On-the-Road Object Recognition for Autonomous Robotic Navigation using Deep Learning

Kamarulafizam Ismail, PhD, Universiti Teknologi Malaysia, Malaysia

Ng Ting Sheng, Universiti Teknologi Malaysia, Malaysia

Fazila Mohd Zawawi, PhD, Universiti Teknologi Malaysia, Malaysia

Abstract (300 word limit)

Robotic system with autonomous navigation ability is important nowadays as many robotic applications is designed with an expectation that it can work without any intervention by human being. Particularly in this work, the robot is designed to perform works related to street navigation (such as cleaning) in which it has to have the ability to recognize on-the-road objects and signs. Autonomous robotic navigation consists of two core technologies: computer vision and deep learning engine. In this work, the object detector is trained using two neural network models: The Single Shot MultiBox Detector (SSD) and the Faster RCNN. Five road signs were selected and the total of 3,000 images we gathered. The system is also trained with Common Object in Context (COCo) dataset. The models are both tested in personal laptop with Nvidia GeForce MX150 GPU, and then deployed into Raspberry Pi. The average processing time for SSD is 25.3 and 1.2 frame per second using computer GPU and raspberry PI respectively. While for RCNN, the computer GPU takes 3.2 frames per second and raspberry Pi takes 0.2 frames per second. The system is shown to be able to accurately recognize up to 97% of the traffic signs and objects.

Image

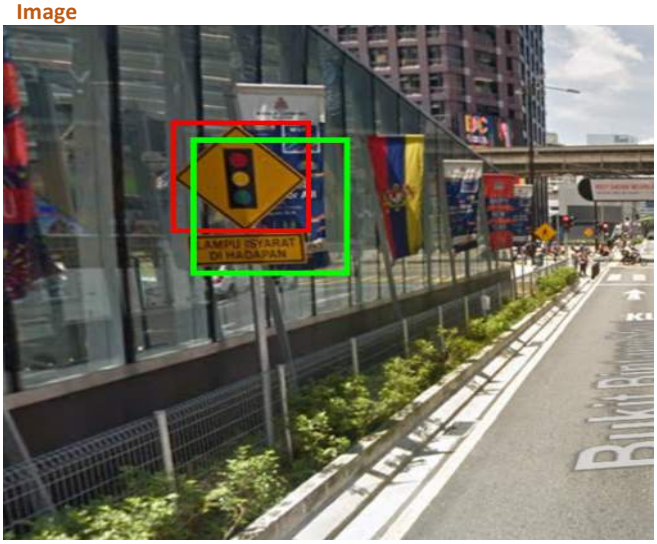


Figure 1 : Ground truth and detection boundaries.

Recent Publications (minimum 5)

1. K. Periyasamy, I. Kamarulafizam, M.Z. Fazila,Time Of Flight Improvement Of A Counter Rotating Drone, The Proceeding Of Mcme 2017, 2nd Multidisciplinary Of Mechanical Engineering 2017, Vol 2, Page: 165-171, UTM Malaysia.
2. S. Herman, I. Kamarulafizam, Single Camera Object Detection For Self-Driving Vehicle: A Review, International Conference On Sustainable Mobility, Kuala Lumpur, 2017.
3. M. Muralitharan, Syeh Ahmad Helmi, I. Kamarulafizam, A. Maaram, Developing Car Seat Ergonimocally Based On Anthropotmetry Measurement, Recar 2017 4thinternational Conference On Recent Advances In Automotive Engineering & Mobility Research, 2017, Kuala Lumpur.
4. S.H. Ng, A Review on Vibration Analysis of Seismocardiography, International Conference on Biomedical Engineering, 2018.
5. S. H Ng, I. Kamarulafizam, M. Mailah, Md Rizman, Cardiac Seismography Analysis using Accelerometer, International Graduate Conference on Engineering, Science and Humanities, UTM Johor, 2018.

Photograph



Biography

Dr Kamarulafizam has his expertise signal processing and passion in artificial intelligent and machine learning. He builds various application specific learning models for various platforms and improves the system operational performance. He has more than 10 year of experience working with various artificial intelligent and machine learning algorithms.

Email: kamarulafizam@utm.my

Notes/Comments: