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ABHINAV RAI

Work Experience

National University of Singapore – Research Assistant (Prof. Angela Yao) Sep 2019 – Present

Interactive Segmentation –

- Design an interactive segmentation network that extracts relevant objects from image using user clicks as guidance inputs. Used superpixels and object proposals to further improve the accuracy of the network.

Hi-Tech Robotic Systemz Ltd – Research Engineer June 2017 – June 2019

Forward Collision Warning (FCW) System:

Association and Tracking –

- Developed motion (i.e by Kalman Filter) and visual cues (i.e. Custom Local Binary Pattern (LBP)) for the obstacles in the environment and thus associating the detections over the frames.
- Designed and developed CUDA Implementation for the Custom LBP feature and its weighted histogram
- Implemented Kalman Filter and Hungarian Algorithm using SIMD instructions.

Depth Computation –

- Computed Disparity Map for Stereo camera using Block Matching algorithm. Implementation done using CUDA and SIMD.
- Computed Depth of obstacles using Pin-Hole Camera Model for Monocular camera.

Semantic Segmentation –

- Modified ResNet Architecture by adding Feature Pyramid Network for accelerated training and incremented accuracy.

Automatic Calibration –

- Implemented Focus of Expansion (Fuzzy FOE) algorithm for auto calibration of camera on a vehicle.

Joint Object Detection and Segmentation –

- Designed a neural network to simultaneously detect obstacles on the road and segment out the drivable region
- The network was inspired from SSD with MobileNet as base network for speed optimization.

Autonomous Driving Vehicle:

Object Detection (Traffic Light)–

- Designed a neural network architecture for object detection inspired from SSD and deployed it on Jetson TX1.

Dynamic Obstacle Avoidance for Autonomous Vehicle –

- Hands on experience with sensors such as, Velodyne (LIDAR), stereo cameras, GPS/INS etc.
- Used MoveBase package (provided by ROS) for vehicle navigation.

Technical Skills

- Programming Languages – C/C++, Python, PHP
- Experience with Ubuntu and Shell Scripts
- Parallel Programming using CUDA, SIMD instructions and OpenMP
- Image Processing and ML/DL Libraries such as OpenCV, Keras, Tensorflow and Caffe.
- Robot Operating System(ROS), PCL, Eigen library.

Education

- Master's in Artificial Intelligence – National University of Singapore (Expected Graduation Dec 2020)
- Bachelor of Technology (Computer Engineering) – Jamia Millia Islamia University, New Delhi (8.71 GPA)
- CBSE Senior Secondary Examination – 90.2% CBSE Secondary Examination – 9.4(CGPA)

Achievement

Smart India Hackathon 2017 April 2017

- Led the team that devised a solution for the Aviation Ministry to prevent the entry of drones into the air space or areas defined as restricted zones.
- Won the first prize in the hackathon event organized by the Government of India in which over 7000 teams participated.

Publications(Elsevier Journal)

- Detecting distraction of drivers using Convolutional Neural Network, Pattern Recognition Letters, 2018, ISSN 0167-8655, https://doi.org/10.1016/j.patrec.2017.12.023.

Open Source Contributions (Shogun Machine Learning Toolbox)

- Contributions include parallel code implementation using OpenMP and implemented the Scala Interface for the toolbox (https://github.com/shogun-toolbox/shogun/blob/develop/NEWS#L133).

Projects

Motor Control using Reinforcement Learning

- Used Deep-Learning based Reinforcement Learning Techniques to train a musculoskeletal model built using OpenSim to perform basic tasks such as standing on both or single leg, crouching etc.