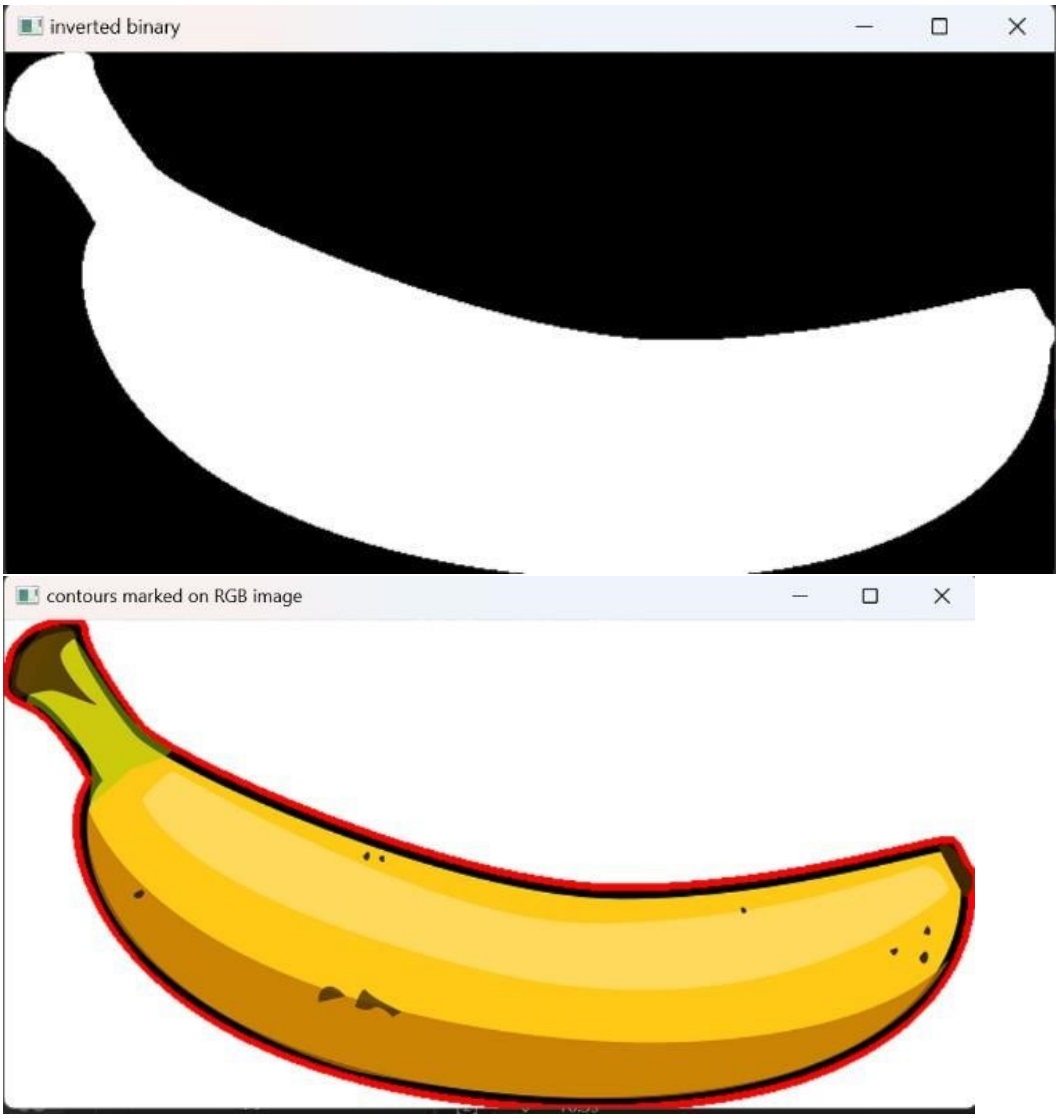
```python
# %%
import cv2

# %%
image = cv2.imread('data/bananaref.png')
imagecopy= image.copy()
cv2.imshow( 'Original image' , image )
cv2.waitKey(0)
cv2.destroyAllWindows()

# %%
gray_image = cv2.cvtColor(image,cv2.COLOR_BGR2GRAY)
cv2.imshow( 'gray' , gray_image )
cv2.waitKey(0)
cv2.destroyAllWindows()

# %%
ret,binary_im = cv2.threshold(gray_image,245,255,cv2.THRESH_BINARY)
cv2.imshow( 'binary' , binary_im )
cv2.waitKey(0)
cv2.destroyAllWindows()

# %%
binary_im= ~binary_im
cv2.imshow( 'inverted binary' , binary_im )
cv2.waitKey(0)
cv2.destroyAllWindows()

# %%
#find the external contours from binary image
contours,hierarchy = cv2.findContours(binary_im,cv2.RETR_EXTERNAL,cv2.CHAIN_APPROX_SIMPLE)

# %%
with_contours = cv2.drawContours(image,contours,-1,(0,0,255),3)
cv2.imshow( 'contours marked on RGB image' , with_contours )
cv2.waitKey(0)
cv2.destroyAllWindows()


```

Output:


Original image


gray

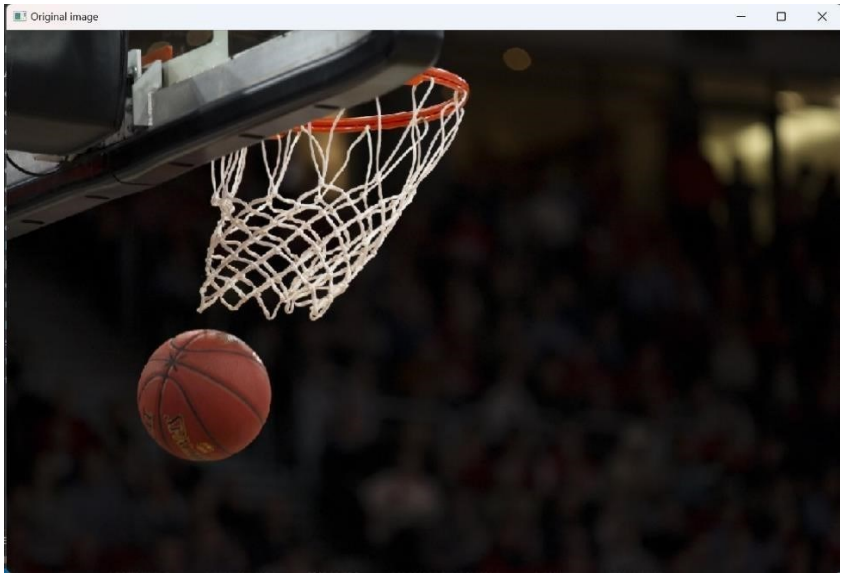

binary



Basketball.ipynb

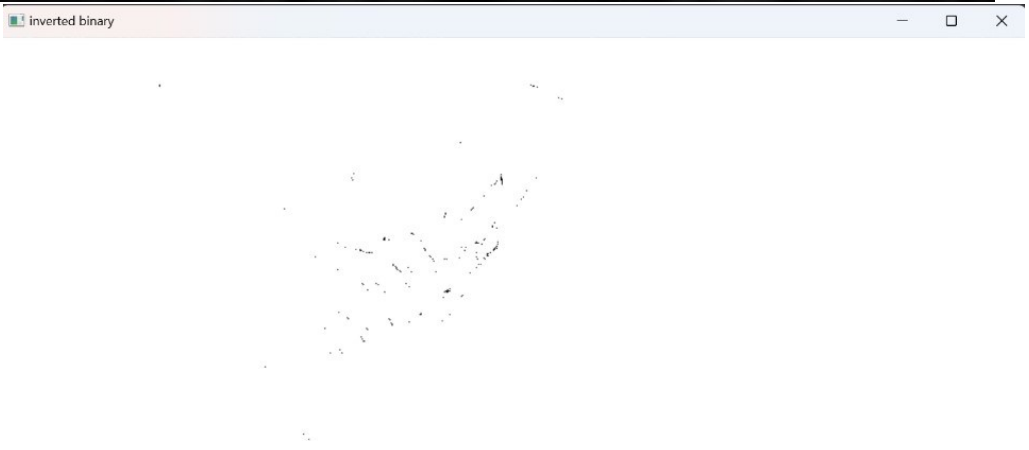
```python
# %%
import cv2

# %%
image = cv2.imread('data/basketball.jpg')
imagecopy= image.copy()
cv2.imshow( 'Original image' , image )
cv2.waitKey(0)
cv2.destroyAllWindows()

# %%
gray_image = cv2.cvtColor(image,cv2.COLOR_BGR2GRAY)
cv2.imshow( 'gray' , gray_image )
cv2.waitKey(0)
cv2.destroyAllWindows()

# %%
ret,binary_im = cv2.threshold(gray_image,245,255,cv2.THRESH_BINARY)
cv2.imshow( 'binary' , binary_im )
cv2.waitKey(0)
cv2.destroyAllWindows()

# %%
binary_im= ~binary_im
cv2.imshow( 'inverted binary' , binary_im )
cv2.waitKey(0)
cv2.destroyAllWindows()

# %%
#find the external contours from binary image
contours,hierarchy = cv2.findContours(binary_im,cv2.RETR_EXTERNAL,cv2.CHAIN_APPROX_SIMPLE)

# %%
with_contours = cv2.drawContours(image,contours,-1,(0,0,255),3)
cv2.imshow( 'contours marked on RGB image' , with_contours )
cv2.waitKey(0)
cv2.destroyAllWindows()
```

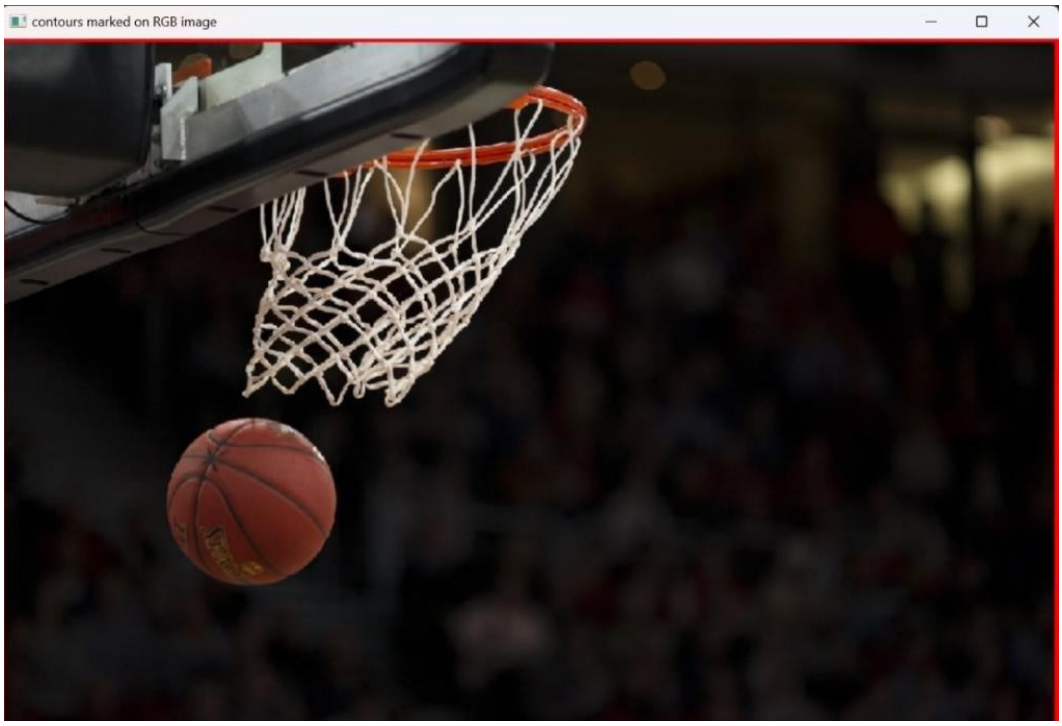
Output:




binary


gray


inverted binary

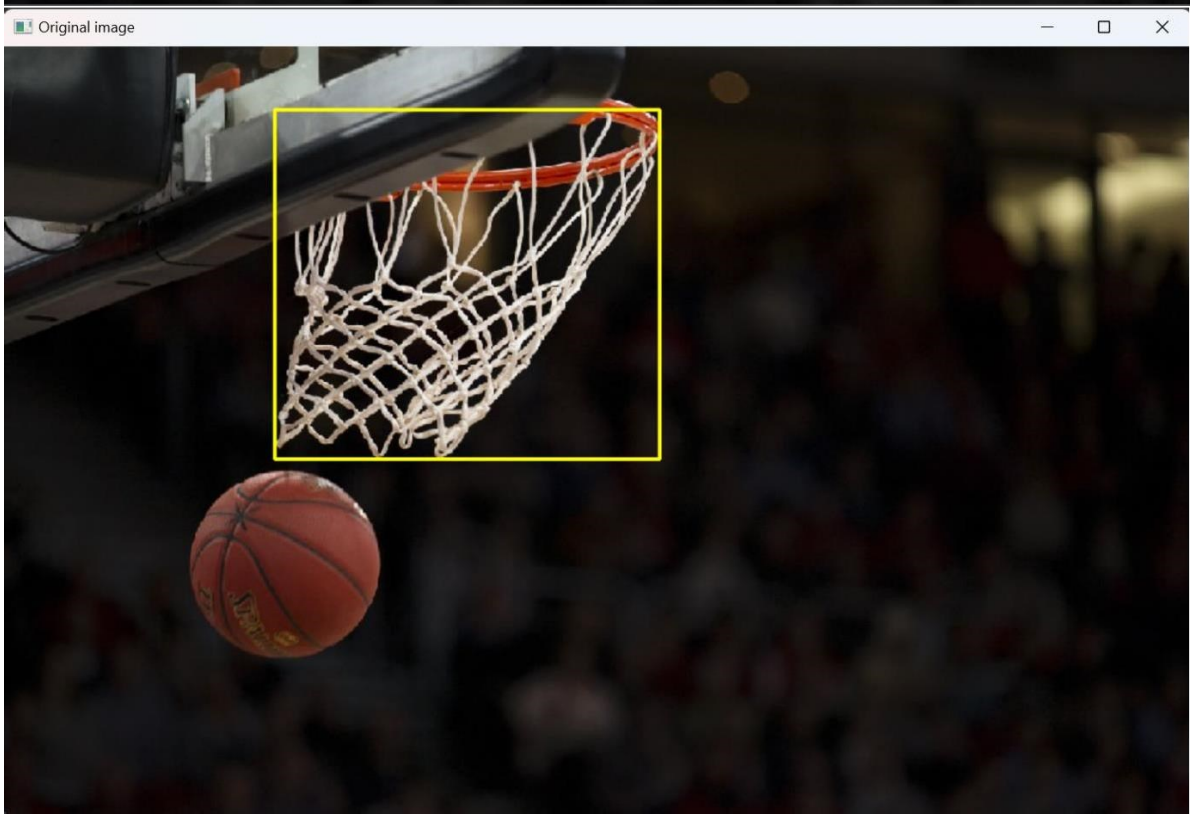


Detected basket.ipynb

```python
# %%
import cv2

# %%
image = cv2.imread('data/detected_basket.png')
imagecopy= image.copy()
cv2.imshow( 'Original image' , image )
cv2.waitKey(0)
cv2.destroyAllWindows()

# %%
gray_image = cv2.cvtColor(image,cv2.COLOR_BGR2GRAY)
cv2.imshow( 'gray' , gray_image )
cv2.waitKey(0)
cv2.destroyAllWindows()

# %%
ret,binary_im = cv2.threshold(gray_image,245,255,cv2.THRESH_BINARY)
cv2.imshow( 'binary' , binary_im )
cv2.waitKey(0)
cv2.destroyAllWindows()

# %%
binary_im= ~binary_im
cv2.imshow( 'inverted binary' , binary_im )
cv2.waitKey(0)
cv2.destroyAllWindows()

# %%
#find the external contours from binary image
contours,hierarchy = cv2.findContours(binary_im,cv2.RETR_EXTERNAL,cv2.CHAIN_APPROX_SIMPLE)

# %%
with_contours = cv2.drawContours(image,contours,-1,(0,0,255),3)
cv2.imshow( 'contours marked on RGB image' , with_contours )
cv2.waitKey(0)
cv2.destroyAllWindows()
```

