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ABHINAV RAI

Work Experience

National University of Singapore –

Research Assistant (Prof Angela Yao) Sep 2019 – Aug 2020

Interactive Segmentation -

- Designed a state of the art interactive neural network to segment relevant object from the image using user clicks as guidance.
- Published the research in leading conferences such as BMVC 2020 and GCPR 2020.

Action Recognition in Videos-

- Formulated a Reprojection module to help boost the accuracy of Action Recognition models, especially for Low Shot Classes.

Teaching Assistant (Prof Angela Yao) Aug 2020 - Present

- Teaching Assistant for the course Computer Vision and Pattern Recognition (CS4243) at NUS.

Hi-Tech Robotic Systemz – 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.
- Implemented the Custom LBP feature and its weighted histogram using CUDA and Kalman and Hungarian using Eigen Library.

Depth Computation -

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

Automatic Calibration -

- Implemented Fuzzy Focus of Expansion (Fuzzy FOE) algorithm for auto extrinsic 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:

Dynamic Obstacle Avoidance for Autonomous Vehicle –

- Hands on experience on sensors such as, Velodyne (LIDAR), stereo cameras, GPS/INS etc.
- Worked on PCL (Point cloud library) for extracting and analyzing LIDAR data. Used MoveBase package (provided by ROS) for vehicle navigation.

Client Engagement:

- Gave product demos to leading OEMs like TATA and Daimler, helping understand the requirements of the industry and incorporating those into our product.

Technical Skills

- Programming Languages – C/C++, Python, Java, 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 PyTorch.
- Robot Operating System(ROS), PCL, Eigen library.

Education

- Master's in Artificial Intelligence – National University of Singapore Aug 2019 - Dec 2020
- Bachelor of Technology (Computer Engineering) – Jamia Millia Islamia University, New Delhi June 2013 - June 2017

Extra-Curricular

Smart India Hackathon Apr 2017

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

Publications

- Two-in-One Refinement for Interactive Segmentation, BMVC 2020
- Multi-Stage Fusion for One-Click Segmentation, GCPR 2020
- Detecting distraction of drivers using Convolutional Neural Network, Pattern Recognition Letters, 2018

Open Source Contributions(Shogun Machine Learning Toolbox)

- Contributions include parallel code implementation using OpenMP and implemented the Scala Interface for the toolbox.

Projects

Pixelate

- Devised an algorithm to solve a given maze using an overhead camera and then guide the bot through the correct path.

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.