POTHOLE AND OBSTACLE DETECTOR

USING NVIDIA JETSON NANO

1. Introduction

The project aims to detect the pothole and obstacles on the road by using NVIDIA Jetson Nano to avoid any road accident and harm to the car. The pothole detector is to be mounted on a vehicle from the view of the driver for live pothole and obstacle detection. Obstacles in this project includes people, cars and trees.

Potholes are deep natural underground cave formed by the erosion of rock especially by the action of water as the result of fatigue cracking. There are so many potholes on the road which may harm the drivers and vehicles. It costs an arm and a leg to service the vehicle that have been damaged by the pothole. It can puncture and damage the tire's sidewall or belts, bend or crack the vehicle. Besides, pothole strike also can damage the shocks and harm the suspension of a car. Pothole has become one of the major problems that cause accident in Malaysia.

2. Objective

- To avoid road accidents caused by the potholes and obstacles on the road.
- To avoid the damage caused to the car especially when the car hits the pothole or any obstacles.
- To ensure people are comfortable during their journey.

3. Proposed System

This project is completed by using the object detection network using PyTorch. SSD-MobileNet architecture has been used in this project. The system able to show the location of the potholes and any obstacles that is present on the road. Interestingly, this system detects the pothole and obstacle in real time system.

4. Method Used

1. Run a docker container and cd to jetson-inference directory.

```
shafiqah@iqbal-desktop:~$ cd jetson-inference
shafiqah@iqbal-desktop:~/jetson-inference$ docker/run.sh
```

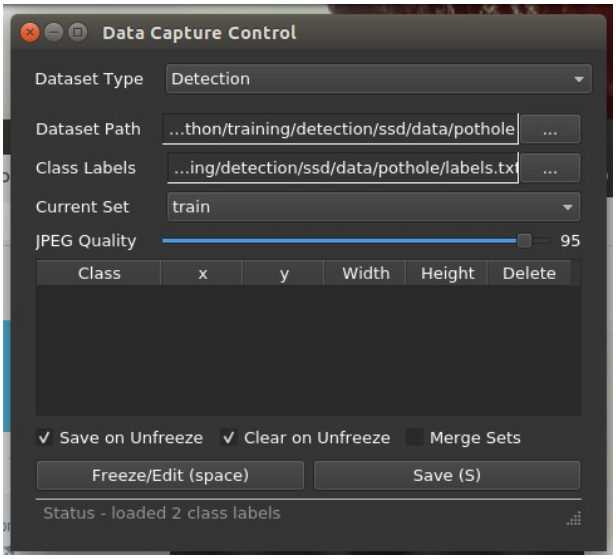
2. Use the docker run script and cd to python/training/detection/ssd. In this directory, all PyTorch scripts and utilities are located.

```
root@iqbal-desktop:/jetson-inference# cd python/training/detection/ssd
root@iqbal-desktop:/jetson-inference/python/training/detection/ssd#
```

3. Use camera-capture tool to capture the custom dataset. It has features to detect the datasets and bounding boxes as well.

```
root@iqbal-desktop:/jetson-inference/python/training/detection/ssd# camera-captu
re /dev/video0
```

4. Change the Dataset Type in Data Capture Control to detection. Fill up the Dataset Path and Class Labels to its respective browser. Capture pictures for train, validate and test by changing the Current Set dropdown arrow.



5. In the .txt file, label pothole and obstacle.
6. Start capturing the data by click on Freeze/Edit button. Create the bounding box on the picture once it is freeze. The data will be saved automatically on Unfreeze the camera.
7. Train the dataset with suitable epoch. In this case, I used 30 epochs to train my datasets.

```
root@iqbal-desktop:/jetson-inference/python/training/detection/ssd# python3 train_ssd
.py --dataset-type=voc --data=data/pothole --model-dir=models/pothole --batch-size=2
--workers=1 --epochs=30
```

8. Export the trained dataset from PyTorch to onnx.

```
root@iqbal-desktop:/jetson-inference/python/training/detection/ssd# python3 onnx_export
.py --model-dir=models/pothole
```

9. Test the data on USB Camera.

```
root@iqbal-desktop:/jetson-inference/python/training/detection/ssd# detectnet --model=models/pothole/ssd-mobilenet.onnx
 --labels=models/pothole/labels.txt --input-blob=input_0 --output-cvg=scores --output-bbox=boxes /dev/video0
```

5. Recommendation and Future Work

- Training more dataset and specify the type of obstacles present in the dataset.
- Detection of pothole during nighttime.
- Detection of the speed bump