

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

```

1  #กิจกรรม3 โลโก้ วันที่ บันทึก ในกล้อง
2  import cv2
3  import numpy as np
4  from datetime import datetime
5  from PIL import Image
6  cap = cv2.VideoCapture(0)
7  logo = Image.open('./image/cat.png')
8  logo.thumbnail((250, 250))
9
10 h = int(cap.get(cv2.CAP_PROP_FRAME_HEIGHT))
11 w = int(cap.get(cv2.CAP_PROP_FRAME_WIDTH))
12 fps = int(cap.get(cv2.CAP_PROP_FPS))
13
14 fourcc = cv2.VideoWriter_fourcc(* 'XVID')
15 out = cv2.VideoWriter('./image/VDOpaer1.avi', fourcc, fps, (w,h))
16 while(cap.isOpened()):
17     ret, image = cap.read()
18     font = cv2.FONT_HERSHEY_SIMPLEX
19     cv2.putText(image, str(datetime.now()), (10,30), font, 1, (0,0,0), 2, cv2.LINE_AA)
20
21     color_covered = cv2.cvtColor(image, cv2.COLOR_BGR2RGB)
22     pil_image = Image.fromarray(color_covered)
23     pil_image.paste(logo, (0,0), logo)
24
25     numpy_image = np.array(pil_image)
26     opencv_image = cv2.cvtColor(numpy_image, cv2.COLOR_RGBA2BGR)
27
28     #cv2.imshow('hatchaya3', opencv_image)
29     if ret == True:
30         out.write(opencv_image)
31         cv2.imshow('frame', 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()

```

```

import cv2

import numpy as np

from datetime import datetime

from PIL import Image

cap = cv2.VideoCapture(0)

logo = Image.open('./image/cat.png')

logo.thumbnail((250, 250))

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/VDopaer1.avi', fourcc, fps, (w,h))
while(cap.isOpened()):
    ret, image = cap.read()
    font = cv2.FONT_HERSHEY_SIMPLEX
    cv2.putText(image,str(datetime.now()),(10,30), font, 1,(0,0,0),2,cv2.LINE_AA)

    color_covered = cv2.cvtColor(image, cv2.COLOR_BGR2RGB)
    pil_image=Image.fromarray(color_covered)

    pil_image.paste(logo, (0,0),logo)

    numpy_image=np.array(pil_image)
    opencv_image=cv2.cvtColor(numpy_image, cv2.COLOR_RGBA2BGR)

    #cv2.imshow('natchaya3', opencv_image)
    if ret == True:
        out.write(opencv_image)
        cv2.imshow('frame', opencv_image)
        if cv2.waitKey(1) & 0xFF == ord('q'):
            break
    else:
        break
cap.release()
out.release()
cv2.destroyAllWindows()

```



YouTube Link <https://youtu.be/RDG2rI85C3A>

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

งเขียนโปรแกรมเพื่ออ่านภาพวิดีโอจากสตรีมวิดีโอของกล้องเว็บแคม แล้ว Capture เพื่อทำ Canny Edge Detection

```

1  # Mission-1/5 Step-2: Edge
2  import cv2
3  myName = 'B6226718 Natchaya Phongkuson'
4  cap = cv2.VideoCapture(0)
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, 50, 100, apertureSize=3, L2gradient=True)
13         cv2.imshow('Original-' + myName, colorImg)
14         cv2.imshow('Edge-' + myName, edges)
15
16 cap.release()
17 cv2.destroyAllWindows ()

```

```

1  # Mission-1/5 Step-1: Test Video Stream
2  import cv2
3  import datetime
4  cap = cv2.VideoCapture(0)
5  while True:
6      ret, image = cap.read()
7      cv2.imshow('Image Show', image)
8      pressedKey = cv2.waitKey(1)
9      if pressedKey == ord('q'):
10         break
11     elif pressedKey == ord('c'):
12         now = datetime.datetime.now().strftime ("%y%d%m_%H%M%S")
13         cv2.imwrite('./tp_'+str(now)+'.jpg', image)
14 cap.release()
15 cv2.destroyAllWindows ()

```

# Mission-1/5 Step-1: Test Video Stream

```

import cv2
import datetime
cap = cv2.VideoCapture(0)
while True:
    ret, image = cap.read()
    cv2.imshow('Image Show', image)
    pressedKey = cv2.waitKey(1)
    if pressedKey == ord('q'):
        break
    elif pressedKey == ord('c'):
        now = datetime.datetime.now().strftime ("%y%d%m_%H%M%S")
        cv2.imwrite('./tp_'+str(now)+'.jpg', image)
cap.release()
cv2.destroyAllWindows ()

```

# Mission-1/5 Step-2: Edge

```

import cv2
myName = 'B6226718 Natchaya Phongkuson'

```

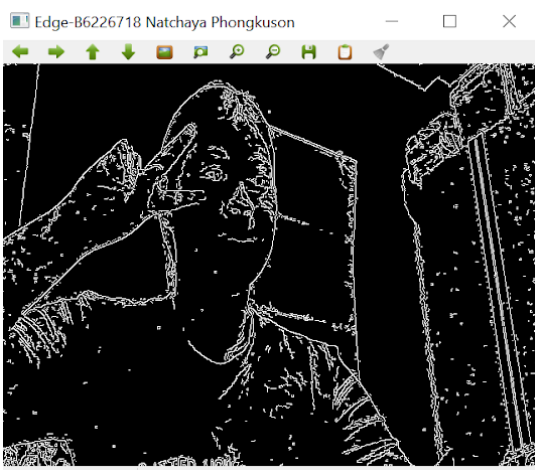
```
cap = cv2.VideoCapture(0)
while True:
    ret, colorImg = cap.read()
    cv2.imshow('Image Show', colorImg)
    pressedKey = cv2.waitKey(1)
    if pressedKey == ord('q'):
        break
    elif pressedKey == ord('c'):
        edges = cv2.Canny (colorImg, 50, 70, apertureSize=3, L2gradient=True)
        cv2.imshow('Original-' + 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

```

1  # วงกลม
2  # Mission-3/5
3  import cv2
4  import numpy as np
5  myName = 'B6226718 Natchaya Phongkuson'
6  img = cv2.imread('./image/coins.jpg',0)
7  edges = cv2.Canny (img, 50, 100, apertureSize=3, L2gradient=True)
8  cv2.imshow ('Original Image' + myName, img)
9  #cv2.imshow ('Edge Image' + myName, edges)
10
11 img = cv2.medianBlur(img,5)
12 cimg = cv2.cvtColor(img,cv2.COLOR_GRAY2BGR)
13
14
15 circles = cv2. HoughCircles(img,cv2.HOUGH_GRADIENT,1,50, param1=100, param2=30, minRadius=20,maxRadius=50)
16 circles = np.uint16(np.around(circles))
17 for i in circles[0,:]:
18     cv2.circle(cimg, (i[0],i[1]),i[2],(0,255,0),2)
19     cv2.circle(cimg, (i[0],i[1]),2 ,(0,0,255),3)
20
21 cv2.imshow ('Detected circles' + myName,cimg)
22 cv2.waitKey (0)
23 cv2.destroyAllWindows()

```

