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| VIHECLE DETECTION |
| Using YOLOV3 |

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Vehicle Detection and Segmentation using YOLOv3.

**Introduction**

This MATLAB script demonstrates how to perform vehicle detection and segmentation in a video using the YOLOv3 object detection network. The script reads in a video file, crops a region of interest (ROI) from each frame, and performs object detection using YOLOv3. The script then selects only vehicle objects from the detected objects, segments each vehicle object from the ROI, and overlays the segmented vehicles onto the original frame. The result is a video with vehicles segmented and highlighted in each frame.

**Requirements**

MATLAB R2021a or later

Deep Learning Toolbox

Computer Vision Toolbox

**Usage**

To use this script, follow these steps:

Install MATLAB and the required toolboxes if you haven't already.

Download the yolov3.cfg and yolov3.weights files from the official YOLOv3 website (https://pjreddie.com/darknet/yolo/).

Save the AHMED\_217380\_Vehicle\_Detection.m script and the yolov3.cfg and yolov3.weights files in the same directory.

Open the AHMED\_217380\_Vehicle\_Detection.m script in MATLAB.

Modify the video\_file\_path variable to specify the path to the video file you want to process.

Modify the roi variable to specify the ROI you want to crop from each frame.

Run the script.

**Explanation of Code**

The code can be broken down into the following steps:

Load the YOLOv3 object detection network.

config\_file\_name = 'yolov3.cfg';

weights\_file\_name = 'yolov3.weights';

config\_file\_path = fullfile(script\_directory, config\_file\_name);

weights\_file\_path = fullfile(script\_directory, weights\_file\_name);

net = deepLearningDetector(config\_file\_path, weights\_file\_path);

This code loads the YOLOv3 object detection network from the configuration and weights files. The deepLearningDetector function is used to load the network.

Read video file and define ROI.

video = VideoReader('Case1.wmv');

roi = [500 50 800 450];

This code reads in the video file and defines the ROI to crop from each frame. The VideoReader function is used to read the video file.

Loop through video frames and perform vehicle detection and segment them.

while hasFrame(video)

frame = readFrame(video);

frame\_roi = imcrop(frame, roi);

[bboxes, scores, labels] = detect(net, frame\_roi);

vehicle\_idx = strcmp(labels, 'car') | strcmp(labels, 'bus') | strcmp(labels, 'truck');

vehicle\_bboxes = bboxes(vehicle\_idx, :);

for i = 1:size(vehicle\_bboxes, 1)

bbox = vehicle\_bboxes(i, :);

vehicle\_roi = imcrop(frame\_roi, bbox);

vehicle\_gray = rgb2gray(vehicle\_roi);

vehicle\_bw = imbinarize(vehicle\_gray);

vehicle\_segmented = vehicle\_roi .\* uint8(vehicle\_bw);

frame\_roi(bbox(2):bbox(2)+bbox(4), bbox(1):bbox(1)+bbox(3), :) = vehicle\_segmented;

end

imshow(frame\_roi);

end

This code loops through each frame of the video, crops the ROI from the frame, performs object detection using YOLOv3, selects only vehicle objects from the detected objects, segments each.

**References**

1. **Redmon, J., & Farhadi, A. (2018). YOLOv3: An Incremental Improvement. arXiv preprint arXiv:1804.02767.** [**https://arxiv.org/abs/1804.02767**](https://arxiv.org/abs/1804.02767)
2. **MATLAB documentation on the deepLearningDetector function:** [**https://www.mathworks.com/help/driving/ref/deeplearningdetector.html**](https://www.mathworks.com/help/driving/ref/deeplearningdetector.html)
3. **MATLAB documentation on the VideoReader function:** [**https://www.mathworks.com/help/matlab/ref/videoreader.html**](https://www.mathworks.com/help/matlab/ref/videoreader.html)
4. **MATLAB documentation on the imcrop function:** [**https://www.mathworks.com/help/images/ref/imcrop.html**](https://www.mathworks.com/help/images/ref/imcrop.html)
5. **MATLAB documentation on the detect function:** [**https://www.mathworks.com/help/driving/ref/detect.html**](https://www.mathworks.com/help/driving/ref/detect.html)
6. **MATLAB documentation on the imbinarize function:** [**https://www.mathworks.com/help/images/ref/imbinarize.html**](https://www.mathworks.com/help/images/ref/imbinarize.html)
7. **MATLAB documentation on the rgb2gray function:** [**https://www.mathworks.com/help/matlab/ref/rgb2gray.html**](https://www.mathworks.com/help/matlab/ref/rgb2gray.html)