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

จงเขียนโปรแกรมเพื่อบันทึกวิดีโอจากสตรีมวิดีโอของกล้องเวปแคม ทำการใส่โลโก้ XXX และระบุวันที่ในภาพ

```python
#กิจกรรม3 โลโก้ วันที่ บันทึก ในกล้อง
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_coverted = cv2.cvtColor(image, cv2.COLOR_BGR2RGB)
    pil_image=Image.fromarray(color_coverted)

    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()
```

```
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_coverted = cv2.cvtColor(image, cv2.COLOR_BGR2RGB)
    pil_image=Image.fromarray(color_coverted)

    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

จงเขียนโปรแกรมเพื่ออ่านภาพวิดีโอจากสตรีมวิดีโอของกล้องเวปแคม แล้ว Capture เพื่อทำ Canny Edge Detection

```python
# 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, 100, apertureSize=3, L2gradient=True)
        cv2.imshow('Orginal-' + myName, colorImg)
        cv2.imshow('Edge-' + myName, edges)

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

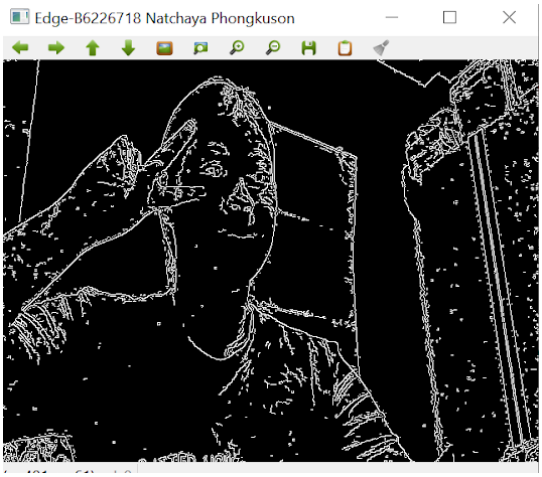
```python
# Mission-1/5 Step-1: Test Video Stream
import cv2
import datetime
cap = cv2.VideoCapture(0)
while True:
    ret, image = cap.read()
    cv2.imshow('Image Show', image)
    pressedKey = cv2.waitKey(1)
    if pressedKey == ord('q'):
        break
    elif pressedKey == ord('c'):
        now = 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-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('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

```python
# วงกลม
# Mission-3/5
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()
```

```
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()
```

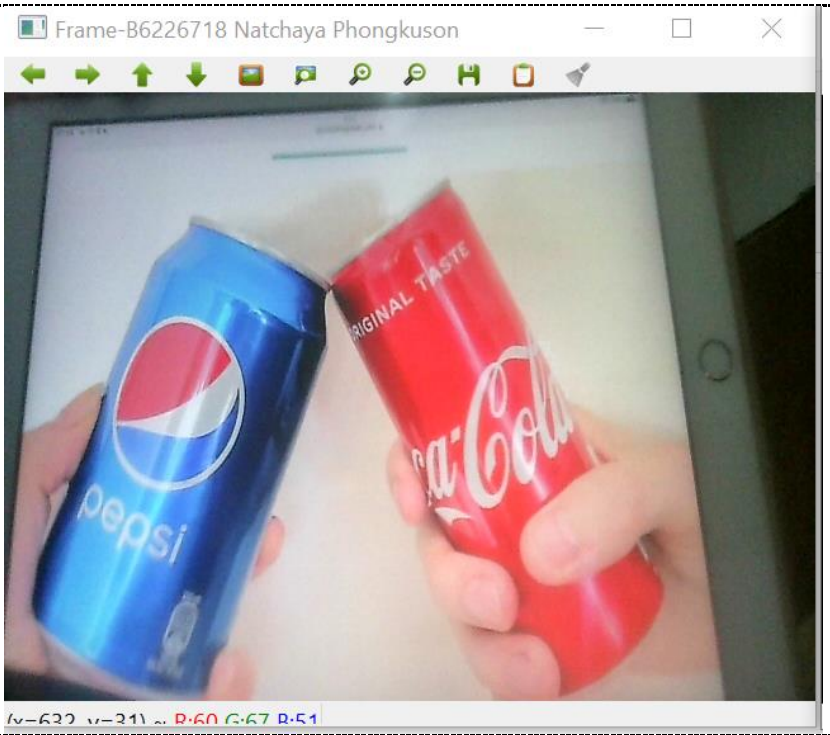

Original ImageB6226718 Nat...

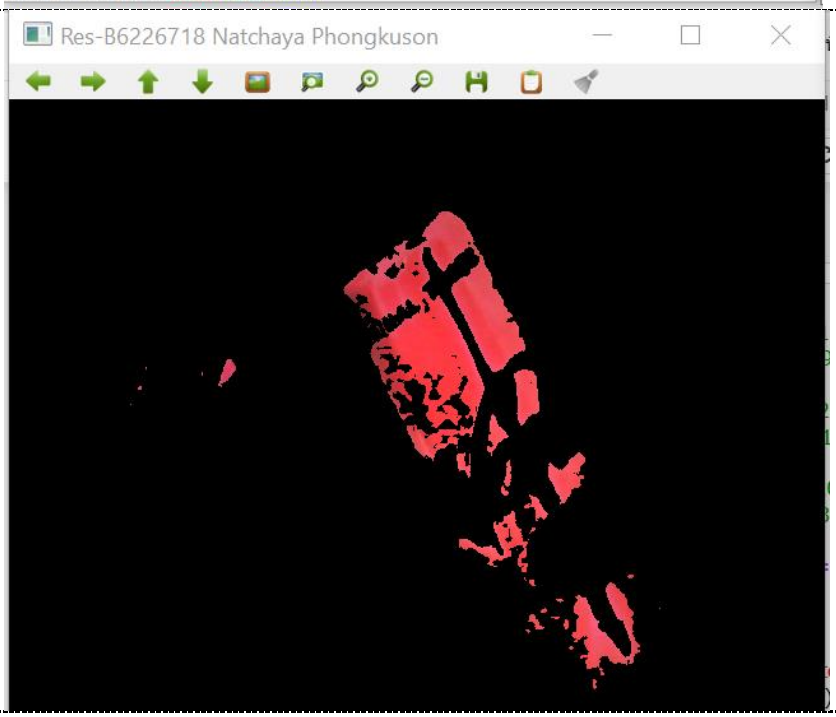

Detected circlesB6226718 Nat...

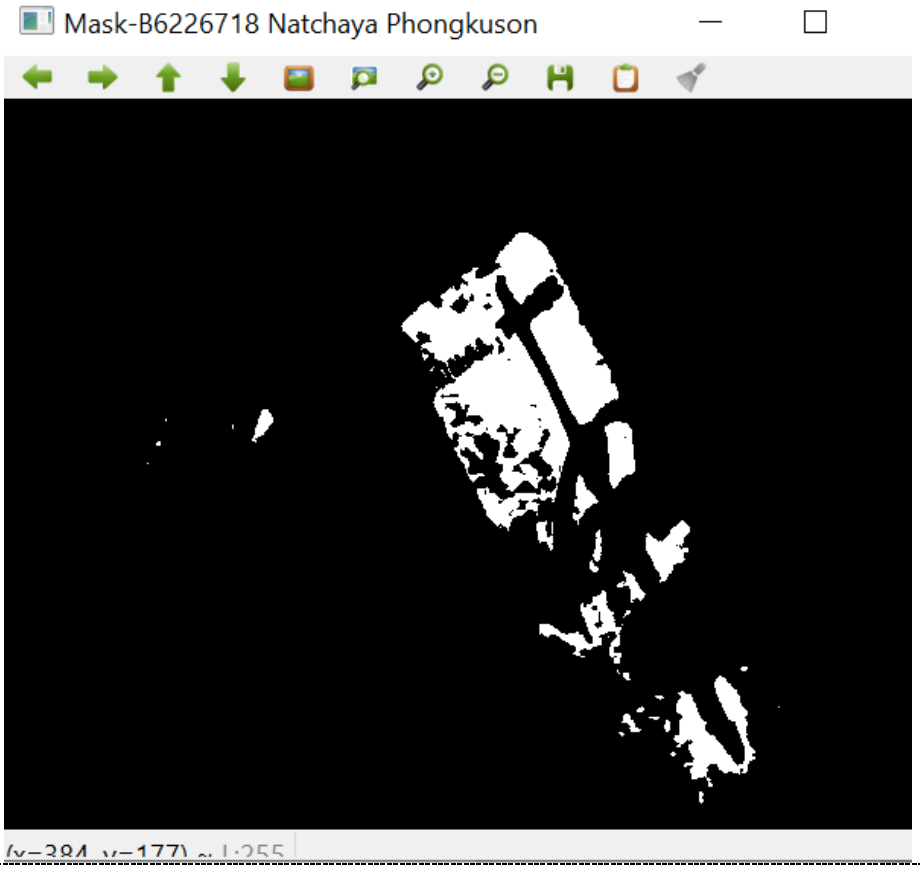
กิจกรรมที่ 4/6 – จงทำการ detect ภาพจากกล้องเพื่อหาภาพโค้กกระป๋อง(สีแดง)

จงเขียนโปรแกรมเพื่ออ่านภาพวิดีโอจากสตรีมวิดีโอของกล้องเวปแคมที่มีภาพโค้กกับแปปซี่แล้วทำการแสดงเฉพาะโค้ก

```
#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()
```


Frame-B6226718 Natchaya Phongkuson
pepsi
ORIGINAL TASTE


Res-B6226718 Natchaya Phongkuson



ตัวอย่างภาพทดสอบ

กิจกรรมที่ 5/6 – Graphic Text

ใช้ภาพถ่ายของตัวเอง สร้างข้อความ แล้วเติมข้อความในภาพถ่ายมุมล่างขวามือ

```python
# 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('Orginal-' + 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()
```

```
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('Orginal-' + 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. แก้ไขให้โปรแกรมทำงานให้ถูกต้องทำอย่างไร
2. ให้ระบายสีแดงแทนที่จะตีกรอบเขียว
3. หาตัวนี้ แล้วไมครบ **4** ตัว ทำอย่างไ

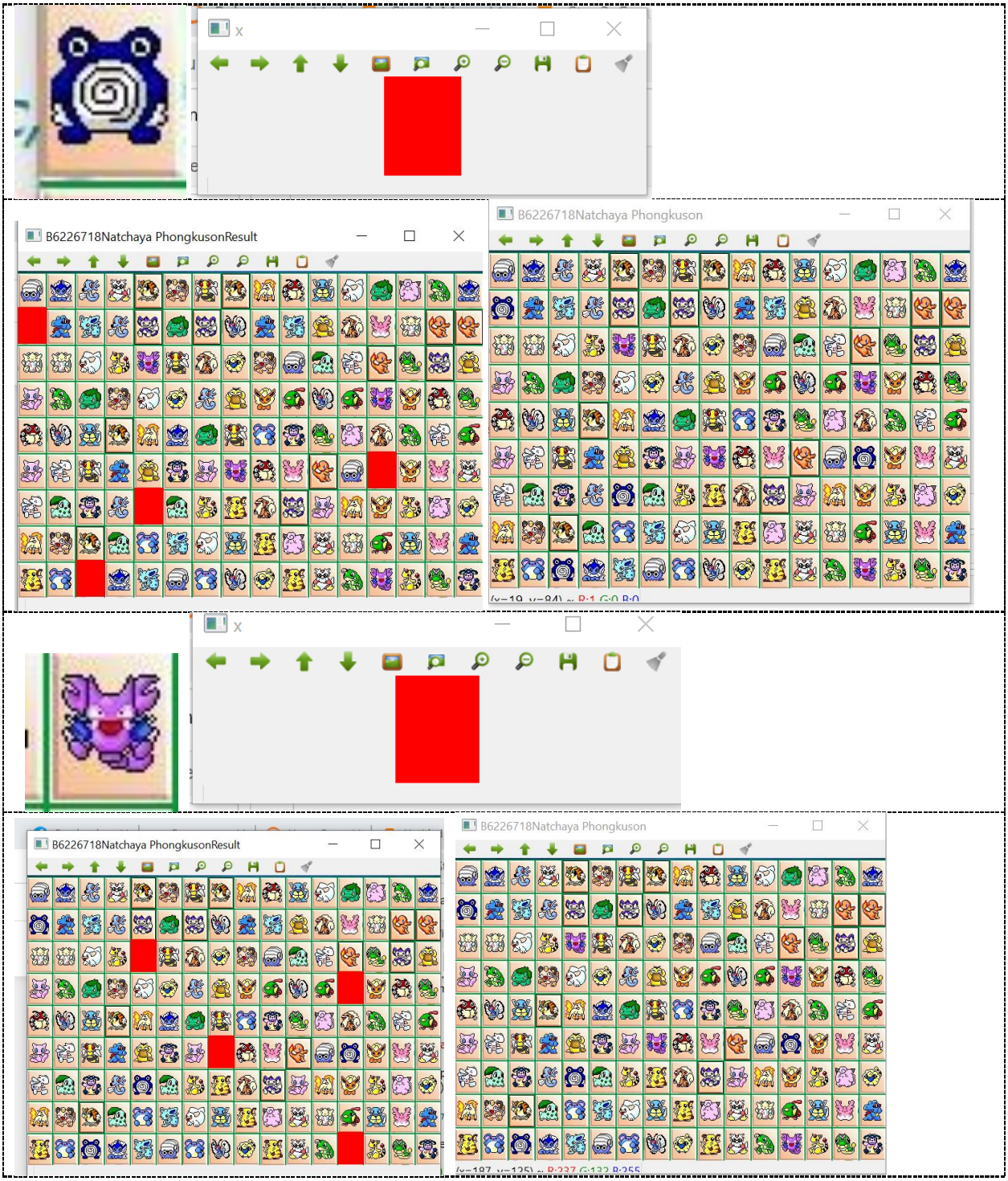
4. ทดสอบกับโจทย์ใหม่ที่สร้างเองจาก https://webofsolitaire.com/Play-Pikachu-Online-Best-Game-Pokemon-Go.html

```
## 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()
```

```python
## Step_2(Ok) CLick and Select Picture Step2 - Crop and Show
import cv2, math
import numpy as np
myName = 'B6226718Natchaya 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()
```

```
(array([104, 156, 260, 416], dtype=int64), array([167, 503, 293, 503], dtype=int64))
```


x
B6226718Natchaya PhongkusonResult
B6226718Natchaya Phongkuson
x
B6226718Natchaya PhongkusonResult
B6226718Natchaya Phongkuson