

การพัฒนาโปรแกรมประยุกต์และปัญญาประดิษฐ์ เพื่อการมองเห็นของเครื่องจักร Computer Programing and Artificial Intelligence in Machine Vision

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5/5 -- คำถามท้ายบทเพื่อทดสอบความเข้าใจ

กิจกรรมที่ 1/6 – Webcam to Video with Logo

จงเขียนโปรแกรมเพื่อบันทึกวิดีโอจากสตรีมวิดีโอของกล้องเว็บแคม ทำการใส่โลโก้ XXX และระบุวันที่ในภาพ

```
In [1]:
1 # Insert Logo to Movies
2 import cv2
3 import numpy as np
4 import datetime
5 from PIL import Image
6
7 cap = cv2.VideoCapture(0)
8 logo = Image.open('./image/lilac_yogurt.png')
9 logo.thumbnail((250, 250))
10 font = cv2.FONT_HERSHEY_SIMPLEX
11
12 h = int(cap.get(cv2.CAP_PROP_FRAME_HEIGHT))
13 w = int(cap.get(cv2.CAP_PROP_FRAME_WIDTH))
14 fps = int(cap.get(cv2.CAP_PROP_FPS))
15 fourcc = cv2.VideoWriter_fourcc(* 'XVID')
16 out = cv2.VideoWriter('./image/B6214005_Mission3.avi', fourcc, fps, (w,h))
17
18 while(True):
19     ret, image = cap.read()
20     cv2.putText(image, str(datetime.datetime.now()), (10,30), font, 1, (0,0,0), 2, cv2.LINE_AA)
21
22     color_converted = cv2.cvtColor(image, cv2.COLOR_BGR2RGB)
23     pil_image = Image.fromarray(color_converted)
24     pil_image.paste(logo, (400,300), logo)
25     numpy_image = np.array(pil_image)
26     opencv_image = cv2.cvtColor(numpy_image, cv2.COLOR_RGBA2BGR)
27
28     if ret == True:
29         cv2.putText(opencv_image, str(datetime.datetime.now()), (10,30), font, 1, (0,0,0), 2, cv2.LINE_AA)
30         out.write(opencv_image)
31         cv2.imshow('B6214005-Mission 3', opencv_image)
32         if cv2.waitKey(1) & 0xFF == ord('q'):
33             break
34     else:
35         break
36
37 cap.release()
38 out.release()
39 cv2.destroyAllWindows()
```



Youtube Link :

