Ganesh Iyer

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Education

Thakur College of Engineering and Technology, Affiliated to Mumbai University — *Mumbai, India*

B.E. in Electronics and Telecommunication Engineering — *Aug. 2012 - Aug. 2016*

- **Aggregate CGPA** - 8.11
- **Undergraduate Courses**
  Linear Algebra, Differential Calculus, Vector Algebra and Analytic Functions, Discrete Time Signal Processing, Image and Video Processing, Fuzzy Logic and Neural Networks, Operating Systems, Digital and Analog Electronics, Digital and Analog Communication, Computer Networks (TCP/IP), Mobile, Optical and Satellite Communication

Experience

Robotics Research Center, IIIT Hyderabad — *Hyderabad, India*

Research Assistant, under Prof. K Madhava Krishna — *July. 2017 - PRESENT*

- Exploring Deep Self-Supervised methods for Visual Odometry. Current approaches include:
  (i.) Training on short sequences of frames, with Conv-LSTM based architecture. Then, using Lie Algebra based constraints to compare groups of short sequential transforms with direct transformations of higher temporal shifts in $se(3)$ tangent space. Allows for self-supervised training with limited regularization.
  (ii.) Warping RGBD frames using Recurrent 3D Spatial Transformer Networks based on a Deep Convolutional Network prediction, then learning to minimize the resultant photometric error between the warped frame and the next temporal frame in the sequence.
- Working on automatic LIDAR-stereo camera (cross-sensor) calibration for self-driving vehicles using a Deep Convolutional Network based initialization and non-linear pose optimization.
- Working on the Road Sign Detection and Tracking Pipeline for the Mahindra RISE Driverless Car Challenge.

Swaayatt Robots — *Bhopal, India*

Research Intern and Developer, Artificial Intelligence and Computer Vision — *Aug. 2016 - June 2017*

- Developed a Deep Convolutional Siamese Network for generation of Stereo-Vision Depth Maps for Self-Driving Vehicular Navigation with semiglobal matching based post processing.
- Worked on a tight segmentation and tracking method for vehicles based on feature keypoints. Tracking using particle filters and multi-scale template matching, resulting in a contour hull of 2D structure and boundary of the vehicle.
- Created a Facial Point Cloud Processing package for tracking the face pose and central axis for RGBD based Advanced Driver Assistance System. Alignment using 3D FPFH features, Sampling Consensus and Iterative Closest Point. Assisted in Point Cloud planar segmentation and object cloud clustering.
- Self-Initiated Research on Generative Adversarial Networks to create photorealistic segmentation maps of vehicles, pedestrians etc. Generated maps would behave as a prior for rendering, simulation and adversarial training tasks.
- Implemented a ROS/LCM framework as a Middleware to integrate Vehicle Sensor Channels, Cameras and Actuators.

Projects

Telepresence Robot with Stereoscopic Vision — *http://y2u.be/YWjOEWO5lFs*

Final Year Project — *July 2015-April 2016*

- Developed a Telepresence platform capable of streaming a 3d immersive live video feed using Raspberry Pi Camera Module and UV4L library streamed onto a webpage
- UDP packets sent from smartphone directly used to control pan and tilt servos to higher accuracy.
- User Control of Robot from the keyboard using Pygame and embedded interface. Side-by-side stream is mirrored onto a Google Cardboard headset

Warehouse Management and Segregation System — *http://y2u.be/YmRXB2YnW48*

eYantra Robotics Competition 2014 — *Nov. 2014 - Mar. 2015*

- Implemented a small scale automated supply chain using order picking algorithms. Objects are collected, sorted or rejected based on a specified requirement (eg. color).
- These are then transported to the specified destination zone for collection or retrieval
- Development on Fire Bird V ATMEGA2560 Robotic Research Platform, Nex Robotics, IIT Bombay.

Mine Localization Robot

http://y2u.be/yTIguJIK16Y

Based on IJARCCE-Grid Based Robot Navigation using Priority Algorithm — *Dec. 2013 - Mar. 2014*

- Simulated a minesweeper robot for a small grid with mines represented by basic obstacles occupying various coordinates.
- Robot reaches the specified end position with information display: the total number of mines and location of each mine on the grid; usig Breadth First Search
- Development on Fire Bird V ATMEGA2560 Robotic Research Platform, Nex Robotics, IIT Bombay

Mini Projects

Semester based & Self-Initiated Projects

- Distributed Projection using Raspberry Pi: Replacement of Scheduled Laptops and Workstations of classrooms with Distributed Raspberry Pi projection system. Raspberry Pis in classrooms were connected to a central server. Proposed for schools in rural areas with no workstations for low cost computing.
- Monte-Carlo Tree Search: Tic-Tac-Toe using Monte-Carlo Tree Search and Upper Confidence Bounds.
- EEG Device with Neurofeedback: Instrumentation amplifier and filter based circuit with alpha wave feedback.

Background & Technical Skills

Research Interests

- **Machine Learning:** Neural Networks and Deep Learning, Reinforcement Learning, Optimization
  Interested in Online Learning and Integration of unique real-time Learning systems for Ubiquitous Robotics
- **Perception and Computer Vision:** 3D Geometry and Reconstruction, Structure from Motion, Visual Odometry, Stereo and Monocular Depth Inference, Semantic Understanding, Visual and Inertial SLAM

Achievements

- Recipient of IEDC(Innovation and Entrepreneurship Development Center) Grant, Department of Science & Technology, New Delhi for 2016-2020
- National Level in the Warehouse Management Theme, eYantra Robotics Competition (eYRC-2014)
- Recipient of Final Year Student Project Grant, Mumbai University
- Research and Development Cell Co-ordinator, TCET

Tools

- **Programming Languages:** C/C++, Python, MATLAB, Java
- **Libraries/Frameworks:** Numpy, OpenCV, Tensorflow, Theano, ROS (Robot Operating Systems), Point Cloud Library, Python/C API, LCM, Keras, ATMEL Studio, LaTeX