

## Project Development Phase

### Sprint 3 Source code

Date	12 November 2022
Team ID	PNT2022TMID45727
Project Name	VirtualEye-Life Guard for swimming pools to detect active drowning
Maximum Mark	8

```
import requests
import progressbar as pb
import os
import cv2
import numpy as np
import time

[5:36 pm, 12/11/2022] Revathi: def download_file(url, file_name, dest_dir):

    if not os.path.exists(dest_dir):
        os.makedirs(dest_dir)

    full_path_to_file = dest_dir + os.path.sep + file_name

    if os.path.exists(dest_dir + os.path.sep + file_name):
        return full_path_to_file

    print("Downloading " + file_name + " from " + url)

    try:
        r = requests.get(url, allow_redirects=True, stream=True)
    except:
        print("Could not establish connection. Download failed")
        return None

    file_size = int(r.headers['Content-Length'])
    chunk_size = 1024
    numBars = round(file_size / chunk_size)

    bar = pb.ProgressBar(maxval=numBars).start()

    if r.status_code != requests.codes.ok:
        print("Error occurred while downloading file")
        return None
```

```
count = 0
```

```
with open(full_path_to_file, 'wb') as file:  
    for chunk in r.iter_content(chunk_size=chunk_size):  
        file.write(chunk)  
        bar.update(count)  
        count +=1
```

```
    return full_path_to_file
```

```
[5:36 pm, 12/11/2022] Revathi: initialize = True
```

```
net = None
```

```
dest_dir = os.path.expanduser('~') + os.path.sep + '.cvlib' + os.path.sep + 'object_detection' +  
os.path.sep + 'yolo' + os.path.sep + 'yolov3'
```

```
classes = None
```

```
#colors are BGR instead of RGB in python
```

```
COLORS = [0,0,255], [255,0,0]
```

```
def populate_class_labels():
```

```
    #we are using a pre existent classifier which is more reliable and more efficient than one
```

```
    #we could make using only a laptop
```

```
    #The classifier should be downloaded automatically when you run this script
```

```
    class_file_name = 'yolov3_classes.txt'
```

```
    class_file_abs_path = dest_dir + os.path.sep + class_file_name
```

```
    url = 'https://github.com/Nico31415/Drowning-Detector/raw/master/yolov3.txt'
```

```
    if not os.path.exists(class_file_abs_path):
```

```
        download_file(url=...
```

```
[5:37 pm, 12/11/2022] Revathi: def get_output_layers(net):
```

```
    #the number of output layers in a neural network is the number of possible
```

```
    #things the network can detect, such as a person, a dog, a tie, a phone...
```

```
    layer_names = net.getLayerNames()
```

```
    output_layers = [layer_names[i[0] - 1] for i in net.getUnconnectedOutLayers()]
```

```
    return output_layers
```

```
def draw_bbox(img, bbox, labels, confidence, Drowning, write_conf=False):
```

```
    global COLORS
```

```
    global classes
```

```
    if classes is None:
```

```
        classes = populate_class_labels()
```

```
    for i, label in enumerate(labels):
```

```
        #if the person is drowning, the box will be drawn red instead of blue
```

```
        if label == 'person' and Drowning:
```

```

        color = COLORS[0]
        label = 'DROWNING'
    else:
        color = COLORS[1]

    if write_conf:
        label += ' ' + str(format(confidence[i] * 100, '.2f')) + '%'

    #you only need to points (the opposite corners) to draw a rectangle. These points
    #are stored in the variable bbox
    cv2.rectangle(img, (bbox[i][0],bbox[i][1]), (bbox[i][2],bbox[i][3]), color, 2)

    cv2.putText(img, label, (bbox[i][0],bbox[i][1]-10), cv2.FONT_HERSHEY_SIMPLEX, 0.5, color,
2)

    return img
def detect_common_objects(image, confidence=0.5, nms_thresh=0.3):

    Height, Width = image.shape[:2]
    scale = 0.00392

    global classes
    global dest_dir

    #all the weights and the neural network algorithm are already preconfigured
    #as we are using YOLO

    #this part of the script just downloads the YOLO files
    config_file_name = 'yolov3.cfg'
    config_file_abs_path = dest_dir + os.path.sep + config_file_name

    weights_file_name = 'yolov3.weights'
    weights_file_abs_path = dest_dir + os.path.sep + weights_file_name

    url = 'https://github.com/Nico31415/Drowning-Detector/raw/master/yolov3.cfg'

    if not os.path.exists(config_file_abs_path):
        download_file(url=url, file_name=config_file_name, dest_dir=dest_dir)

    url = 'https://pjreddie.com/media/files/yolov3.weights'

    if not os.path.exists(weights_file_abs_path):
        download_file(url=url, file_name=weights_file_name, dest_dir=dest_dir)

    global initialize
    global net

```

```

if initialize:
    classes = populate_class_labels()
    net = cv2.dnn.readNet(weights_file_abs_path, config_file_abs_path)
    initialize = False

blob = cv2.dnn.blobFromImage(image, scale, (416,416), (0,0,0), True, crop=False)

net.setInput(blob)

outs = net.forward(get_output_layers(net))

class_ids = []
confidences = []
boxes = []

for out in outs:
    for detection in out:
        scores = detection[5:]
        class_id = np.argmax(scores)
        max_conf = scores[class_id]
        if max_conf > confidence:
            center_x = int(detection[0] * Width)
            center_y = int(detection[1] * Height)
            w = int(detection[2] * Width)
            h = int(detection[3] * Height)
            x = center_x - w / 2
            y = center_y - h / 2
            class_ids.append(class_id)
            confidences.append(float(max_conf))
            boxes.append([x, y, w, h])

indices = cv2.dnn.NMSBoxes(boxes, confidences, confidence, nms_thresh)

bbox = []
label = []
conf = []

for i in indices:
    i = i[0]
    box = boxes[i]
    x = box[0]
    y = box[1]
    w = box[2]
    h = box[3]
    bbox.append([round(x), round(y), round(x+w), round(y+h)])
    label.append(str(classes[class_ids[i]]))
    conf.append(confidences[i])

```

```

    return bbox, label, conf
#for PiCamera
#from picamera Import PiCamera
#camera = PiCamera
#camera.start_preview()
# open webcam
webcam = cv2.VideoCapture(0)

if not webcam.isOpened():
    print("Could not open webcam")
    exit()

t0 = time.time() #gives time in seconds after 1970

#variable dcount stands for how many seconds the person has been standing still for
centre0 = np.zeros(2)
isDrowning = False

#this loop happens approximately every 1 second, so if a person doesn't move,
#or moves very little for 10seconds, we can say they are drowning

#loop through frames
while webcam.isOpened():

    # read frame from webcam
    status, frame = webcam.read()

    if not status:
        print("Could not read frame")
        exit()

    # apply object detection
    bbox, label, conf = cv.detect_common_objects(frame)
    #simplifying for only 1 person

    #s = (len(bbox), 2)

    if(len(bbox)>0):
        bbox0 = bbox[0]
        #centre = np.zeros(s)
        centre = [0,0]

        #for i in range(0, len(bbox)):
            #centre[i] =[(bbox[i][0]+bbox[i][2])/2,(bbox[i][1]+bbox[i][3])/2 ]

        centre =[(bbox0[0]+bbox0[2])/2,(bbox0[1]+bbox0[3])/2 ]

```

```

#make vertical and horizontal movement variables
hmov = abs(centre[0]-centre0[0])
vmov = abs(centre[1]-centre0[1])

#there is still need to tweek the threshold
#this threshold is for checking how much the centre has moved

x=time.time()

threshold = 10
if(hmov>threshold or vmov>threshold):
    print(x-t0, 's')
    t0 = time.time()
    isDrowning = False

else:

    print(x-t0, 's')
    if((time.time() - t0) > 10):
        isDrowning = True


#print('bounding box: ', bbox, 'label: ' label , 'confidence: ' conf[0], 'centre: ', centre)
#print(bbox,label ,conf, centre)
print('bbox: ', bbox, 'centre:', centre, 'centre0:', centre0)
print('Is he drowning: ', isDrowning)

centre0 = centre
# draw bounding box over detected objects

out = draw_bbox(frame, bbox, label, conf,isDrowning)

#print('Seconds since last epoch: ', time.time()-t0)

# display output
cv2.imshow("Real-time object detection", out)

# press "Q" to stop
if cv2.waitKey(1) & 0xFF == ord('q'):
    break

# release resources
webcam.release()
cv2.destroyAllWindows()

```