GRT INSTITUTE OF ENGINEERING AND TECHNOLOGY, TIRUTTANI - 631209

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

PROJECT TITLE

Traffic Management for Internet of Things (IoT)

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CODING:

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from tracking.centroidtracker import CentroidTracker
from tracking.trackableobject import TrackableObject
import tensornets as nets
import cv2
import numpy as np
import time
import dlib
import tensorflow.compat.v1 as tf
import os
import threading

def countVehicles(param):
        # param -> path of the video
        # list -> number of vehicles will be written in the list
        # index ->Index at which data has to be written

        tf.disable_v2_behavior()

        # Image size must be '416x416' as YoloV3 network expects that specific image size as
input
        img_size = 416
        inputs = tf.placeholder(tf.float32, [None, img_size, img_size, 3])
        model = nets.YOLOv3COCO(inputs, nets.Darknet19)

        ct = CentroidTracker(maxDisappeared=5, maxDistance=50) # Look into
'CentroidTracker' for further info about parameters
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        trackers = [] # List of all dlib trackers
        trackableObjects = {} # Dictionary of trackable objects containing object's ID and its' corresponding centroid/s
        skip_frames = 10 # Numbers of frames to skip from detecting
        confidence_level = 0.40 # The confidence level of a detection
        total = 0 # Total number of detected objects from classes of interest
        use_original_video_size_as_output_size = True # Shows original video as output and not the 416x416 image that is used as yolov3 input (NOTE: Detection still happens with 416x416 img size but the output is displayed in original video size if this parameter is True)

        video_path = os.getcwd() + param # "/videos/4.mp4"
        video_name = os.path.basename(video_path)

        # print("Loading video {video_path}...".format(video_path=video_path))
        if not os.path.exists(video_path):
                print("File does not exist. Exited.")
                exit()

        # YoloV3 detects 80 classes represented below
        all_classes = ["person", "bicycle", "car", "motorbike", "aeroplane", "bus", "train", "truck", \
                                "boat", "traffic light", "fire hydrant", "stop sign", "parking meter", "bench", \
                                "bird", "cat", "dog", "horse", "sheep", "cow", "elephant", "bear", "zebra", "giraffe", \
                                "backpack", "umbrella", "handbag", "tie", "suitcase", "frisbee", "skis", "snowboard", \
                                "sports ball", "kite", "baseball bat", "baseball glove", "skateboard", "surfboard", \
                                "tennis racket", "bottle", "wine glass", "cup", "fork", "knife", "spoon", "bowl", "banana", \
                                "apple", "sandwich", "orange", "broccoli", "carrot", "hot dog", "pizza", "donut", "cake", \
                                "chair", "sofa", "pottedplant", "bed", "diningtable", "toilet", "tvmonitor", "laptop", "mouse", \
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                                    "remote", "keyboard", "cell phone", "microwave", "oven",
"toaster", "sink", "refrigerator", \
                                    "book", "clock", "vase", "scissors", "teddy bear", "hair drier",
"toothbrush"]

        # Classes of interest (with their corresponding indexes for easier looping)
        classes = { 1 : 'bicycle', 2 : 'car', 3 : 'motorbike', 5 : 'bus', 7 : 'truck' }

        with tf.Session() as sess:
                sess.run(model.pretrained())
                cap = cv2.VideoCapture(video_path)

                # Get video size (just for log purposes)
                width =  int(cap.get(cv2.CAP_PROP_FRAME_WIDTH))
                height = int(cap.get(cv2.CAP_PROP_FRAME_HEIGHT))

                # Scale used for output window size and net size
                width_scale = 1
                height_scale = 1

                if use_original_video_size_as_output_size:
                        width_scale = width / img_size
                        height_scale = height / img_size

                def drawRectangleCV2(img, pt1, pt2, color, thickness,
width_scale=width_scale, height_scale=height_scale):
                        point1 = (int(pt1[0] * width_scale), int(pt1[1] * height_scale))
                        point2 = (int(pt2[0] * width_scale), int(pt2[1] * height_scale))
                        return cv2.rectangle(img, point1, point2, color, thickness)

                def drawTextCV2(img, text, pt, font, font_scale, color, lineType,
width_scale=width_scale, height_scale=height_scale):
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                pt = (int(pt[0] * width_scale), int(pt[1] * height_scale))
                cv2.putText(img, text, pt, font, font_scale, color, lineType)

        def drawCircleCV2(img, center, radius, color, thickness,
width_scale=width_scale, height_scale=height_scale):
                center = (int(center[0] * width_scale), int(center[1] * height_scale))
                cv2.circle(img, center, radius, color, thickness)

        # Python 3.5.6 does not support f-strings (next line will generate syntax error)
        #print(f'Loaded {video_path}. Width: {width}, Height: {height}")
        # print("Loaded {video_path}. Width: {width}, Height:
{height}".format(video_path=video_path, width=width, height=height))

        skipped_frames_counter = 0

        while(cap.isOpened()):
                try :
                        ret, frame = cap.read()
                        img = cv2.resize(frame, (img_size, img_size))
                except:
                        print(total_str)


                output_img = frame if use_original_video_size_as_output_size else
img

                tracker_rects = []

                if skipped_frames_counter == skip_frames:

                        # Detecting happens after number of frames have passes
specified by 'skip_frames' variable value
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                                # print("[DETECTING]")

                                trackers = []
                                skipped_frames_counter = 0 # reset counter

                                np_img = np.array(img).reshape(-1, img_size, img_size, 3)

                                start_time=time.time()
                                predictions = sess.run(model.preds, {inputs:
model.preprocess(np_img)})
                                # print("Detection took %s seconds" % (time.time() -
start_time))

                                # model.get_boxes returns a 80 element array containing
information about detected classes
                                # each element contains a list of detected boxes, confidence
level ...
                                detections = model.get_boxes(predictions, np_img.shape[1:3])
                                np_detections = np.array(detections)

                                # Loop only through classes we are interested in
                                for class_index in classes.keys():
                                        local_count = 0
                                        class_name = classes[class_index]

                                        # Loop through detected infos of a class we are
interested in
                                        for i in range(len(np_detections[class_index])):
                                                box = np_detections[class_index][i]

                                                if np_detections[class_index][i][4] >=
confidence_level:
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                                                    # print("Detected ", class_name, " with
confidence of ", np_detections[class_index][i][4])

                                                    local_count += 1

                                                    startX, startY, endX, endY = box[0],
box[1], box[2], box[3]

                                                    drawRectangleCV2(output_img, (startX,
startY), (endX, endY), (0, 255, 0), 1)

                                                    drawTextCV2(output_img, class_name,
(startX, startY), cv2.FONT_HERSHEY_SIMPLEX, .5, (0, 0, 255), 1)

                                                    # Construct a dlib rectangle object from
the bounding box coordinates and then start the dlib correlation

                                                    tracker = dlib.correlation_tracker()

                                                    rect = dlib.rectangle(int(startX),
int(startY), int(endX), int(endY))

                                                    tracker.start_track(img, rect)

                                                    # Add the tracker to our list of trackers
so we can utilize it during skip frames

                                                    trackers.append(tracker)

                                        # Write the total number of detected objects for a given
class on this frame

                                        # print(class_name," : ", local_count)

                            else:

                                        # If detection is not happening then track previously detected
objects (if any)

                                        # print("[TRACKING]")

                                        skipped_frames_counter += 1 # Increase the number frames for
which we did not use detection
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                # Loop through tracker, update each of them and display their
rectangle
                for tracker in trackers:
                        tracker.update(img)
                        pos = tracker.get_position()

                        # Unpack the position object
                        startX = int(pos.left())
                        startY = int(pos.top())
                        endX = int(pos.right())
                        endY = int(pos.bottom())

                        # Add the bounding box coordinates to the tracking
rectangles list
                        tracker_rects.append((startX, startY, endX, endY))

                        # Draw tracking rectangles
                        drawRectangleCV2(output_img, (startX, startY), (endX,
endY), (255, 0, 0), 1)



                # Use the centroid tracker to associate the (1) old object centroids with
(2) the newly computed object centroids
                objects = ct.update(tracker_rects)

                # Loop over the tracked objects
                for (objectID, centroid) in objects.items():
                        # Check to see if a trackable object exists for the current object
ID
                        to = trackableObjects.get(objectID, None)
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                    if to is None:
                        # If there is no existing trackable object, create one
                        to = TrackableObject(objectID, centroid)
                    else:
                        to.centroids.append(centroid)

                        # If the object has not been counted, count it and mark it as counted
                        if not to.counted:
                            total += 1
                            to.counted = True

                    # Store the trackable object in our dictionary
                    trackableObjects[objectID] = to

                    # Draw both the ID of the object and the centroid of the object on the output frame
                    object_id = "ID {}".format(objectID)
                    drawTextCV2(output_img, object_id, (centroid[0] - 10, centroid[1] - 10), cv2.FONT_HERSHEY_SIMPLEX, 0.5, (0, 255, 0), 1)
                    drawCircleCV2(output_img, (centroid[0], centroid[1]), 2, (0, 255, 0), -1)

                    # Display the total count so far
                    total_str = str(total)
                    drawTextCV2(output_img, total_str, (10, 30), cv2.FONT_HERSHEY_SIMPLEX, 0.6, (0, 0, 255), 2)

                # Display the current frame (with all annotations drawn up to this point)
                cv2.imshow(video_name, output_img)

                key = cv2.waitKey(1) & 0xFF
                if key  == ord('q'): # QUIT (exits)
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                    break
                elif key == ord('p'):
                    cv2.waitKey(0) # PAUSE (Enter any key to continue)

        cap.release()
        cv2.destroyAllWindows()
        print("Exited")

        """
        function which will run our code

        will write the number of veicles in the list provided
        """

if __name__ == "__main__":



        countVehicles("/videos/test.mp4")

        # Logic for setting the time for each signal
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OUTPUT: