การพัฒนาโปรแกรมประยุกต์และปัญญาประดิษฐ์ เพื่อการมองเห็นของเครื่องจักร
Computer Programing and Artificial Intelligence in Machine Vision

ชื่อ-สกุล : วราสิริ ลิ้มประเสริฐ B6214005

5/5 -- คำถามท้ายบทเพื่อทดสอบความเข้าใจ

กิจกรรมที่ 1/6 – Webcam to Video with Logo

จงเขียนโปรแกรมเพื่อบันทึกวิดีโอจากสตรีมวิดีโอของกล้องเวปแคม ทำการใส่โลโก้ XXX และระบุวันที่ในภาพ

In [1]:

```python
# Insert Logo to Movies
import cv2
import numpy as np
import datetime
from PIL import Image

cap = cv2.VideoCapture(0)
logo = Image.open('./image/lilac_yogurt_png.png')
logo.thumbnail((250, 250))
font = cv2.FONT_HERSHEY_SIMPLEX

h = int(cap.get(cv2.CAP_PROP_FRAME_HEIGHT))
w = int(cap.get(cv2.CAP_PROP_FRAME_WIDTH))
fps = int(cap.get(cv2.CAP_PROP_FPS))
fourcc = cv2.VideoWriter_fourcc(* 'XVID')
out = cv2.VideoWriter('./image/B6214005_Mission3.avi', fourcc, fps, (w,h))

while(True):
    ret, image = cap.read()
    cv2.putText(image,str(datetime.datetime.now()),(10,30), font, 1,(0,0,0),2,cv2.LINE_AA)

    color_coverted = cv2.cvtColor(image, cv2.COLOR_BGR2RGB)
    pil_image=Image.fromarray(color_coverted)
    pil_image.paste(logo, (400,300),logo)
    numpy_image=np.array(pil_image)
    opencv_image=cv2.cvtColor(numpy_image, cv2.COLOR_RGBA2BGR)

    if ret == True:
        cv2.putText(opencv_image,str(datetime.datetime.now()),(10,30), font, 1,(0,0,0),2,cv2.LINE_AA)
        out.write(opencv_image)
        cv2.imshow('B6214005-Mission 3', opencv_image)
        if cv2.waitKey(1) & 0xFF == ord('q'):
            break
    else:
        break

cap.release()
out.release()
cv2.destroyAllWindows()
```

Youtube Link :

https://youtu.be/WQh6D2bKbCY

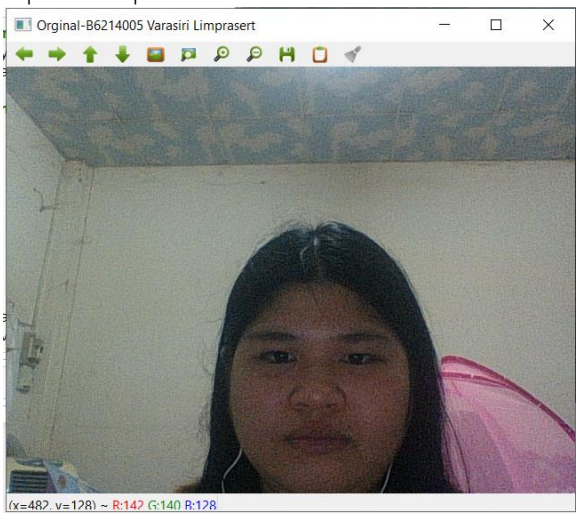
กิจกรรมที่ 2/6 – Canny Edge Detection from Webcam to Video with Logo

จงเขียนโปรแกรมเพื่ออ่านภาพวิดีโอจากสตรีมวิดีโอของกล้องเวปแคม แล้ว Capture เพื่อทำ Canny Edge Detection

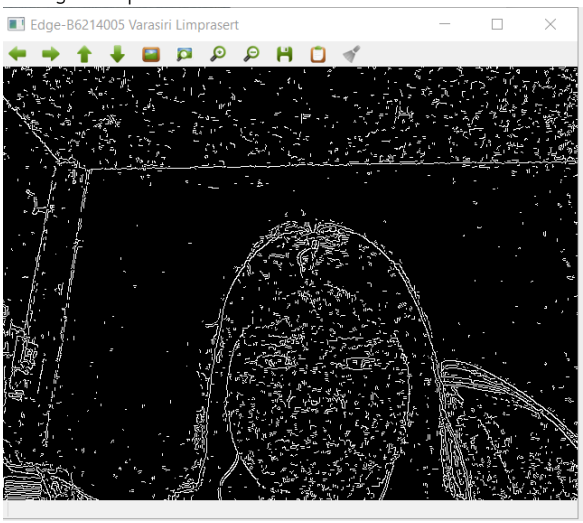
In [3]:

```python
import cv2
myName = 'B6214005 Varasiri Limprasert'
cap = cv2.VideoCapture(1)

while True:
    ret, colorImg = cap.read()
    cv2.imshow('Image Show', colorImg)
    pressedKey = cv2.waitKey(1)
    if pressedKey == ord('q'):
        break
    elif pressedKey == ord('c'):
        edges = cv2.Canny (colorImg, 75, 100, apertureSize=3, L2gradient=True)
        cv2.imshow('Orginal-' + myName, colorImg)
        cv2.imshow('Edge-' + myName, edges)

cap.release()
cv2.destroyAllWindows ()
```

< picture input >



< Edge output >



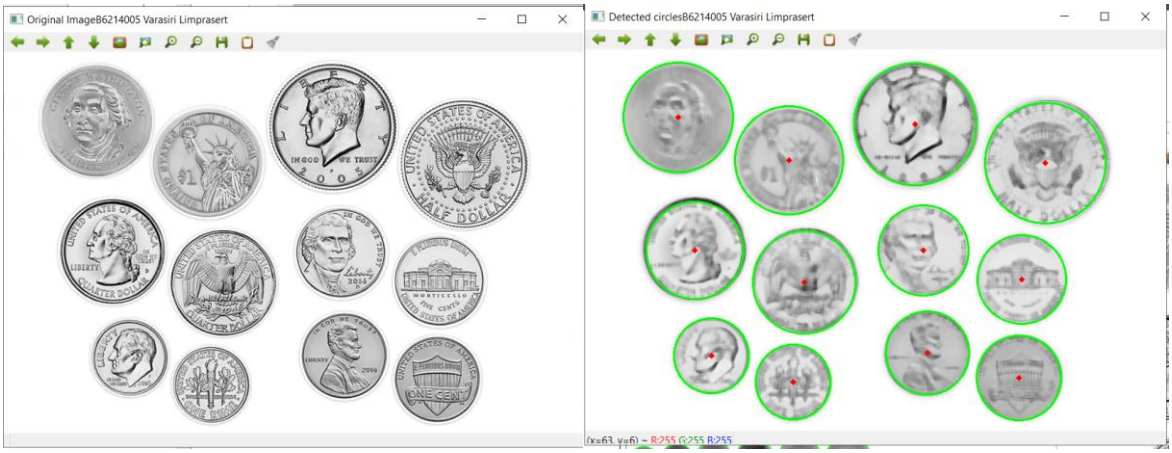
กิจกรรมที่ 3/6 – ทำการตรวจจับเหรียญด้วย Hough Circle Transform

ให้ถ่ายรูปเหรียญของตัวเอง จำนวน 12 เหรียญ เหมือนตัวอย่าง แล้วทดสอบทำ Hough Circle Transform

In [*]:

```python
import cv2
import numpy as np
myName = 'B6214005 Varasiri Limprasert'
img = cv2.imread('./image/coins2.jpg',0)
edges = cv2.Canny (img, 50, 100, apertureSize=3, L2gradient=True)
cv2.imshow ('Original Image' + myName, img)
font = cv2.FONT_HERSHEY_SIMPLEX

img = cv2.medianBlur(img,7)
cimg = cv2.cvtColor(img,cv2.COLOR_GRAY2BGR)

circles = cv2. HoughCircles(img,cv2.HOUGH_GRADIENT,1,120, param1=50, param2=30, minRadius=20,maxRadius=90)
circles = np.uint16(np.around(circles))

count = 0

for i in circles[0,:]:
    count += 1

    cv2.circle(cimg, (i[0],i[1]),i[2],(0,255,0),2) # Line
    cv2.circle(cimg, (i[0],i[1]),2 ,(0,0,255),3) # point
print("There are", str(count),"coin(s)")
cv2.imshow ('Detected circles' + myName,cimg)
cv2.waitKey (0)
cv2.destroyAllWindows()
```

```
There are 12 coin(s)
```



กิจกรรมที่ 4/6 – จงทำการ detect ภาพจากกล้องเพื่อหาภาพโค้กกระป๋อง(สีแดง)

จงเขียนโปรแกรมเพื่ออ่านภาพวิดีโอจากสตรีมวิดีโอของกล้องเวปแคมที่มีภาพโค้กกับแปปซี่แล้วทำการแสดงเฉพาะโค้ก

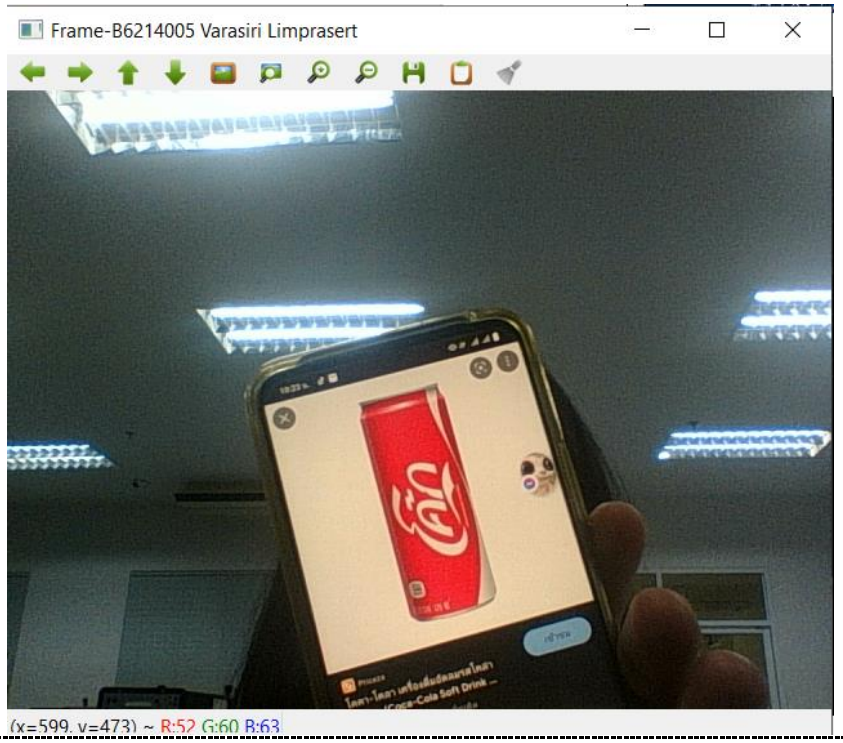
< Code >

In [*]:

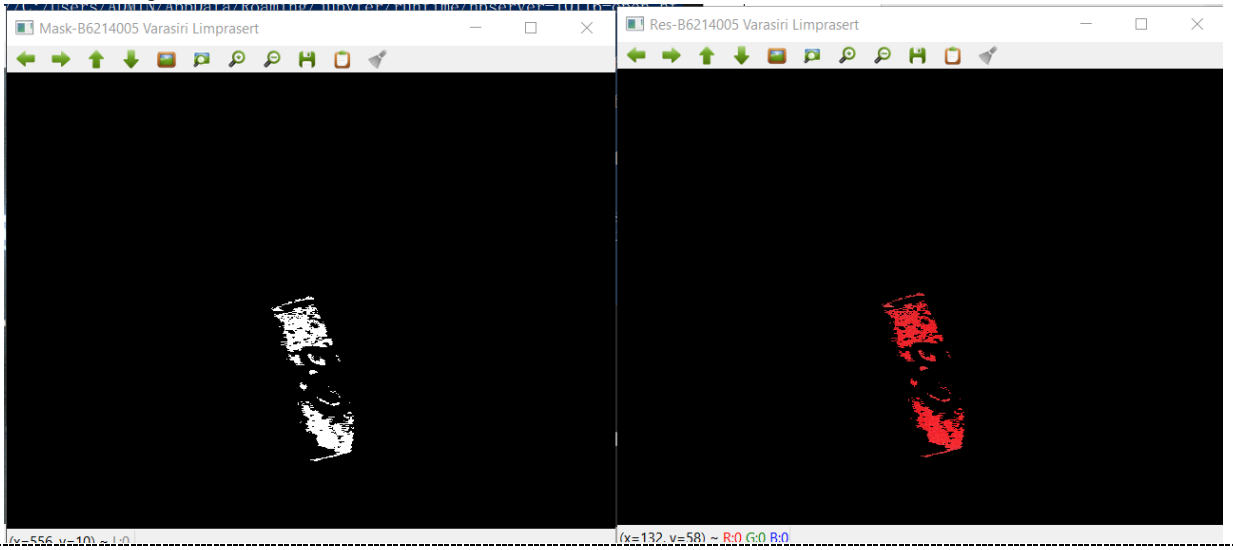
```python
import cv2
import numpy as np

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()
```


```
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 >

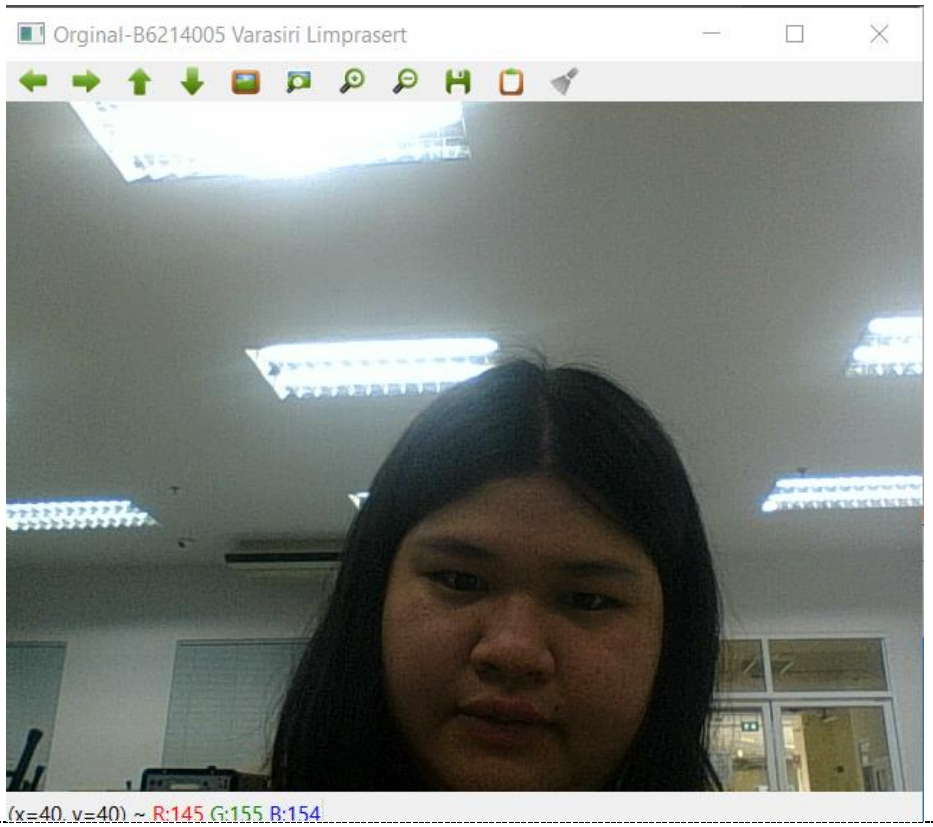
In [*]:

```
import cv2
myName = 'B6214005 Varasiri Limprasert'
frame = cv2.imread('./image/myPic.png')
xlogo = cv2.imread('./image/Text.png')
cv2.imshow('Orginal-' + 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()
```

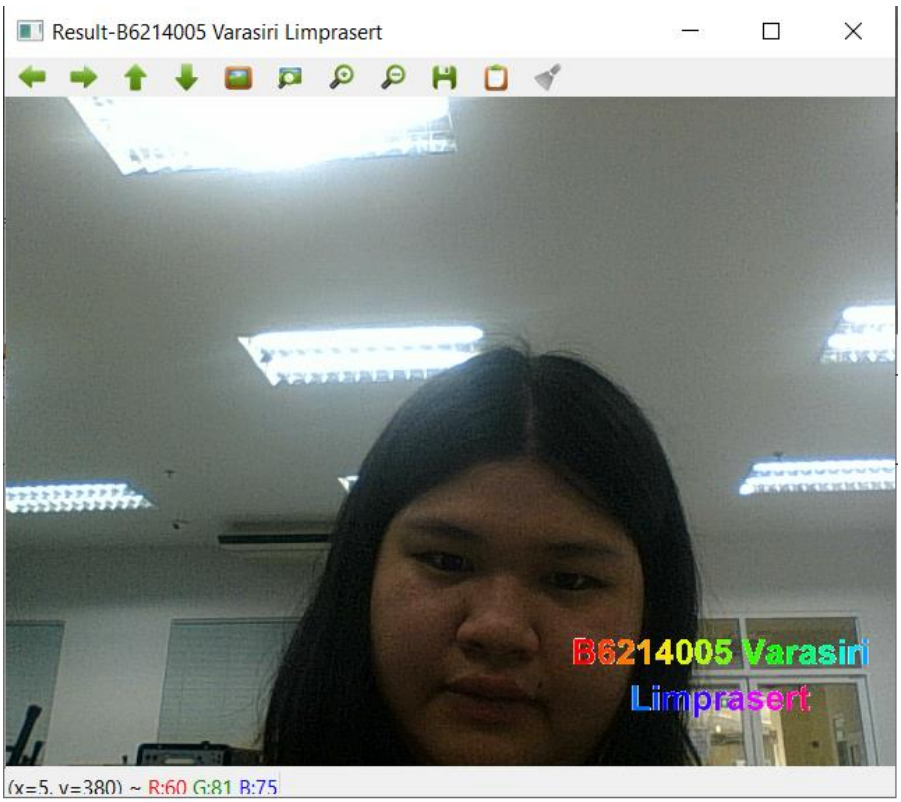
```
Frame >>  482 639 3
xLogo >>  132 250 3
```


```
import cv2
myName = 'B6214005 Varasiri Limprasert'
frame = cv2.imread('./image/myPic.png')
xlogo = cv2.imread('./image/Text.png')
cv2.imshow('Orginal-' + 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. แก้ไขให้โปรแกรมทำงานให้ถูกต้องทำอย่างไร
2. ให้ระบายสีแดงแทนที่จะตีกรอบเขียว
3. หาตัวนี้ แล้วไม่ครบ 4 ตัว ทำอย่างไร

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

```python
## 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()
```

```
(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()
```