Allan Garcia

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EDUCATION

Northwestern University **Evanston, IL**
M.S in Robotics December 2023

Boston University **Boston, MA**
B.S in Biomedical Engineering May 2022

SKILLS

Programming Languages: C++, Python, C, MATLAB
Robotics: Robot Operating System (ROS 2/ROS), SLAM, Inverse/Forward Kinematics and Dyamics, Motion Planning, Gazebo, Moveit, Computer Vision, Machine Learning, CoppeliaSim
Software: Git, Linux, Bash, CMake, Docker, Unit Testing, PyTorch, Keras, Real Time Operating Systems (Zephyr), Point Cloud Library (PCL), MeshLab
Hardware: Circuit Design, CAD/SolidWorks, PCB Design (KiCAD), Teensy 4.x

WORK EXPERIENCE

R&D Engineering Intern **Weston FL**
Stryker, Robotic Platform Accuracy and Registration June 2023 - August 2023

- Designed and built a physical system that tests the cutting accuracy of the Mako surgical robotic platform
- Wrote programs in MATLAB for control of the dynamic test setup and for performing data analysis
- Built a new surgical probe prototype that will allow for more accurate bone registration for the robot

Software Research Intern, Image Guided Surgery **Boston, MA**
Brigham and Women's Hospital, Department of Radiology June 2021 - August 2021

- Enhanced 3D mesh registration from MRI scans using Python Point Cloud Library's ICP methods
- Utilized the point cloud library for segmentation and registration to optimize 3D mesh processing from MRI scans

SELECTED PROJECTS

Simultaneous Localization and Mapping (SLAM) from Scratch (ROS 2, C++) January 2023 - March 2023

- Developed an Extended Kalman Filter SLAM pipeline library from scratch for use on a differential drive wheeled robot
- Wrote C++ libraries for differential drive inverse and forward kinematics, rigid body transformations, and sensor fusion
- Utilized lidar data, odometry, and data association to evaluate the pipeline in a simulated environment

Adroit Robotic Arm Teleoperation (Python, ROS, PyTorch) January 2023 - March 2023

- Created a ROS motion control package for teleoperation of an Adroit Robotic Arm using EMG/ IMU signals
- Integrated a convolutional neural network gesture recognition machine learning model to interpret user hand gestures
- Simulated real time movements of the arm and IMU in Rviz for integration testing

Prosthetic Elbow for Balance Adjustment (C, RTOS) March 2023 - December 2023

- Designed a prosthetic elbow that maps real time arm swing movements to a corresponding motor torque
- Created the embedded software stack using C with the Zephyr real time operating system (RTOS)
- Implemented a torque control algorithm that utilizes a PID controller to output calculated motor torque commands
- Developed a walking speed detection algorithm using filtered IMU data for real time motion monitoring

Franka Robotic Arm Motion Planning (Python, ROS 2) October 2022 - December 2022

- Wrote a ROS 2 package that allows a 7 DOF robot arm to autonomously prepare a cup of hot chocolate
- Created a Python API for ROS2 MoveIt for trajectory planning and execution

KUKA YouBot Motion Planning Simulation (Python, CoppeliaSim) October 2022 - December 2022

- Developed a motion planner for the robot in Python using forward/inverse kinematics and PID control
- Tested different pick and place trajectories in simulation using CoppeliaSim

Robotic Arm Pen Tracker (Python, OpenCV) September 2022

- Implemented an object detection and tracking algorithm using the OpenCV Python library
- Employed robot kinematic libraries for px100 arm to grasp and manipulate pen within its workspace