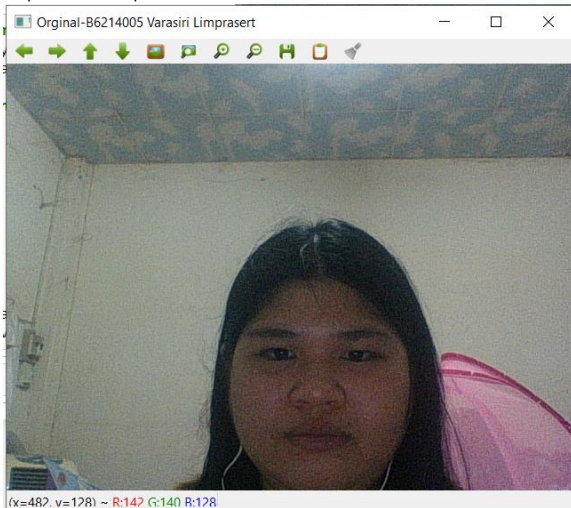
<https://youtu.be/WQh6D2bKbCY>

กิจกรรมที่ 2/6 – Canny Edge Detection from Webcam to Video with Logo

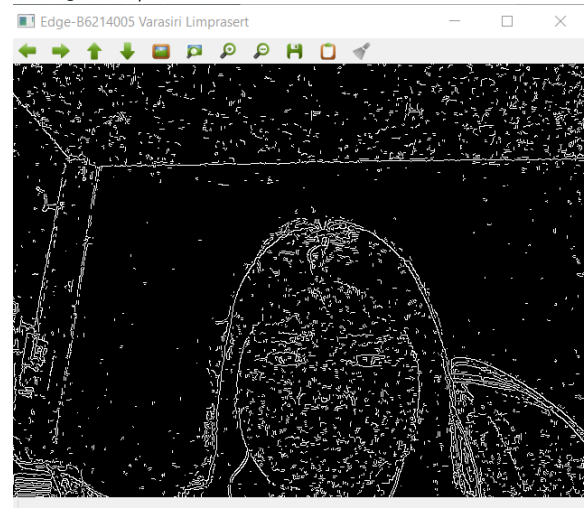
จึงเขียนโปรแกรมเพื่ออ่านภาพวิดีโอจากสตรีมวิดีโอของกล้องเว็บแคม แล้ว Capture เพื่อทำ Canny Edge Detection

```
In [3]: 1 import cv2
2 myName = 'B6214005 Varasiri Limprasert'
3 cap = cv2.VideoCapture(1)
4
5 while True:
6     ret, colorImg = cap.read()
7     cv2.imshow('Image Show', colorImg)
8     pressedKey = cv2.waitKey(1)
9     if pressedKey == ord('q'):
10         break
11     elif pressedKey == ord('c'):
12         edges = cv2.Canny (colorImg, 75, 100, apertureSize=3, L2gradient=True)
13         cv2.imshow('Original-' + myName, colorImg)
14         cv2.imshow('Edge-' + myName, edges)
15
16 cap.release()
17 cv2.destroyAllWindows ()
```

< picture input >



< Edge output >

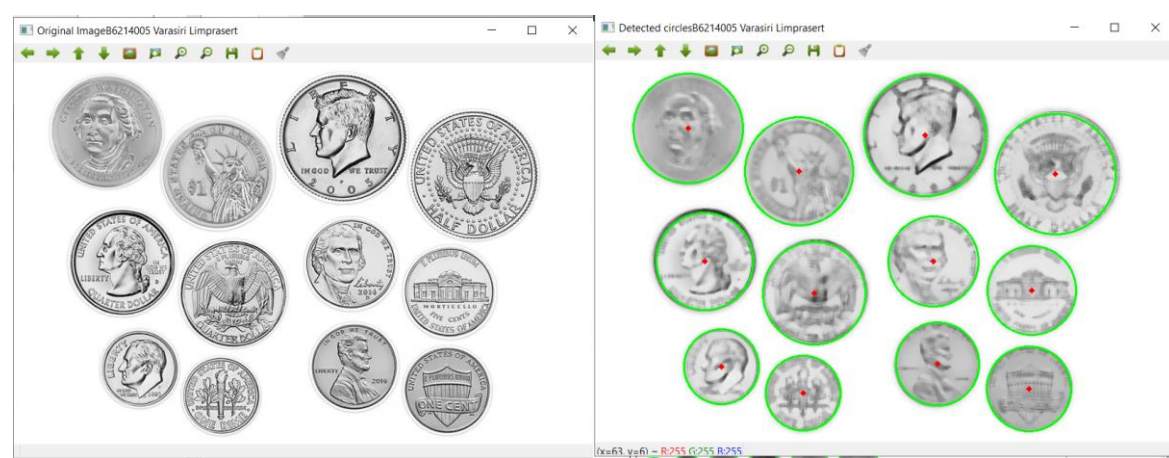


กิจกรรมที่ 3/6 – ทำการตรวจจับเหรียญด้วย Hough Circle Transform

ให้ถ่ายรูปเหรียญของตัวเอง จำนวน 12 เหรียญ เหมือนตัวอย่าง แล้วทดสอบทำ Hough Circle Transform

```
In [*]: 1 import cv2
2 import numpy as np
3 myName = 'B6214005 Varasiri Limprasert'
4 img = cv2.imread('./image/coins2.jpg',0)
5 edges = cv2.Canny (img, 50, 100, apertureSize=3, L2gradient=True)
6 cv2.imshow ('Original Image' + myName, img)
7 font = cv2.FONT_HERSHEY_SIMPLEX
8
9 img = cv2.medianBlur(img,7)
10 cimg = cv2.cvtColor(img,cv2.COLOR_GRAY2BGR)
11
12 circles = cv2.HoughCircles(img,cv2.HOUGH_GRADIENT,1,120, param1=50, param2=30, minRadius=20,maxRadius=90)
13 circles = np.uint16(np.around(circles))
14
15 count = 0
16
17 for i in circles[0,:]:
18     count += 1
19
20     cv2.circle(cimg, (i[0],i[1]),i[2],(0,255,0),2) # Line
21     cv2.circle(cimg, (i[0],i[1]),2,(0,0,255),3) # point
22 print("There are", str(count),"coin(s)")
23 cv2.imshow ('Detected circles' + myName,cimg)
24 cv2.waitKey (0)
25 cv2.destroyAllWindows()
```

There are 12 coin(s)



กิจกรรมที่ 4/6 – จงทำการ detect ภาพจากกล้องเพื่อหาภาพโค้กกระป๋อง(สีแดง)

จงเขียนโปรแกรมเพื่ออ่านภาพวิดีโอจากสตรีมวิดีโอของกล้องเว็บแคมที่มีภาพโค้กกับแปปซี่แล้วทำการแสดงเฉพาะโค้ก

< Code >

```
In [*]: 1 import cv2
2 import numpy as np
3
4 lower_red = np.array([161, 155, 84])
5 upper_red = np.array([179, 255, 255])
6 lower_color, upper_color = lower_red, upper_red
7
8 myName = 'B6214005 Varasiri Limprasert'
9 cap = cv2.VideoCapture(1)
10
11 while(1):
12     ret, frame = cap.read()
13     hsv = cv2.cvtColor(frame, cv2.COLOR_BGR2HSV)
14     mask = cv2.inRange(hsv, lower_color, upper_color)
15     res = cv2.bitwise_and(frame, frame, mask= mask)
16
17     cv2.imshow('Frame-'+myName, frame)
18     cv2.imshow('Mask-'+myName, mask)
19     cv2.imshow('Res-'+myName, res)
20     k = cv2.waitKey(5)
21     if k == 27:
22         break
23 cap.release()
24 cv2.destroyAllWindows()
```

import cv2

import numpy as np

lower_red = np.array([161, 155, 84])

upper_red = np.array([179, 255, 255])

lower_color, upper_color = lower_red, upper_red

myName = 'B6214005 Varasiri Limprasert'

cap = cv2.VideoCapture(1)

while(1):

ret, frame = cap.read()

hsv = cv2.cvtColor(frame, cv2.COLOR_BGR2HSV)

mask = cv2.inRange(hsv, lower_color, upper_color)

res = cv2.bitwise_and(frame, frame, mask= mask)

cv2.imshow('Frame-'+myName, frame)

cv2.imshow('Mask-'+myName, mask)

cv2.imshow('Res-'+myName, res)

k = cv2.waitKey(5)

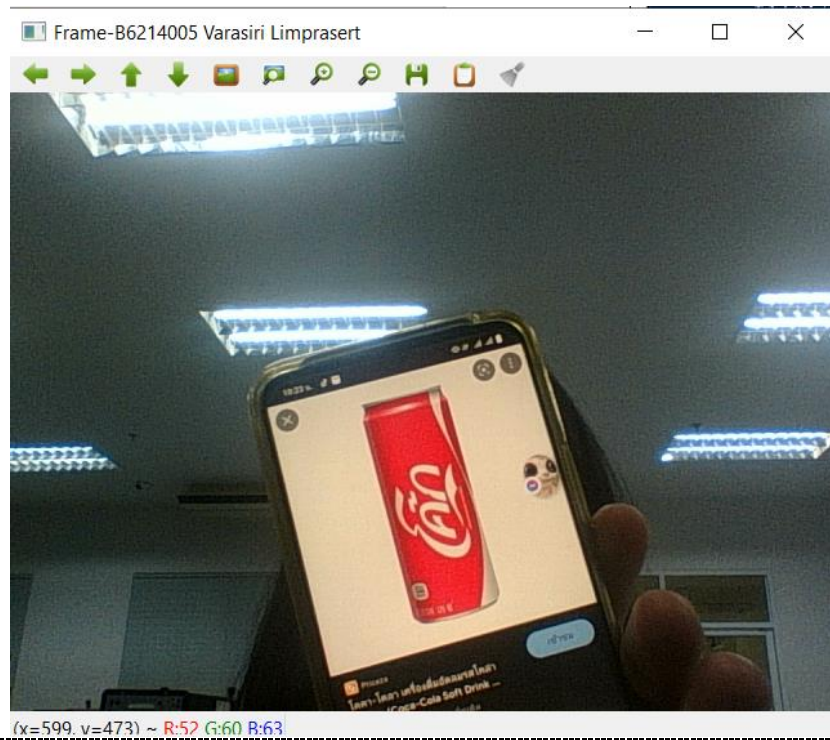
if k == 27:

break

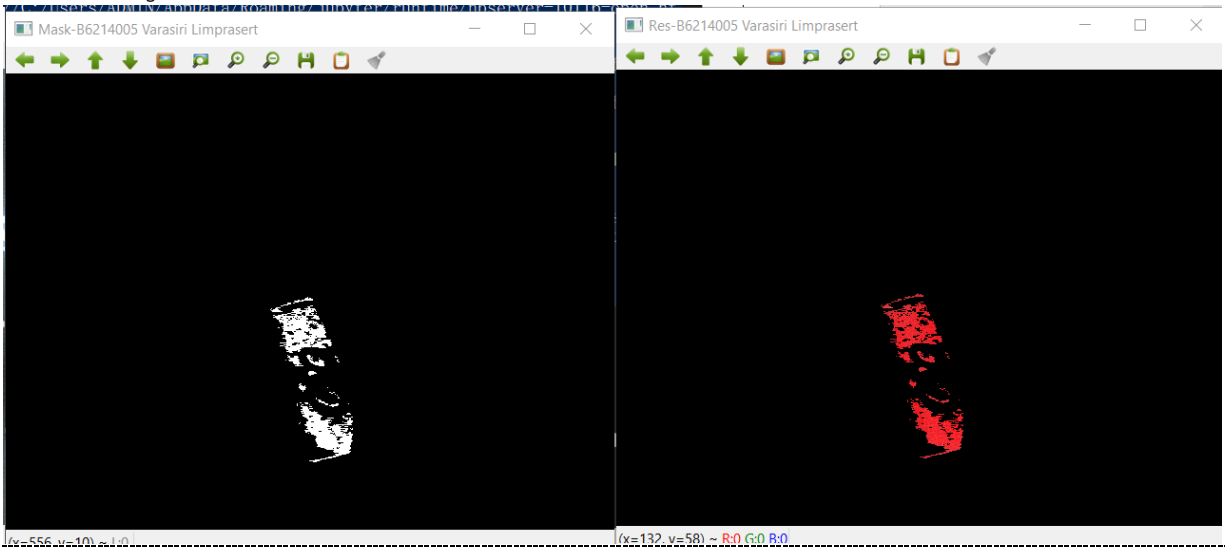
cap.release()

cv2.destroyAllWindows()

< Real Image >



< Result Image >



กิจกรรมที่ 5/6 – Graphic Text

ใช้ภาพถ่ายของตัวเอง สร้างข้อความ แล้วเติมข้อความในภาพถ่ายมุมล่างขวามือ

< Code >

```
In [*]: 1 import cv2
2 myName = 'B6214005 Varasiri Limprasert'
3 frame = cv2.imread('./image/myPic.png')
4 xlogo = cv2.imread('./image/Text.png')
5 cv2.imshow('Original-' + myName, frame)
6 cv2.imshow('Logo-' + myName, xlogo)
7 xlogo = cv2.resize(xlogo, (250, 132)) #cv2.resize(src, dsize[, dst[, fx[, fy[, interpolation]]]])
8
9 fRows,fCols,fChannels = frame.shape
10 lRows,lCols,lChannels = xlogo.shape
11 print("Frame >> ",fRows,fCols,fChannels)
12 print("xLogo >> ",lRows,lCols,lChannels)
13
14 rows_from, cols_from = fRows-lRows-1, fCols-lCols-1
15 rows_to, cols_to = fRows-1, fCols-1
16 roi = frame[rows_from:rows_to, cols_from:cols_to]
17
18 logoGray = cv2.cvtColor(xlogo,cv2.COLOR_BGR2GRAY)
19 ret, mask = cv2.threshold(logoGray, 220, 255, cv2.THRESH_BINARY_INV)
20 mask_inv = cv2.bitwise_not(mask)
21
22 frame_bg = cv2.bitwise_and(roi,roi,mask = mask_inv)
23 xlogo_fg = cv2.bitwise_and(xlogo,xlogo,mask = mask)
24 out_img = cv2.add(frame_bg,xlogo_fg)
25 frame[rows_from:rows_to, cols_from:cols_to] = out_img
26
27 cv2.imshow('Result-' + myName, frame)
28 cv2.waitKey(0)
29 cv2.destroyAllWindows()

Frame >> 482 639 3
xLogo >> 132 250 3
```

```
import cv2
myName = 'B6214005 Varasiri Limprasert'
frame = cv2.imread('./image/myPic.png')
xlogo = cv2.imread('./image/Text.png')
cv2.imshow('Original-' + myName, frame)
cv2.imshow('Logo-' + myName, xlogo)
xlogo = cv2.resize(xlogo, (250, 132)) #cv2.resize(src, dsize[, dst[, fx[, fy[, interpolation]]]])

fRows,fCols,fChannels = frame.shape
lRows,lCols,lChannels = xlogo.shape
print("Frame >> ",fRows,fCols,fChannels)
print("xLogo >> ",lRows,lCols,lChannels)

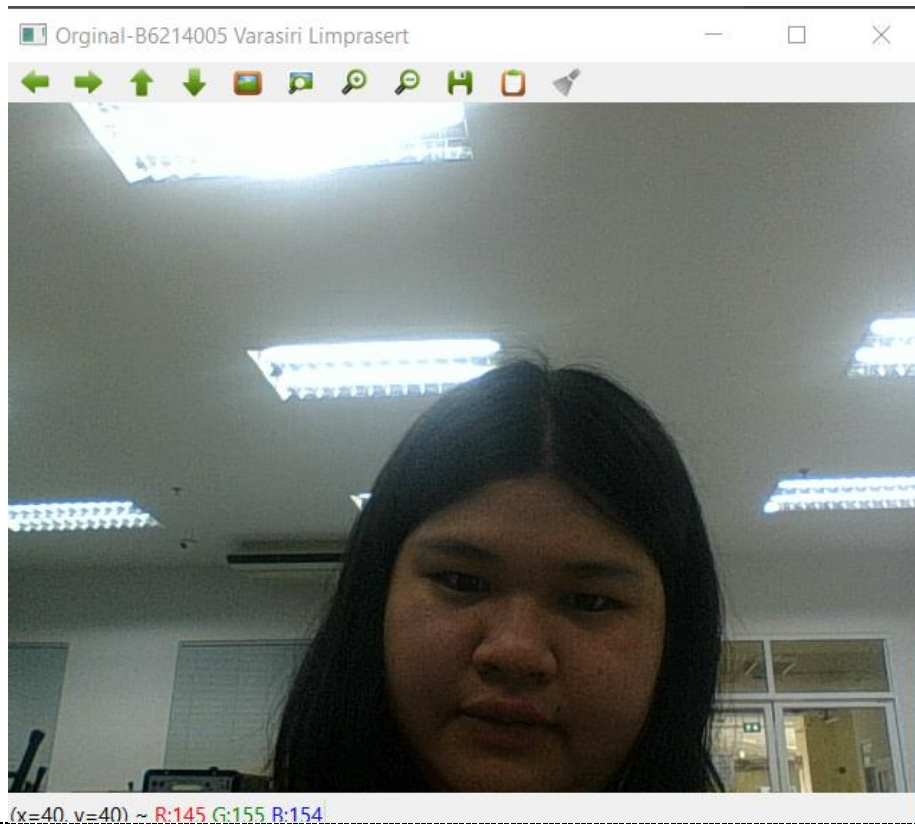
rows_from, cols_from = fRows-lRows-1, fCols-lCols-1
rows_to, cols_to = fRows-1, fCols-1
roi = frame[rows_from:rows_to, cols_from:cols_to]

logoGray = cv2.cvtColor(xlogo,cv2.COLOR_BGR2GRAY)
ret, mask = cv2.threshold(logoGray, 220, 255, cv2.THRESH_BINARY_INV)
mask_inv = cv2.bitwise_not(mask)

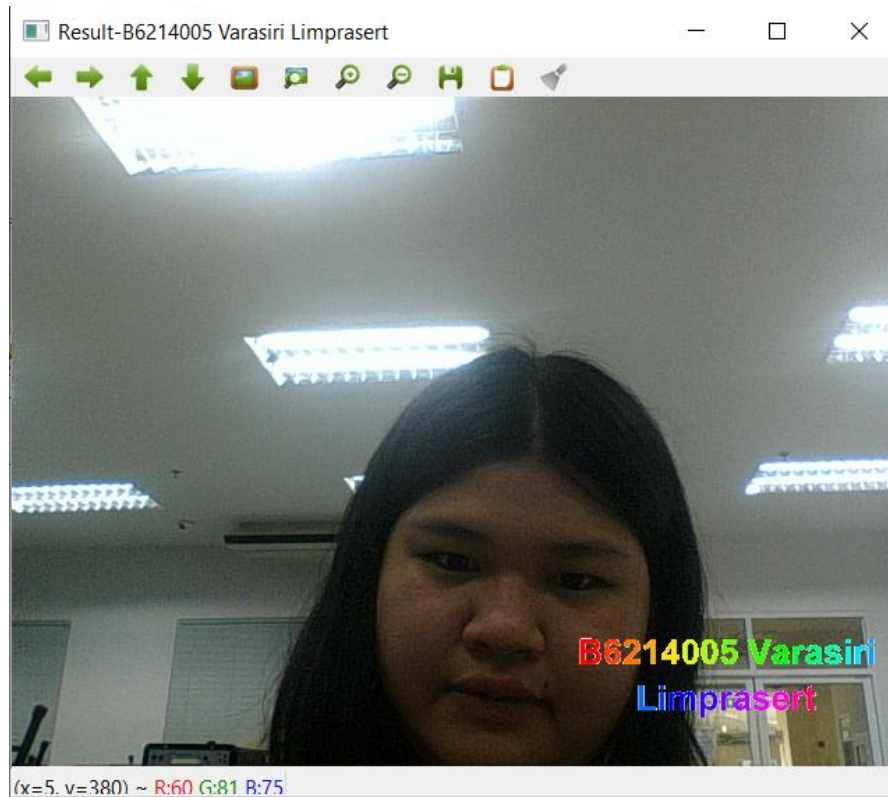
frame_bg = cv2.bitwise_and(roi,roi,mask = mask_inv)
xlogo_fg = cv2.bitwise_and(xlogo,xlogo,mask = mask)
out_img = cv2.add(frame_bg,xlogo_fg)
frame[rows_from:rows_to, cols_from:cols_to] = out_img

cv2.imshow('Result-' + myName, frame)
cv2.waitKey(0)
cv2.destroyAllWindows()
```


< Real Image >



< Result Image >



กิจกรรมที่ 6/6 – Pokémon Matching Image Project

ศึกษาและปรับแก้การทำงานของโปรแกรมเพื่อ

1. แก้ไขให้โปรแกรมทำงานให้ถูกต้องอย่างไร
2. ให้ระบายสีแดงแทนที่จะติกรอบเขียว
3. หาตัวนี้ แล้วไม่ครบ 4 ตัว ทำอย่างไร



4. ทดสอบกับโจทย์ใหม่ที่สร้างเองจาก <https://webofsolitaire.com/Play-Pikachu-Online-Best-Game-Pokemon-Go.html>

```

1  ## Step_2(Ok) Click and Select Picture Step2 - Crop and Show
2  import cv2, math
3  import numpy as np
4  myName = 'B6214005 Varasiri Limprasert'
5  ResultName = myName + 'Result'
6  ROI_Name = 'x'
7  RowPic, ColPic = 9, 16
8
9  def click_event(event, x, y, flags, param):
10     global RowPic, ColPic, maxXPic, maxYPic
11     if event == cv2.EVENT_LBUTTONDOWN:
12         # print(x, y, ColPic, RowPic, maxXPic, maxYPic)
13
14         y_index = math.ceil( y / (maxYPic/RowPic))
15         x_index = math.ceil( x / (maxXPic/ColPic))
16         # print(x_index, y_index)
17
18         xFrom = int((x_index-1) * maxXPic / ColPic)
19         xTo = int(x_index * maxXPic / ColPic)
20         yFrom = int((y_index-1) * maxYPic / RowPic)
21         yTo = int(y_index * maxYPic / RowPic)
22         ROI = testImg [yFrom:yTo, xFrom:xTo]
23
24         img_rgb = testImg # img_rgb = testImg.copy()
25         template = cv2.cvtColor(ROI, cv2.COLOR_BGR2GRAY)
26         img_gray = cv2.cvtColor(img_rgb, cv2.COLOR_BGR2GRAY)
27         w, h = template.shape[::-1]
28
29         res = cv2.matchTemplate(img_gray, template, cv2.TM_CCOEFF_NORMED)
30         threshold = 0.8
31         loc = np.where(res >= threshold)
32
33         for pt in zip(*loc[::-1]):
34             cv2.rectangle(img_rgb, pt, (pt[0] + w, pt[1] + h), (0, 0, 255), -1)
35
36             cv2.destroyWindow(ROI_Name)
37             cv2.destroyWindow(ResultName)
38             cv2.imshow(ROI_Name, ROI)
39             cv2.moveWindow(ROI_Name, 800, 20);
40             cv2.imshow(ResultName, img_rgb)
41             cv2.moveWindow(ResultName, 20, 20);
42
43             print(loc)
44
45 testImg = cv2.imread('./image/Data_ROI.jpg')
46 cv2.imshow(myName, testImg)
47 maxYPic, maxXPic = testImg.shape[:2]
48 oneSizeY = int(maxYPic/RowPic)
49 oneSizeX = int(maxXPic/ColPic)
50 #print(ColPic, RowPic, maxXPic, maxYPic, oneSizeX, oneSizeY)
51
52 ROI = testImg [1:oneSizeY, 1:oneSizeX]
53 cv2.imshow(ROI_Name, ROI)
54 cv2.moveWindow(ROI_Name, 800, 20);
55 cv2.imshow(ResultName, testImg)
56 cv2.moveWindow(ResultName, 20, 20);
57 cv2.setMouseCallback(myName, click_event)
58
59 cv2.waitKey(0)
60 cv2.destroyAllWindows()

```

```
(array([ 0, 104, 260, 416], dtype=int64), array([ 0, 378, 462, 210], dtype=int64))
```



```

## Step_2(Ok) Click and Select Picture Step2 - Crop and Show

import cv2, math
import numpy as np

myName = 'B6214005 Varasiri Limprasert'
ResultName = myName + 'Result'
ROI_Name = 'x'

RowPic, ColPic = 9, 16

def click_event(event, x, y, flags, param):
    global RowPic, ColPic, maxXPic, maxYPic
    if event == cv2.EVENT_LBUTTONDOWN:
        # print(x, y, ColPic, RowPic, maxXPic, maxYPic)

        y_index = math.ceil( y / (maxYPic/RowPic))
        x_index = math.ceil( x / (maxXPic/ColPic))
        # print(x_index, y_index)

        xFrom = int((x_index-1) * maxXPic / ColPic)
        xTo = int(x_index * maxXPic / ColPic)
        yFrom = int((y_index-1) * maxYPic / RowPic)
        yTo = int(y_index * maxYPic / RowPic)
        ROI = testImg [yFrom:yTo, xFrom:xTo]

        img_rgb = testImg # img_rgb = testImg.copy()
        template = cv2.cvtColor(ROI, cv2.COLOR_BGR2GRAY)
        img_gray = cv2.cvtColor(img_rgb, cv2.COLOR_BGR2GRAY)
        w, h = template.shape[::-1]

        res = cv2.matchTemplate(img_gray, template, cv2.TM_CCOEFF_NORMED)
        threshold = 0.8
        loc = np.where(res >= threshold)

        for pt in zip(*loc[::-1]):
            cv2.rectangle(img_rgb, pt, (pt[0] + w, pt[1] + h), (0, 0, 255), -1)

        cv2.destroyWindow(ROI_Name)
        cv2.destroyWindow(ResultName)
        cv2.imshow(ROI_Name, ROI)
        cv2.moveWindow(ROI_Name, 800, 20);
        cv2.imshow(ResultName, img_rgb)
        cv2.moveWindow(ResultName, 20, 20);

        print(loc)

testImg = cv2.imread('./image/Data_ROI.jpg')
cv2.imshow(myName, testImg)

```

```

maxYPic, maxXPic = testImg.shape[:2]
oneSizeY = int(maxYPic/RowPic)
oneSizeX = int(maxXPic/ColPic)
#print(ColPic, RowPic, maxXPic, maxYPic, oneSizeX, oneSizeY)

```

```

ROI = testImg [1:oneSizeY, 1:oneSizeX]
cv2.imshow(ROI_Name, ROI)
cv2.moveWindow(ROI_Name,800,20);
cv2.imshow(ResultName, testImg)
cv2.moveWindow(ResultName,20,20);
cv2.setMouseCallback(myName, click_event)

```

```
cv2.waitKey(0)
```

```
cv2.destroyAllWindows()
```

