GOKUL NARAYANAN SATHYA NARAYANAN

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EDUCATION

Worcester Polytechnic Institute, Massachusetts, USA   May 2020
Masters in Robotics   CGPA: 3.83/4

PSG College of Technology, Coimbatore, India   May 2016
Bachelor of Robotics and Automation Engineering CGPA: 8.94/10

COURSEWORK

Foundations of robotics, Introduction to AI, Field and Service Robots, Human Robot interaction, Robot Dynamics, Robot Control, Motion planning, Advanced Robot navigation, Reinforcement learning.

SKILLS

C++, Python, Robot Operating System, Pytorch, Gazebo, Solidworks, MATLAB, Git.

WORK EXPERIENCE

- **Advanced Robotics Intern, SIEMENS**, California, USA   August 2019 – Present
  Automating the sewing industry by integrating UR3 robot with sewing machines to stitch garments. Developed an automated system using ROS and OpenCV to estimate the pose of garments and pick and place them with suction gripper. Developed a prototype to fold garments and temporarily hold garments for stitching them together. Currently, building a state machine to manage the complete task flow from raw unstitched material to stitched garment.

- **Research Assistant, WPI**, Worcester, USA   October 2018 – July 2019
  Within-hand Manipulation Planning and Control Approaches for Variable Friction Fingers:
  Developed a modified A* motion planner for performing within hand manipulation of objects using Variable friction fingers. Developed visual servoing algorithm to solve the same task. Developed an hybrid method integrating the motion planner with an online visual servoing algorithm to handle the uncertainties while executing the motion. Evaluated the performance of various approaches to solve the task of manipulating a cube within hand. Submitted the paper for **ICARA 2020**.

- **Robot Software Engineer**, **ASIMOV Robotics**, Kerala, India   January 2016 – May 2018
  Intelligent Robot Assistant(IRA):
  Deployed India's first mobile robot 'Intelligent Robot Assistant (IRA) for HDFC bank, India. Developed the top level task planner for the robot using state machines. Worked on localization and path planners in ROS and C++ to make the robot navigate in the indoor environment avoiding obstacles. Developed backend code for the robot user interface system. Evaluated the human-robot interaction aspect by conducting user study in the actual market and then improved the interaction by introducing emotions to the robot API.

  SAYABOT – A service robot for hospitals:
  Built a nursing robot to solve the nursing crisis(nurse to patient ratio -1:40) in Indian hospitals. Worked on the AMCL and SLAM packages of the nursing robot to navigate smoothly in a hospital like environment to deliver medications to patients. Implemented speech recognition engine to interact with the patients and record their conversations to better diagnose the patient's illness.

  CRANIOBOT – Craniofacial Surgical Robot:
  This project was funded by Biotechnology Industry Research Assistance Council, India. Built a 7 DOF manipulator with surgical tool at the end effector. Developed the low level controllers for controlling the actuators of the robot using ROS. Developed waypoint navigation for the surgical robot to follow the path defined by a doctor using a custom UI.

  Teleoperation of mobile manipulator:
  Developed the teleoperation interface to control robot using a joystick interface. Developed modules for the manipulator to perform position and orientation constrained tasks in cartesian and cylindrical space.

RESEARCH EXPERIENCE

- **Reinforcement learning for within hand manipulation** Advisor: Dr. Berk Calli   September 2019 - Present
  Developing a learning algorithm to perform within hand manipulation of objects using variable friction finger gripper system. Currently, the conventional motion planners can solve the task, given the model of the object and the system. This pose a serious limitation as modelling the interaction of the asymmetrical objects with the gripper system is hard. So, learning algorithm should overcome this limitation by approximating the model and policy at the same time. This is a direct extension of this work **"*Variable-Friction Finger Surfaces to enable Within-Hand Manipulation via gripping and sliding by Adam J. Spiers, Yale University (RA Letters18)*"**

- **High level task planning for loco-manipulation task**   Advisor: Dr. Jane Li   August 2018 – April 2019
  The aim of the project was to make the robots plan in high level to solve the loco-manipulation task of picking objects on a table and placing it inside a bin. In order to achieve this, the state-space was considered as an Semi-Markov Decision Process and then low level sensory data are abstracted into high-level symbols using PDDL language. Data was collected from humans solving the task in a virtual game environment. From this data, the symbols were automatically generated using machine learning algorithms. Then, developed a task planning framework to solve the task using the symbols which can also address the execution failures by dynamic re-planning. This is a direct extension of the work **"*From Skills to Symbols: Learning Symbolic Representations for Abstract High-Level Planning by George Konidaris, Brown University (JAIR 18)*"**

PROJECTS

- **Implementation of EKF based SLAM for mobile robots**   January 2019 – April 2019
  Developed localization and mapping algorithm for a low cost indoor mobile robot using 2D LIDAR. Sensor data obtained from the LIDAR were used to extract landmarks from the environment. Based on the observed landmarks and the robot odometry data, the location of the robot was estimated using an Extended Kalman Filter (EKF).
- **Comparison of trajectory tracking controllers for UR5 manipulator**   January 2019-April 2019
  The aim of the project was to compare the performance of various trajectory tracking controllers such as Inverse-dynamic controller, Passivity based controller and Robust feedback linearization controller on the UR5 manipulator in MATLAB using a benchmark trajectory set.
- **Teleoperation interface for ATLAS robot using Razer Hydra controller**   August 2018-November 2018
  Mapped the Razer Hydra controller with the ATLAS robot arm. Implemented IK solver for the ATLAS robot arm in MATLAB. Developed the teleoperation interface to communicate Razer Hydra with the ATLAS robot in ROS. Tested the controller on the real ATLAS robot to draw various shapes defined using the Razer Hydra controller.