```

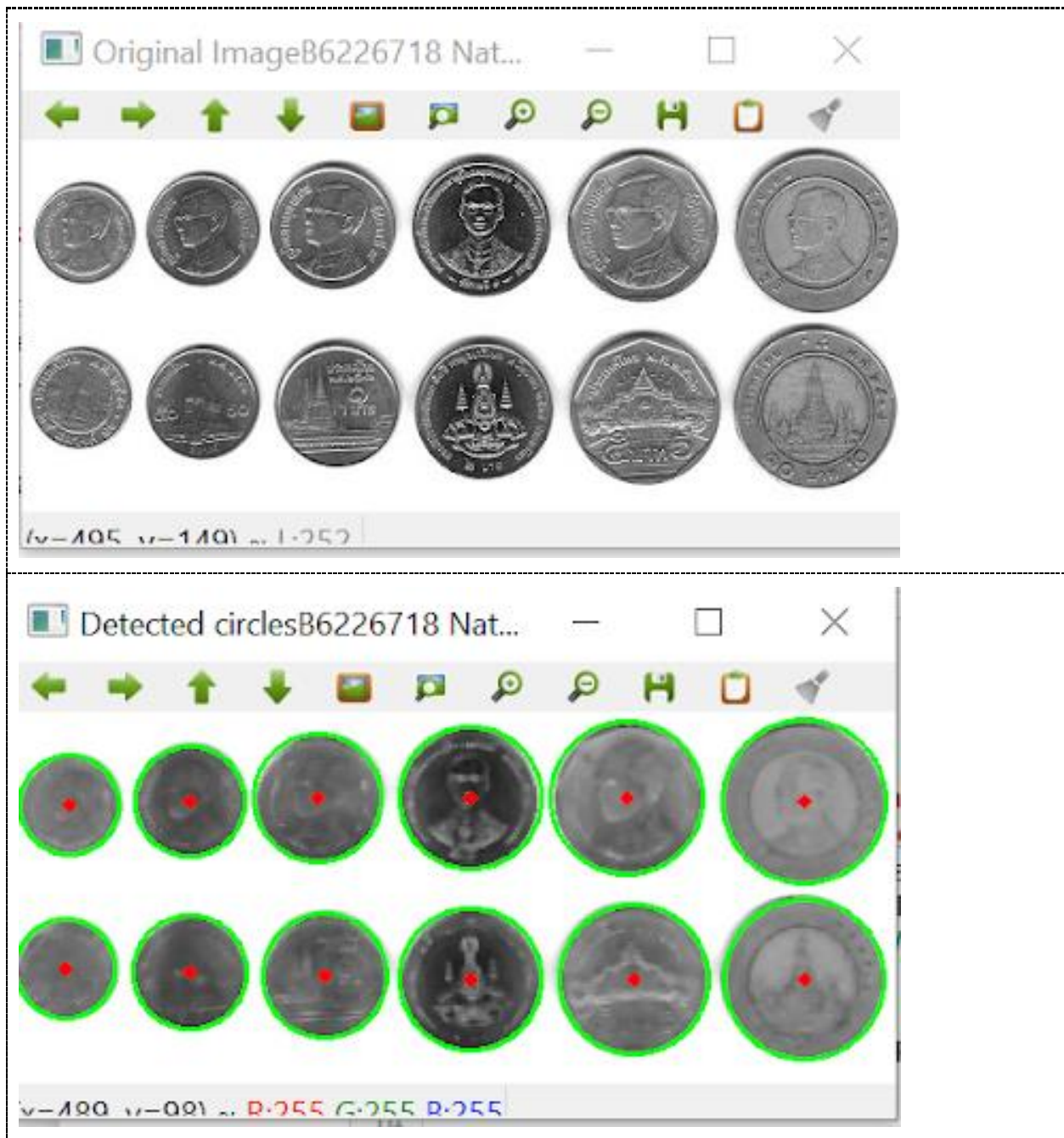
import cv2
import numpy as np
myName = 'B6226718 Natchaya Phongkuson'
img = cv2.imread('./image/coins.jpg',0)
edges = cv2.Canny (img, 50, 100, apertureSize=3, L2gradient=True)
cv2.imshow ('Original Image' + myName, img)
#cv2.imshow ('Edge Image' + myName, edges)

img = cv2.medianBlur(img,5)
cimg = cv2.cvtColor(img,cv2.COLOR_GRAY2BGR)

circles = cv2. HoughCircles(img,cv2.HOUGH_GRADIENT,1,50, param1=100, param2=30,
minRadius=20,maxRadius=50)
circles = np.uint16(np.around(circles))
for i in circles[0,:]:
    cv2.circle(cimg, (i[0],i[1]),i[2],(0,255,0),2)
    cv2.circle(cimg, (i[0],i[1]),2 ,(0,0,255),3)

cv2.imshow ('Detected circles' + myName,cimg)
cv2.waitKey (0)
cv2.destroyAllWindows()

```



**กิจกรรมที่ 4/6 – จงทำการ detect ภาพจากกล้องเพื่อหาภาพโค้กกระป๋อง(สีแดง)**

จงเขียนโปรแกรมเพื่ออ่านภาพวิดีโอจากสตรีมวิดีโอของกล้องเว็บแคมที่มีภาพโค้กกับแปปซี่แล้วทำการแสดงเฉพาะโค้ก

```
#Color-Detection
lower_red = np.array([161, 155, 84])
upper_red = np.array([179, 255, 255])

lower_green = np.array([25, 52, 72])
upper_green = np.array([102, 255, 255])

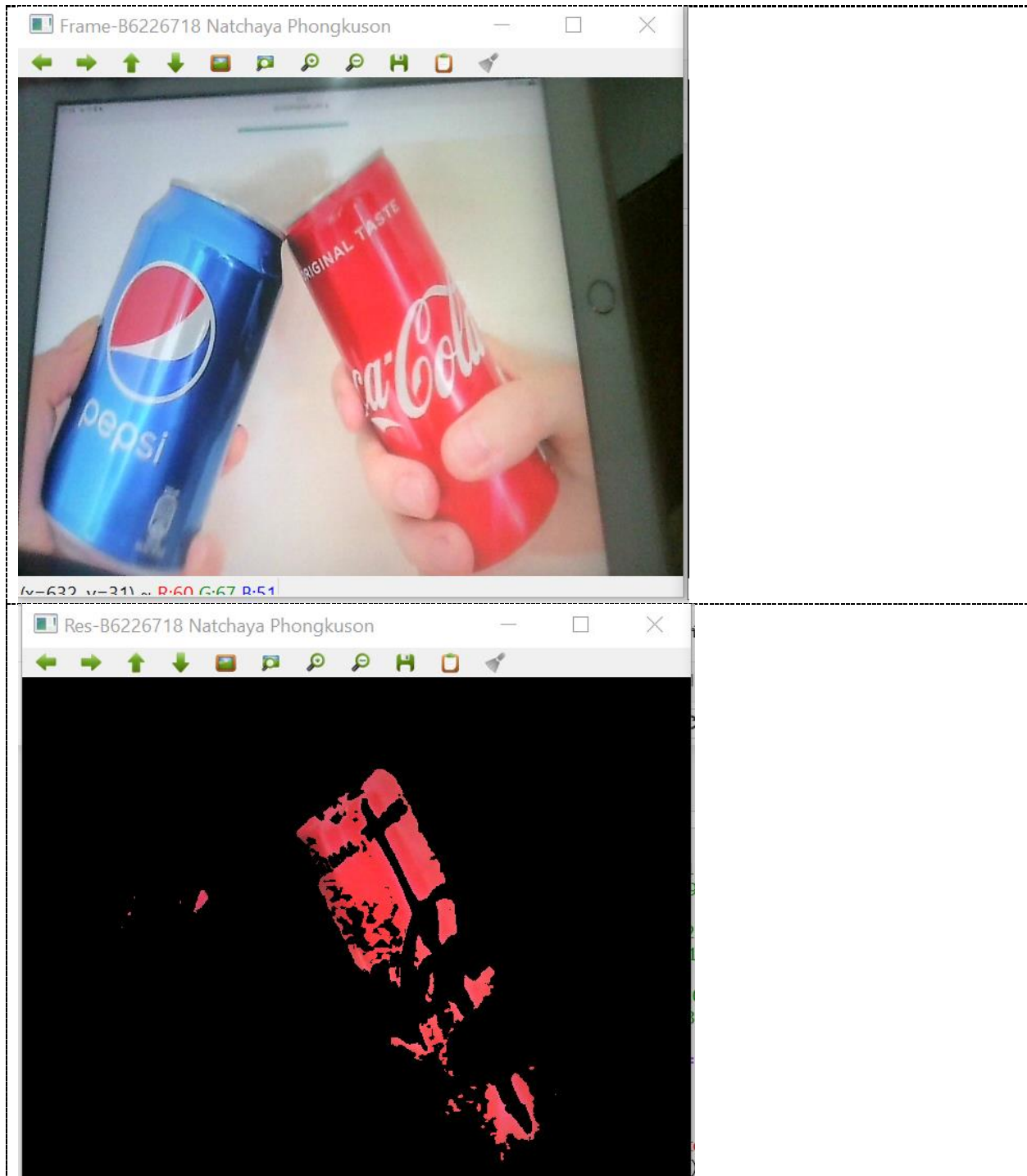
lower_blue = np.array([110,50,50])
upper_blue = np.array([130,255,255])

lower_color, upper_color = lower_red, upper_red

import cv2
import numpy as np
myName = 'B6226718 Natchaya Phongkuson'
cap = cv2.VideoCapture(0)

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()
```







ตัวอย่างภาพทดสอบ



## กิจกรรมที่ 5/6 – Graphic Text

ใช้ภาพถ่ายของตัวเอง สร้างข้อความ แล้วเติมข้อความในภาพถ่ายมุมล่างขวามือ

```

1  # Image Overlays using Bitwise Operations OpenCV-Python
2  import cv2
3  myName = 'B6226718 Natchaya Phongkuson'
4  frame = cv2.imread('./image/paer.jpg')
5  xlogo = cv2.imread('./image/myname1.png')
6  cv2.imshow('Original-' + myName, frame)
7  cv2.imshow('Logo-' + myName, xlogo)
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 = 377, 326
15 rows_to, cols_to = fRows, fCols
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 >> 477 720 3
xLogo >> 100 394 3

```

# Image Overlays using Bitwise Operations OpenCV-Python

import cv2

myName = 'B6226718 Natchaya Phongkuson'

frame = cv2.imread('./image/paer.jpg')

xlogo = cv2.imread('./image/myname1.png')

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

cv2.imshow('Logo-' + myName, xlogo)

fRows,fCols,fChannels = frame.shape

lRows,lCols,lChannels = xlogo.shape

print("Frame >> ",fRows,fCols,fChannels)

print("xLogo >> ",lRows,lCols,lChannels)

rows\_from, cols\_from = 377, 326

rows\_to, cols\_to = fRows, fCols

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)

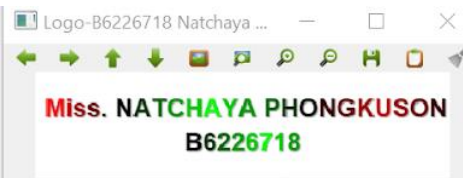
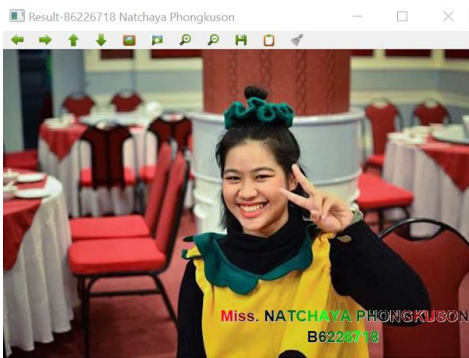
```
xlogo_fg = cv2.bitwise_and(xlogo,xlogo,mask = mask)
out_img = cv2.add(frame_bg,xlogo_fg)
frame[rows_from:rows_to, cols_from:cols_to] = out_img

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

< Real Image >



< Result Image >



## กิจกรรมที่ 6/6 – Pokémon Matching Image Project

ศึกษาและปรับแก้การทำงานของโปรแกรมเพื่อ

1. แก้ไขให้โปรแกรมทำงานให้ถูกต้องได้อย่างไร
2. ให้ระบายสีแดงแทนที่จะติดกรอบเขียว
3. หาตัวนี้ แล้วไม่ครบ 4 ตัว ทำอย่างไร



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

```
## Step_2(Ok) Click and Select Picture Step2 - Crop and Show
import cv2, math
import numpy as np
myName ='B6226718 Natchaya Phongkuson'
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()

```

```

1  ## Step_2(Ok) Click and Select Picture Step2 - Crop and Show
2  import cv2, math
3  import numpy as np
4  myName = 'B6226718Natchaya Phongkuson'
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.destroyAllWindows(ROI_Name)
37         cv2.destroyAllWindows(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([104, 156, 260, 416], dtype=int64), array([167, 503, 293, 503], dtype=int64))

```



