Shrutheesh Raman Iyer

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Robotics graduate student at the CSE Department, UC San Diego. Interested in navigation and manipulation. Research and internship experience in the fields of autonomous navigation, visual odometry and SLAM and robot teleoperation.

EDUCATION

University of California, San Diego (UCSD) Sep 2021 – Jun 2023
M.S. in Computer Science & Engineering | GPA: 4.0/4.0
Relevant Coursework: Introduction to Robotics, Math for Robotics, Sensing and Estimation, Computer Vision, ML 3D Geometry, Convex Optimization

R.V. College of Engineering, Bangalore (RVCE) Aug 2016 – Aug 2020
Bachelor of Engineering in Computer Science & Engineering | CGPA : 9.6/10.0

SKILLS

- *General Programming*: C/C++, Python, R, MATLAB
- *Software/Tools*: ROS, PyTorch, Moveit, CoppeliaSim, Bullet, PCL, OpenCV, Git, Tensorflow
- *Robotics Hardware*: experience with Fetch Robot, Raspberry Pi, Arduino, Pixhawk, Yaskawa Motomini

RESEARCH

Cognitive Robotics Lab, Contextual Robotics Institute, UCSD

Generalized Framework for Robot Tool Improvisation | Advisor: Henrik I. Christensen Oct 2021 – Present

- Ongoing Masters thesis project work on a planning framework for the robot MacGyver project
- Developing this task planning framework for robots to reason about tool usage using affordances.
- Also contributing to the service home robot project in the lab in terms of planning and integration of relevant components
- Implementing atomic actions (e.g. grasping, pushing) on the Fetch Robot using C++, Python, ROS and MoveIt

Robert Bosch Centre for Cyber-Physical Systems, Indian Institute of Science *Intern & Technical Associate*

Visual Odometry for Navigation | Advisor: Raghu Krishnapuram Oct 2019 – Apr 2021

- Research project to explore the challenges and applications of Visual Odometry
- Compared deep learning based feature extractors and traditional features for indoor and outdoor navigation tasks, and developed a data pipeline for synchronized collection of navigation information
- Published a comprehensive survey on advancements in monocular visual odometry. Used research findings to design an application for visual odometry in Advanced Driver Assistant System (ADAS). Publication under review

Teleoperation of Humanoid Robot | Advisor : Bharadwaj Amrutur, Raghu Krishnapuram Apr 2020 – Jan 2021

(Collaboration with Hanson Robotics and Tata Consultancy Services R&D)

- Research project to develop a teleoperated humanoid robotic nurse as part of ANA Xprize Avatar challenge which aims to deploy real-time senses in remote environments. https://aham-avatar.org/
- Worked on tracking human arm movements on the robot using optical trackers and VR technology. Developed an in-house data glove with finger tracking and haptic feedback for hand teleoperation
- Contributed to the entire teleoperation architecture including networking and inverse kinematics & control

Experience

Aurora Inc. *Perception Intern*

Long range Lidar Detection Jun 2022 – Sep 2022

- Improved long range lidar object detection for the self-driving autonomy stack
- Implemented range-view based object detection library for detection of objects >200m on all sides
- Skills: 3D Object Detection, Lidar Processing, Depth Processing, PyTorch, Python, C++

LightMetrics Pvt. Ltd. *Research Intern*

Neural Network Pruning & Automatic Report Generation May 2019 – Aug 2019 | Jun 2018 – Jul 2018

- Compare the performance of various techniques for compressing neural networks for real-time performance on edge compute by implementing filter-based and activation-based pruning algorithms.
- Evaluated their performance in terms of the speed, accuracy, and size of the neural networks. Achieved 6× speed-up and 12× size reduction with no significant decrease in accuracy for object detection

Projects

3D Reconstruction using SLAM *Mar 2022 – June 2022*

- In a team of 3, developed an end-to-end VR application for 3D reconstruction and VR rendering of archaeological sites with an inertial RGBD camera using SLAM. https://github.com/KolinGuo/maya-slam
- Primarily contributed to the development and interface of SLAM to obtain 6D pose trajectory
- Implemented using C++, Python, ROS, Unity and Docker; as part of Embedded Systems course CSE237D

Extended Kalman Filter and Particle Filter for SLAM *Jan 2022 – Mar 2022*

- Implememted Visual Intertial Simultaneous Localization and Mapping (SLAM) using Extended Kalman Filter (EKF), and Particle Filter (2 independent projects)
- EKF implemented using stereo camera observation model, and IMU measurement model to localize the autonomous robot
- Using Particle Filter, built a 2D occupancy grip map using Laser correlation observation model, and differential drive odometry. Performed texture mapping using RGB information.

Project Jatayu, RVCE *Computer Vision Head and Team Lead*

Unmanned Aerial Vehicles with Project Jatayu Aug 2017 – Aug 2020

- Created drones with Project Jatayu, the flagship autonomous unmanned aerial vehicle (UAV) team of the RVCE
- Enabled perception in noisy and poorly-lit environments by developing image and video processing protocols for drone footage, and compared ANNs for object recognition and localization
- Designed communication pipeline for transmission of data packets between UAV and the ground station
- Led the team in the AUVSI Student Unmanned Aerial Systems Competition 2019 (SUAS 2019), Maryland, USA

Conferences & Publications

1. **Shrutheesh Raman Iyer**, Sowmyarani CN, Ramakanthkumar P., "A Survey on Monocular Visual Odometry for Autonomous Vehicle Navigation", *International Journal of Advanced Science and Technology (IJAST)*, Vol. 29, No. 9s, Apr 2020, pp. 570-584. Link : sersc.org/journals/index.php/IJAST/article/view/13155

2. Parinith R. Iyer, **Shrutheesh Raman Iyer**, Raghavendran Ramesh, Anala M.R., and K.N. Subramanya, "Adaptive Real Time Traffic Prediction Using Deep Neural Networks", *IAES International Journal of Artificial Intelligence (IJ-AI)*, Vol. 8, No. 2, June 2019, pp. 107-119, ISSN: 2252-8938. Link : ijai.iaescore.com/index.php/IJAI/article/view/17497/pdf

Societies & Committees

Robograds, UCSD Jan 2022 – PRESENT

Academic Chair

- Member and later academic chair of Robograds, a graduate student organization for robotics students at UCSD
- Hosted biweekly talks on recent development in robotics by students and industry.

Project Jatayu, RVCE Aug 2017 – Aug 2020

Team Lead and Head of Computer Vision Subsystem

- Successfully planned and constructed custom unmanned aerial vehicles for autonomous tasks
- Successfully led a team of over 30 members at the AUVSI Student Unmanned Aerial Systems Competition 2019(SUAS 2019), held in Maryland, USA where we secured 27^{th} rank among 75 participating teams

RV QuizCorp, RVCE Aug 2016 – Aug 2020

Coordinator

- Host and organizer of Under The Peepal Tree (UTPT) in 2018, 2019 & 2020, one of Asia's largest quiz festivals
- Organized and participated in inter and intra-college quizzes with 100+ participants