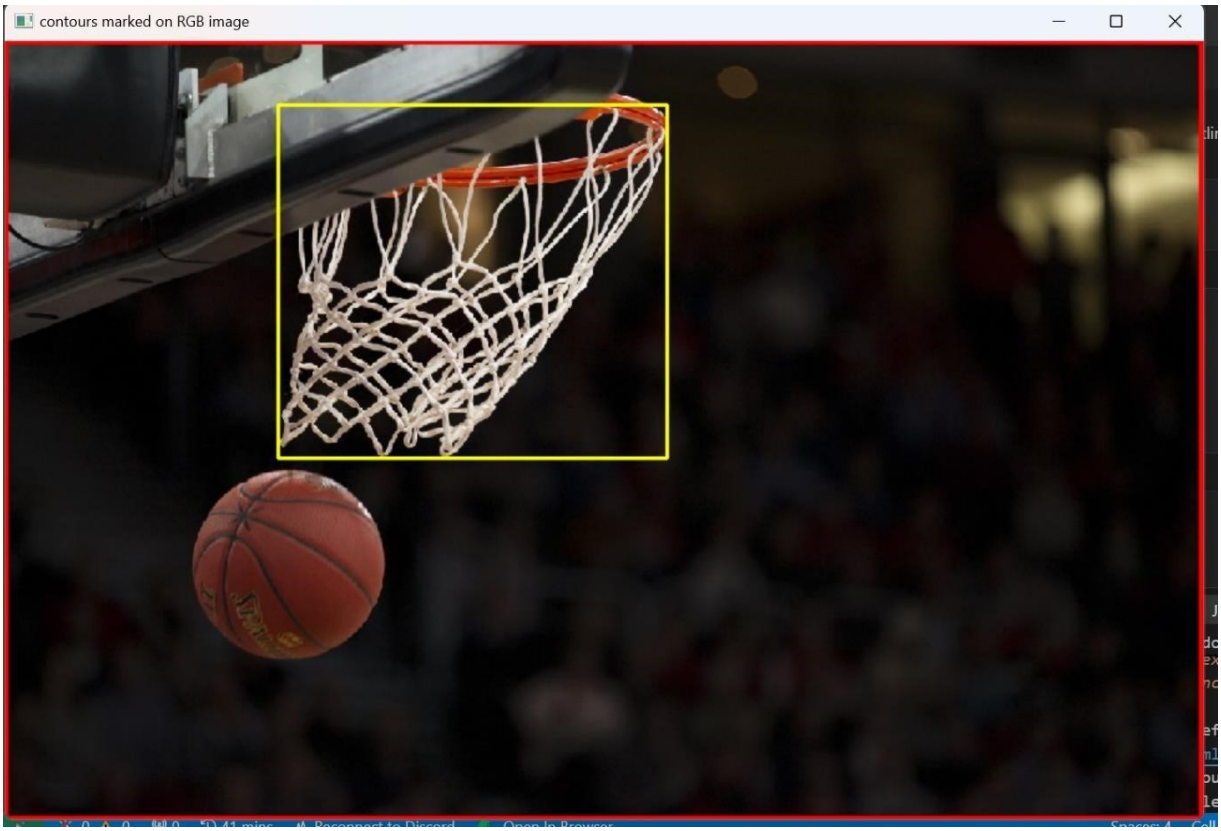
Output:


gray


Original image


binary

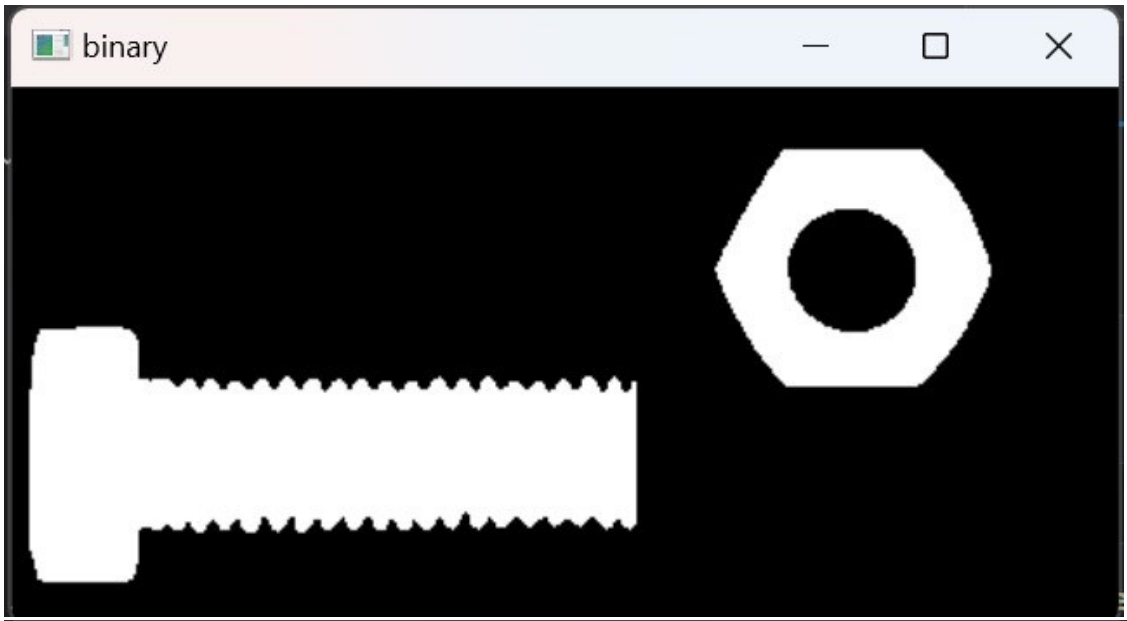

inverted binary

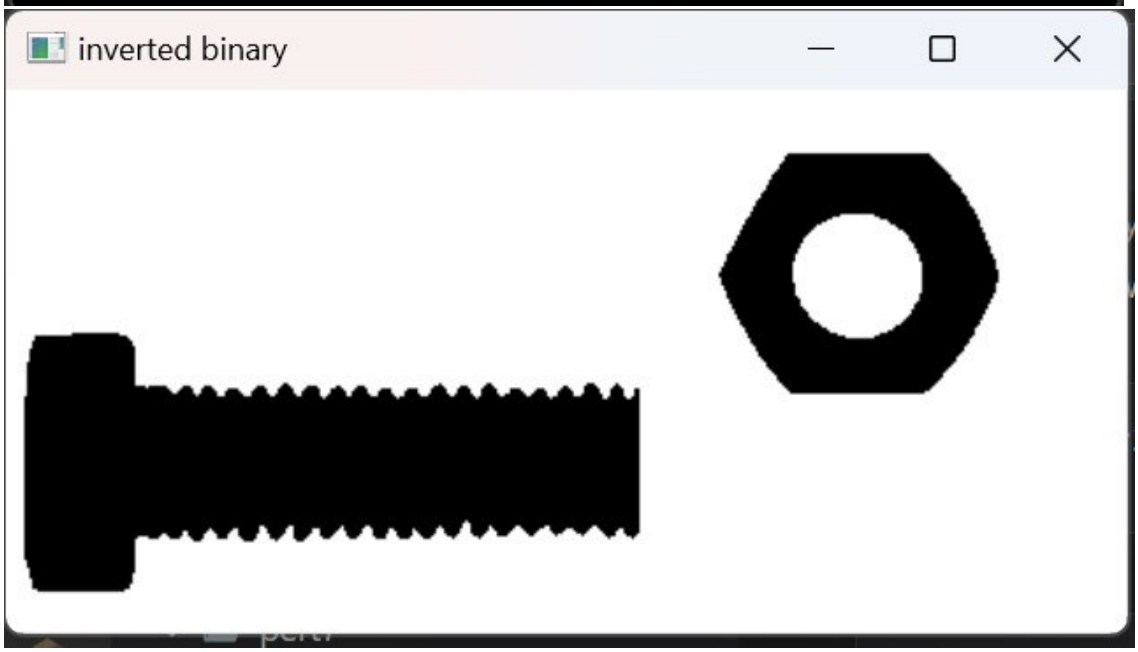


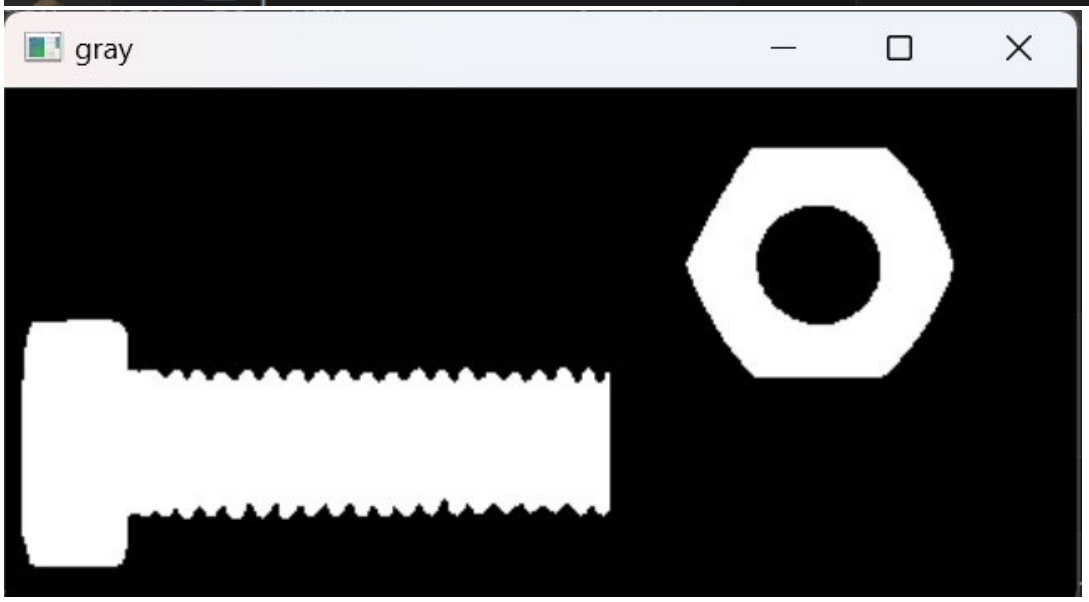
Nult_bolt.ipynb

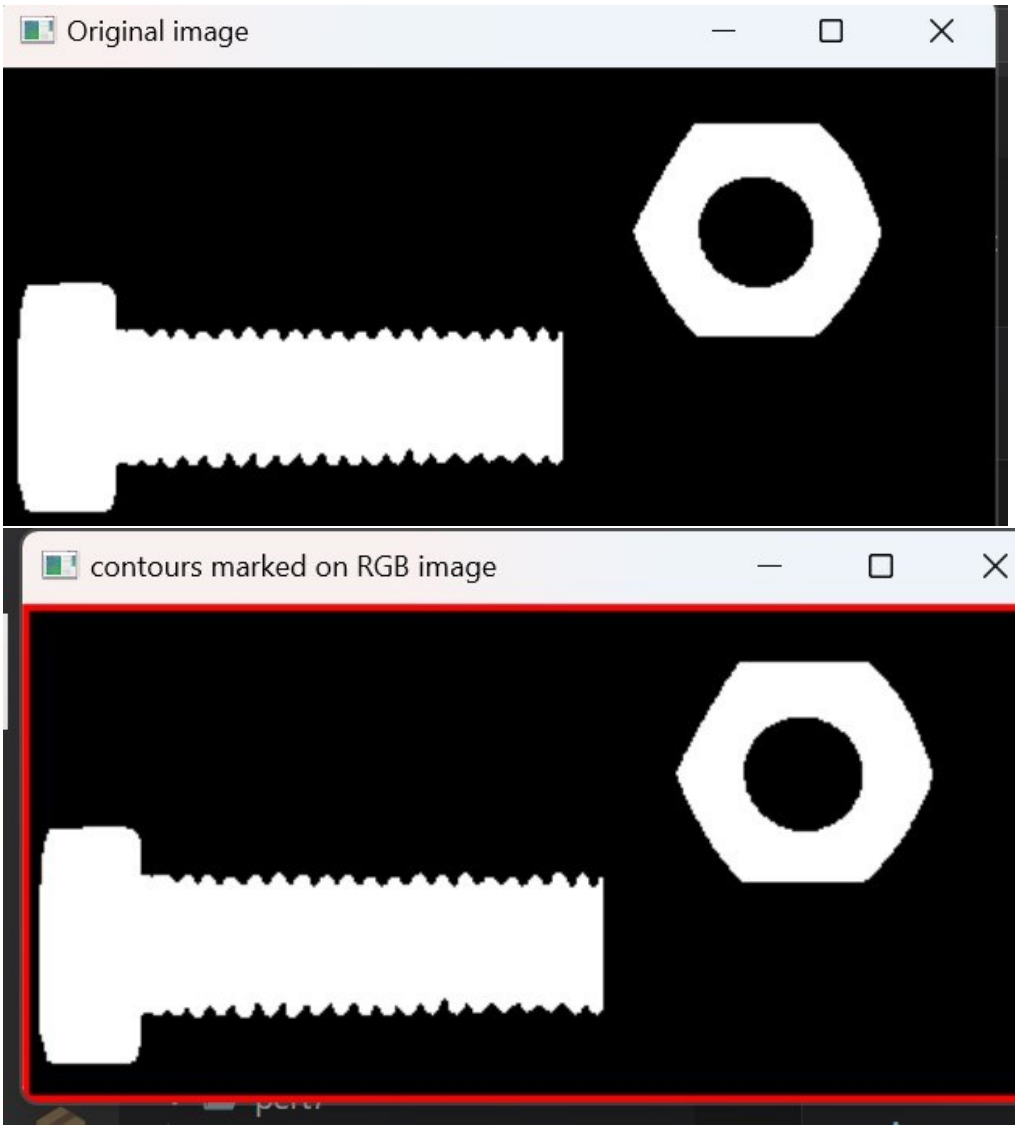
```python
# %%
import cv2

# %%
image = cv2.imread('data/nut_bolt.png')
imagecopy= image.copy()
cv2.imshow( 'Original image' , image )
cv2.waitKey(0)
cv2.destroyAllWindows()

# %%
gray_image = cv2.cvtColor(image,cv2.COLOR_BGR2GRAY)
cv2.imshow( 'gray' , gray_image )
cv2.waitKey(0)
cv2.destroyAllWindows()

# %%
ret,binary_im = cv2.threshold(gray_image,245,255,cv2.THRESH_BINARY)
cv2.imshow( 'binary' , binary_im )
cv2.waitKey(0)
cv2.destroyAllWindows()

# %%
binary_im= ~binary_im
cv2.imshow( 'inverted binary' , binary_im )
cv2.waitKey(0)
cv2.destroyAllWindows()

# %%
#find the external contours from binary image
contours,hierarchy = cv2.findContours(binary_im,cv2.RETR_EXTERNAL,cv2.CHAIN_APPROX_SIMPLE)

# %%
with_contours = cv2.drawContours(image,contours,-1,(0,0,255),3)
cv2.imshow( 'contours marked on RGB image' , with_contours )
cv2.waitKey(0)
cv2.destroyAllWindows()


```

Output:


binary


inverted binary


gray



Phrase_handwriting.ipynb

```python
# %%
import cv2

# %%
image = cv2.imread('data/phrase_handwritten.png')
imagecopy= image.copy()
cv2.imshow( 'Original image' , image )
cv2.waitKey(0)
cv2.destroyAllWindows()

# %%
gray_image = cv2.cvtColor(image,cv2.COLOR_BGR2GRAY)
cv2.imshow( 'gray' , gray_image )
cv2.waitKey(0)
cv2.destroyAllWindows()

# %%
ret,binary_im = cv2.threshold(gray_image,245,255,cv2.THRESH_BINARY)
cv2.imshow( 'binary' , binary_im )
cv2.waitKey(0)
cv2.destroyAllWindows()

# %%
binary_im= ~binary_im
cv2.imshow( 'inverted binary' , binary_im )
cv2.waitKey(0)
cv2.destroyAllWindows()

# %%
#find the external contours from binary image
contours,hierarchy = cv2.findContours(binary_im,cv2.RETR_EXTERNAL,cv2.CHAIN_APPROX_SIMPLE)

# %%
with_contours = cv2.drawContours(image,contours,-1,(0,0,255),3)
cv2.imshow( 'contours marked on RGB image' , with_contours )
cv2.waitKey(0)
cv2.destroyAllWindows()


```

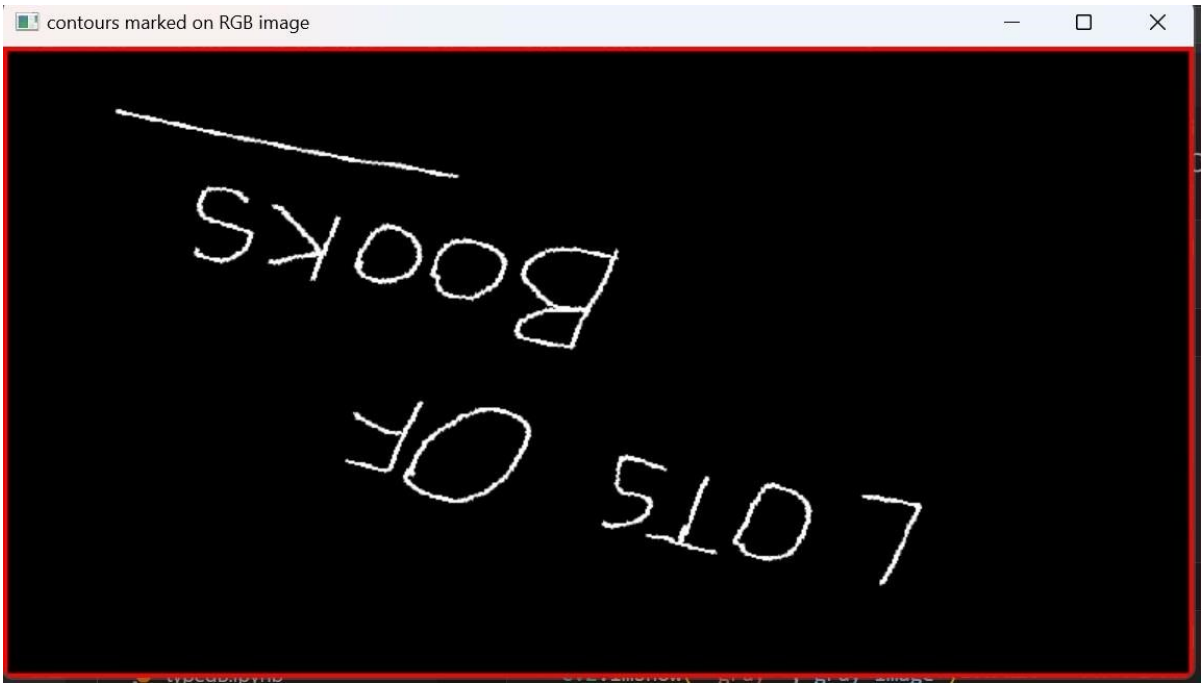
Output:

gray
BOOKS
OF
LOTS
7

Original image
BOOKS
OF
LOTS
7

binary
BOOKS
OF
SLOT

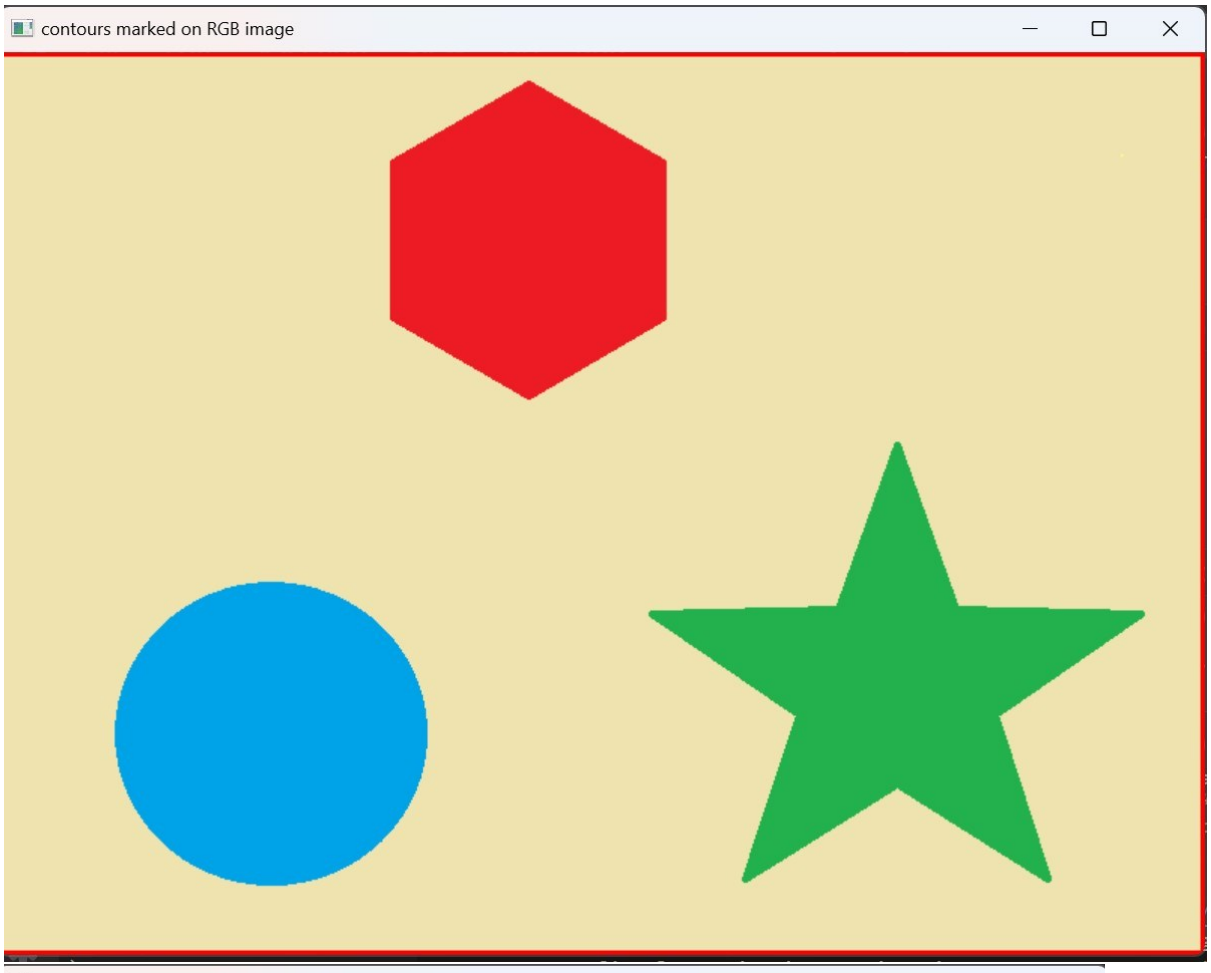
inverted binary
BOOKS
OF
SLOT

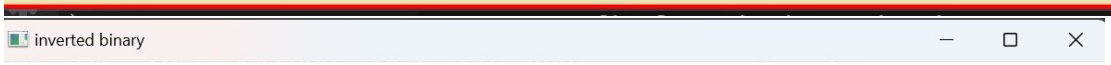


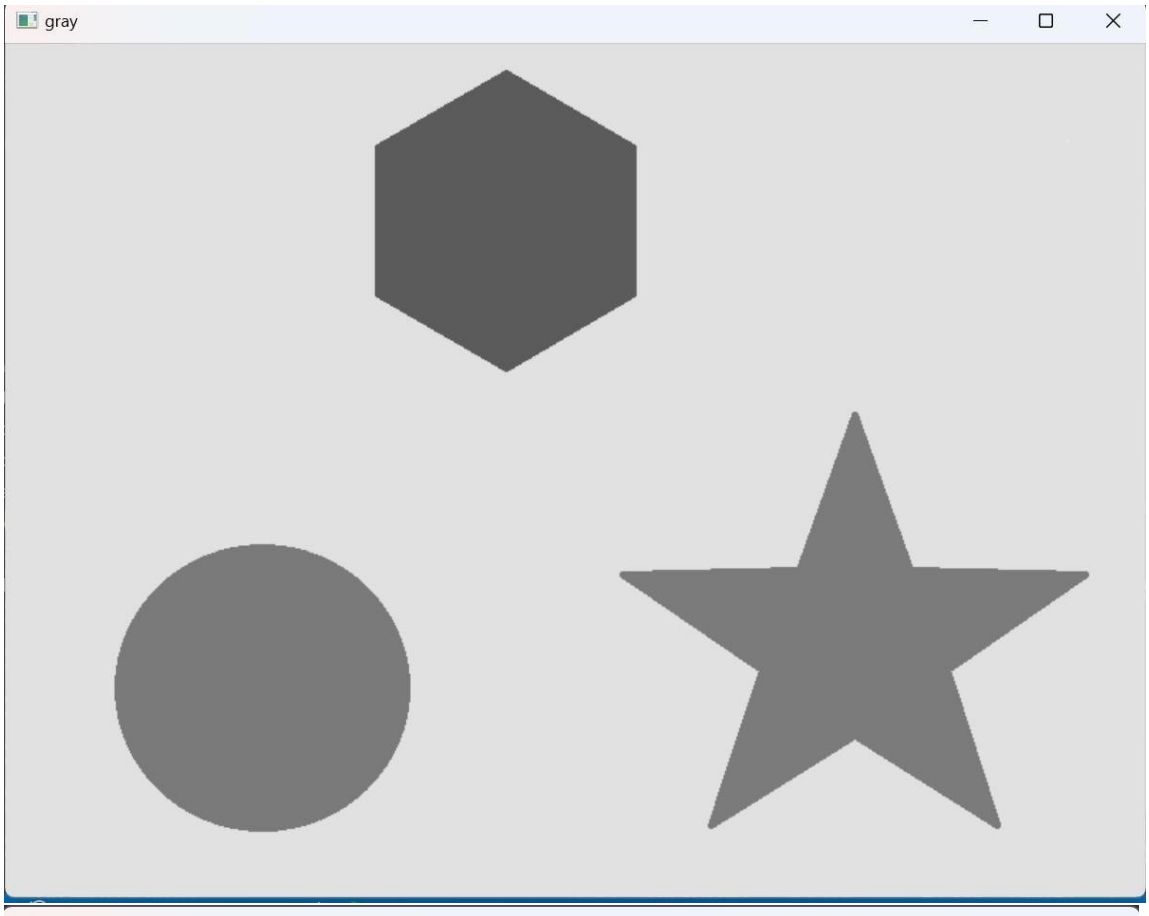
Sample_shapes.ipynb

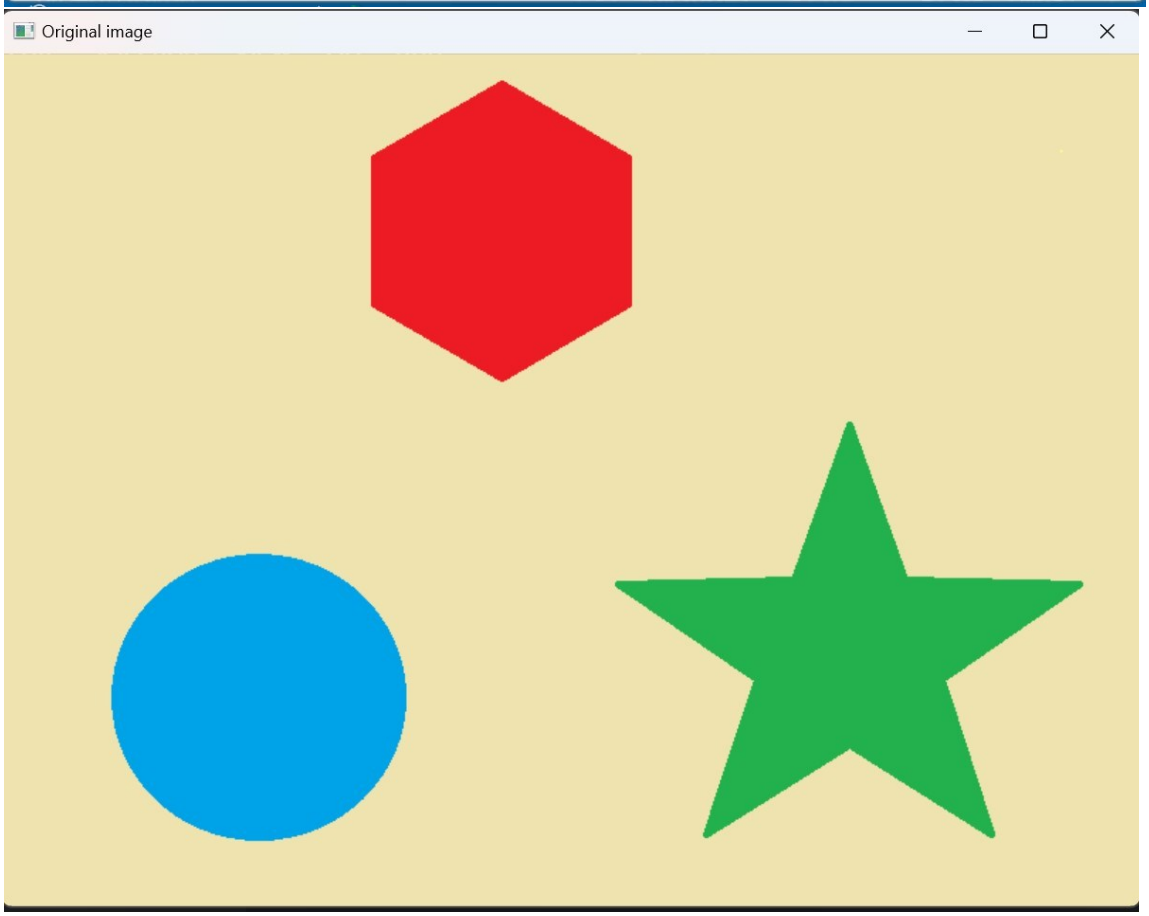
```python
# %%
import cv2

# %%
image = cv2.imread('data/sample_shapes.png')
imagecopy= image.copy()
cv2.imshow( 'Original image' , image )
cv2.waitKey(0)
cv2.destroyAllWindows()

# %%
gray_image = cv2.cvtColor(image,cv2.COLOR_BGR2GRAY)
cv2.imshow( 'gray' , gray_image )
cv2.waitKey(0)
cv2.destroyAllWindows()

# %%
ret,binary_im = cv2.threshold(gray_image,245,255,cv2.THRESH_BINARY)
cv2.imshow( 'binary' , binary_im )
cv2.waitKey(0)
cv2.destroyAllWindows()

# %%
binary_im= ~binary_im
cv2.imshow( 'inverted binary' , binary_im )
cv2.waitKey(0)
cv2.destroyAllWindows()

# %%
#find the external contours from binary image
contours,hierarchy = cv2.findContours(binary_im,cv2.RETR_EXTERNAL,cv2.CHAIN_APPROX_SIMPLE)

# %%
with_contours = cv2.drawContours(image,contours,-1,(0,0,255),3)
cv2.imshow( 'contours marked on RGB image' , with_contours )
cv2.waitKey(0)
cv2.destroyAllWindows()


```

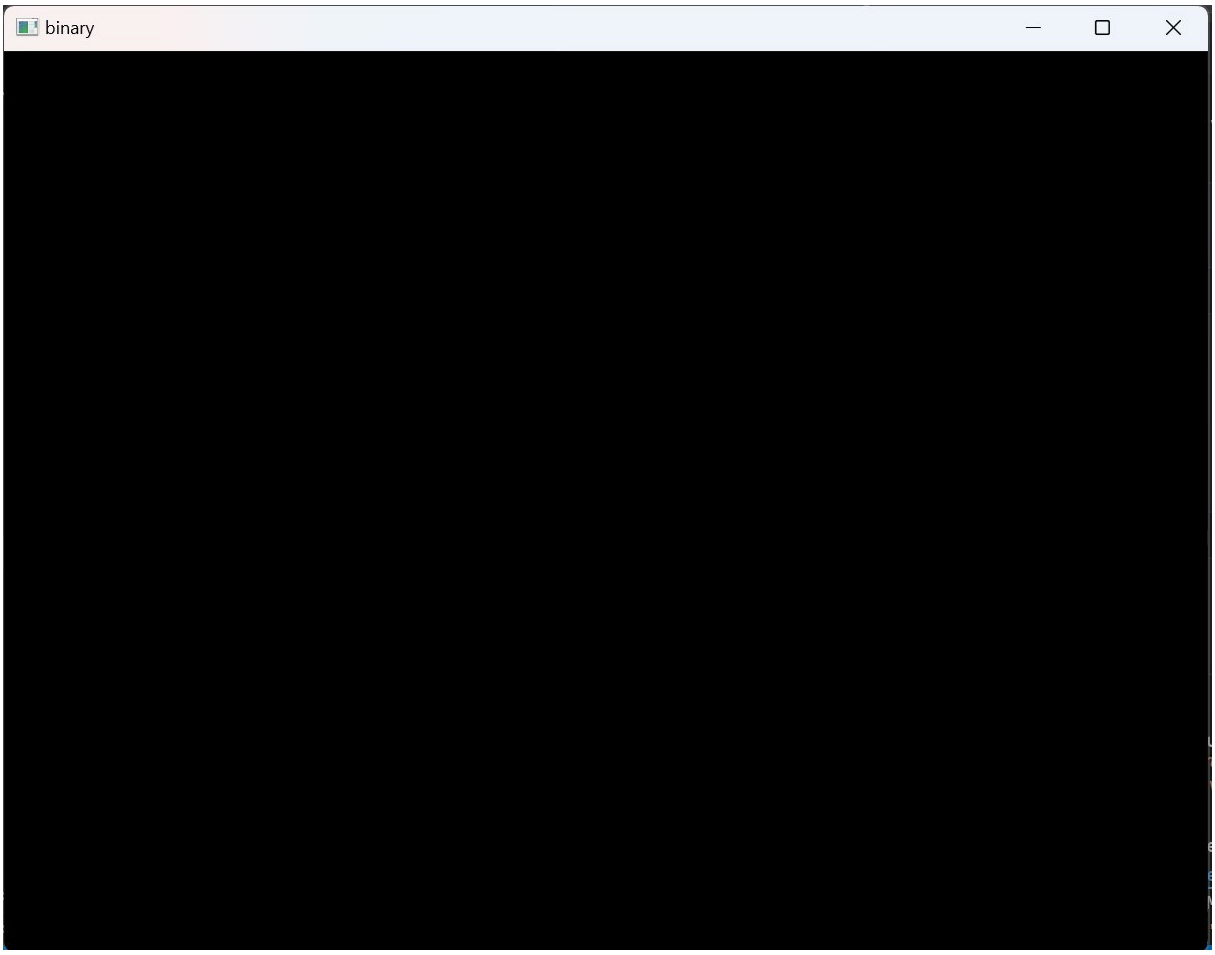
Output:


contours marked on RGB image


inverted binary


gray

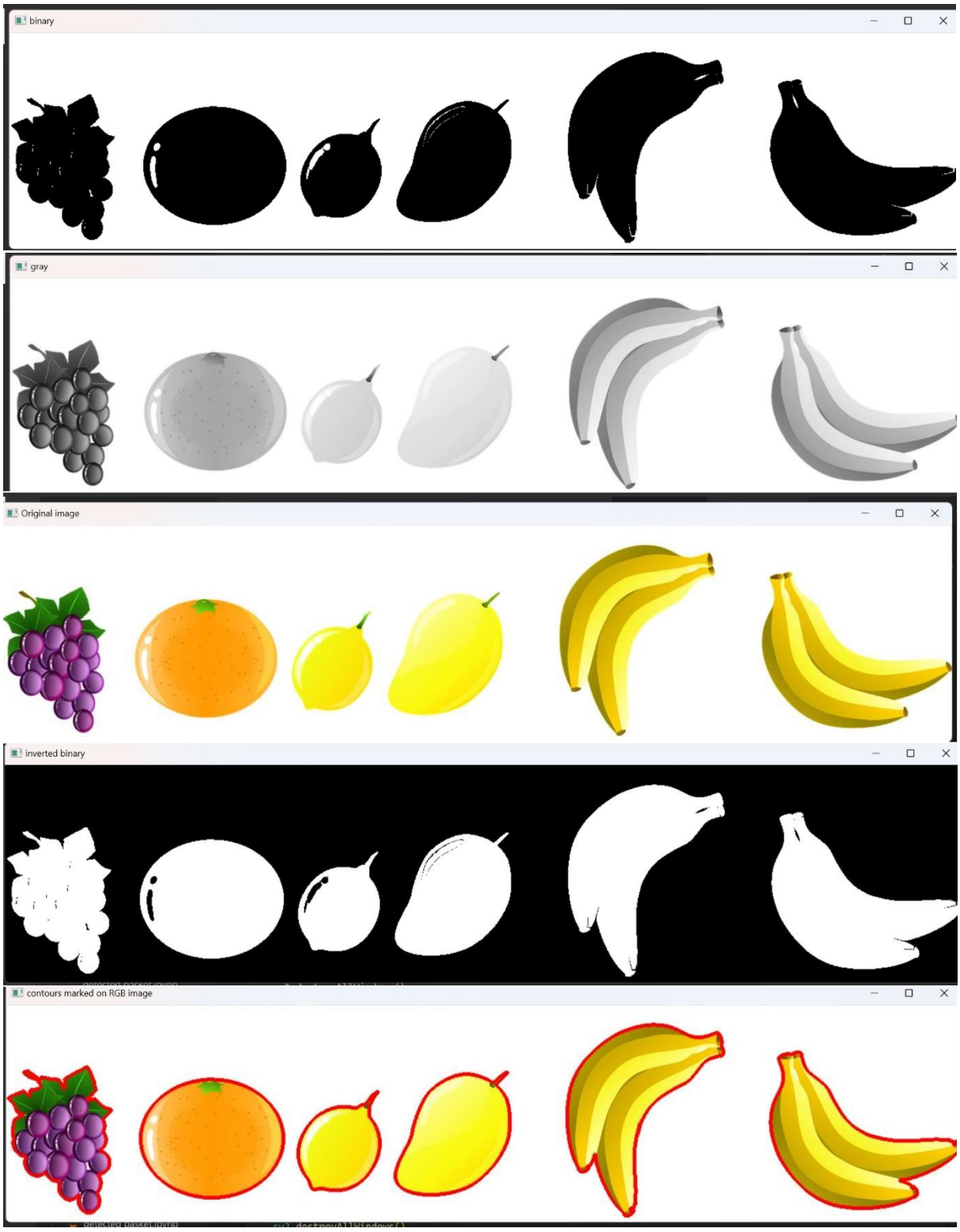

Original image



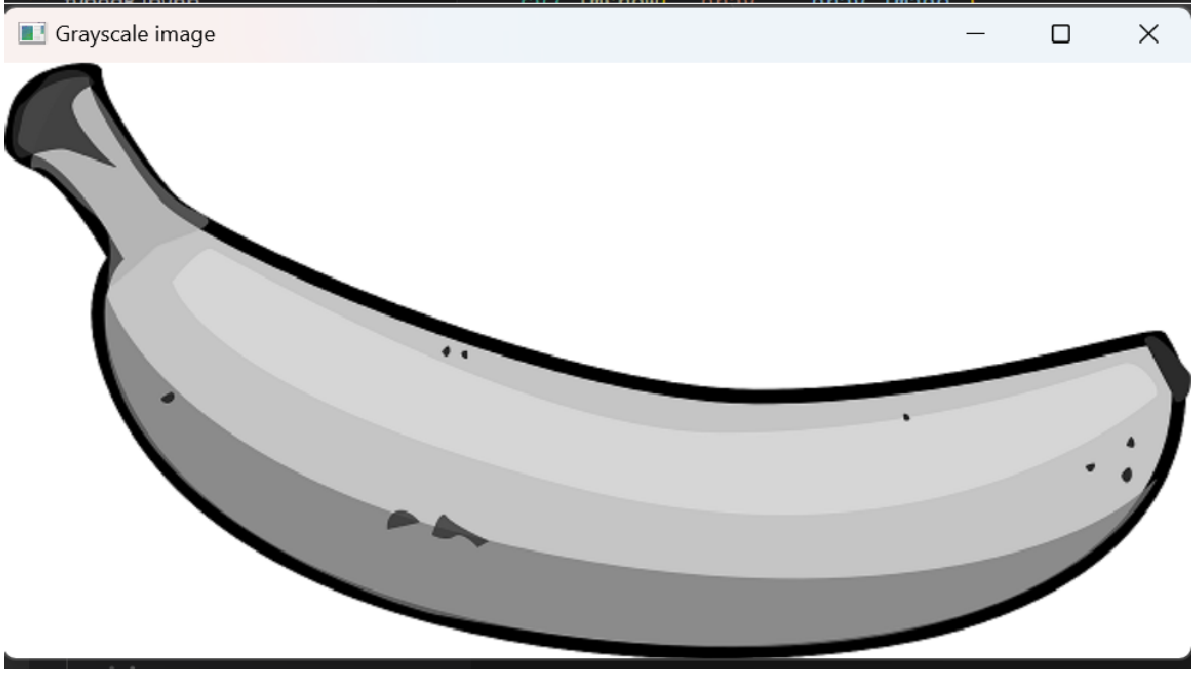
Many_fruit.ipynb

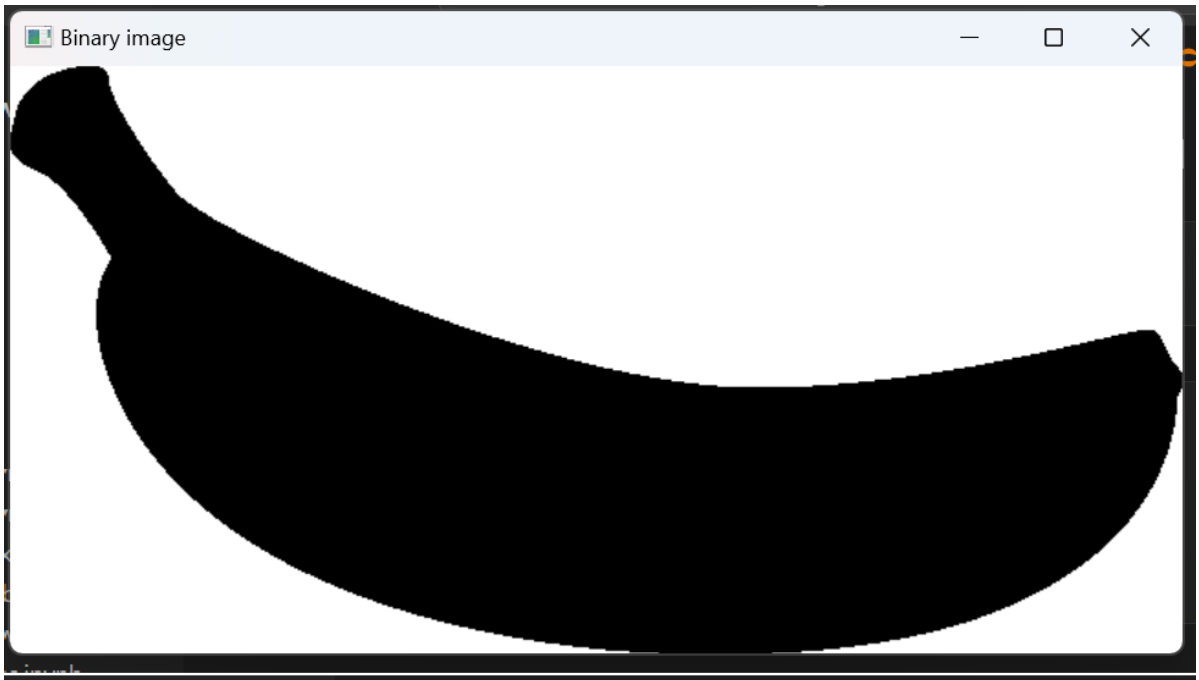
```python
# %%
import cv2

# %%
image = cv2.imread('data/many fruits.png')
imagecopy= image.copy()
cv2.imshow( 'Original image' , image )
cv2.waitKey(0)
cv2.destroyAllWindows()

# %%
gray_image = cv2.cvtColor(image,cv2.COLOR_BGR2GRAY)
cv2.imshow( 'gray' , gray_image )
cv2.waitKey(0)
cv2.destroyAllWindows()

# %%
ret,binary_im = cv2.threshold(gray_image,245,255,cv2.THRESH_BINARY)
cv2.imshow( 'binary' , binary_im )
cv2.waitKey(0)
cv2.destroyAllWindows()

# %%
binary_im= ~binary_im
cv2.imshow( 'inverted binary' , binary_im )
cv2.waitKey(0)
cv2.destroyAllWindows()

# %%
#find the external contours from binary image
contours,hierarchy = cv2.findContours(binary_im,cv2.RETR_EXTERNAL,cv2.CHAIN_APPROX_SIMPLE)

# %%
with_contours = cv2.drawContours(image,contours,-1,(0,0,255),3)
cv2.imshow( 'contours marked on RGB image' , with_contours )
cv2.waitKey(0)
cv2.destroyAllWindows()

# %%
ref_image = cv2.imread('data/bananaref.png')
cv2.imshow( 'Reference image' , ref_image )
cv2.waitKey(0)
cv2.destroyAllWindows()

# %%
gray_image = cv2.cvtColor(ref_image,cv2.COLOR_BGR2GRAY)
cv2.imshow( 'Grayscale image' , gray_image )
cv2.waitKey(0)
cv2.destroyAllWindows()

# %%
ret,binary_im = cv2.threshold(gray_image,245,255,cv2.THRESH_BINARY)
cv2.imshow( 'Binary image' , binary_im )
cv2.waitKey(0)
cv2.destroyAllWindows()

# %%
binary_im= ~binary_im
cv2.imshow( 'inverted binary image' , binary_im )
cv2.waitKey(0)
cv2.destroyAllWindows()

# %%
dist_list = []
for cnt in contours:
    retval = cv2.matchShapes(cnt, binary_im, 1, 0)  # reference_countour diganti dengan binary_im
    dist_list.append(retval)

# %%
sorted_list= dist_list.copy()
sorted_list.sort() # sorts the list from smallest to largest
ind1_dist= dist_list.index(sorted_list[0])
ind2_dist= dist_list.index(sorted_list[1])

# %%
banana_cnts= []
banana_cnts.append(contours[ind1_dist])
banana_cnts.append(contours[ind2_dist])

# %%
with_contours = cv2.drawContours(image,banana_cnts,-1,(255,0,0),3)
cv2.imshow( 'contours marked on RGB image' , with_contours )
cv2.waitKey(0)
cv2.destroyAllWindows()

# %%
for cnt in banana_cnts:
    x,y,w,h = cv2.boundingRect(cnt)
    if h>w:
        cv2.rectangle(imagecopy,(x,y),(x+w,y+h),(255,0,0),2)
cv2.imshow( 'Upright banana marked on RGB image' , imagecopy )
cv2.waitKey(0)
cv2.destroyAllWindows()
```

Output:

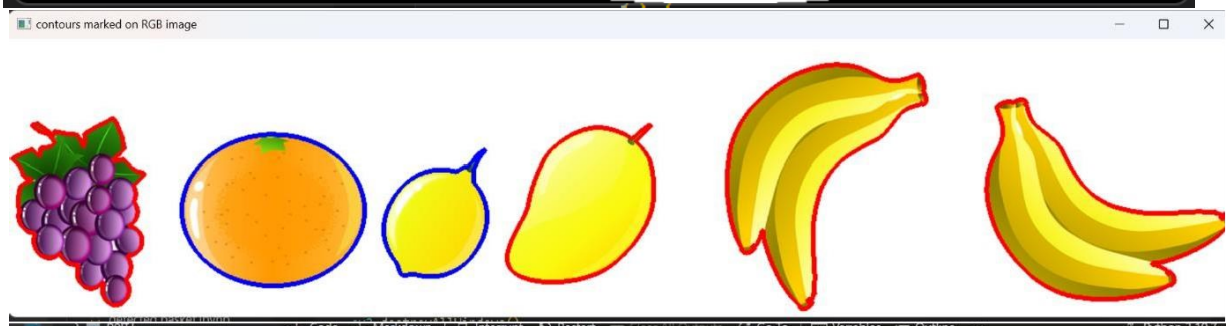

binary
gray
Original image
inverted binary
contours marked on RGB image

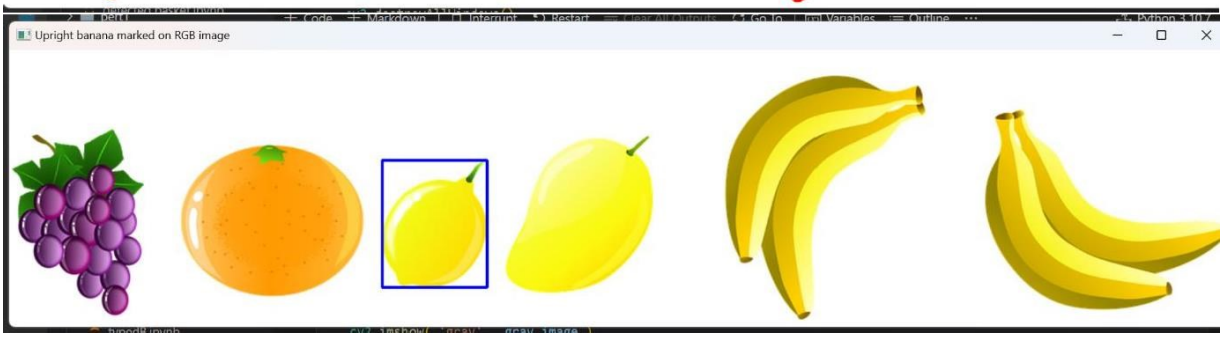

Reference image


Grayscale image


Binary image


inverted binary image


contours marked on RGB image


Upright banana marked on RGB image

Typed_b.ipynb

```python
# %%
import cv2

# %%
image = cv2.imread('data/typed_B.png')
imagecopy= image.copy()
cv2.imshow( 'Original image' , image )
cv2.waitKey(0)
cv2.destroyAllWindows()

# %%
gray_image = cv2.cvtColor(image,cv2.COLOR_BGR2GRAY)
cv2.imshow( 'gray' , gray_image )
cv2.waitKey(0)
cv2.destroyAllWindows()

# %%
ret,binary_im = cv2.threshold(gray_image,245,255,cv2.THRESH_BINARY)
cv2.imshow( 'binary' , binary_im )
cv2.waitKey(0)
cv2.destroyAllWindows()

# %%
binary_im= ~binary_im
cv2.imshow( 'inverted binary' , binary_im )
cv2.waitKey(0)
cv2.destroyAllWindows()

# %%
#find the external contours from binary image
contours,hierarchy = cv2.findContours(binary_im,cv2.RETR_EXTERNAL,cv2.CHAIN_APPROX_SIMPLE)

# %%
with_contours = cv2.drawContours(image,contours,-1,(0,0,255),3)
cv2.imshow( 'contours marked on RGB image' , with_contours )
cv2.waitKey(0)
cv2.destroyAllWindows()


```

Output: