NISHANT DOSHI

36 John Street, Worcester, MA 01609 | 774-502-2954 | ndoshi@wpi.edu

OBJECTIVE

Summer Internship in Robot Navigation.

EDUCATION

Worcester Polytechnic Institute (WPI), Worcester, MA **May 2019**
Master of Science in Robotics Engineering, GPA: 4.0
Courses: Foundation of Robotics, Robot Dynamics, Robot Control, Deep Reinforcement Learning, Motion Planning.

National Institute of Technology (NITK), Karnataka, India **May 2015**
Bachelor of Technology in Mechanical Engineering, GPA: 7.75/10

PROJECTS

Understanding SLAM in mobile robots, WPI **Current**

- The objective is to understand the working and end to end implementation of SLAM in mobile robots by actually implementing different variations of SLAM in a turtlebot.

Reactive planning in a Hidden MDP given malicious demonstrations, WPI **Current**

- The objective is infer the policy of the environment given the possibility that it can perform random actions so as to device a counter-policy for the agent.

Autonomous Drone Navigation in Dynamic Environment, WPI **August 2017-December 2017**

- The objective was to achieve a safe navigation of a quadcopter in an uncertain environment using visual cues.
- The quadcopter agent was trained to avoid obstacles. The learnt control model was then coupled with a go to goal controller to enable autonomous navigation.
- Implemented DQN, DDQN and Policy gradient algorithm libraries to compare their performance in the obstacle avoidance task
- Designed a training arena and implemented control macros and wrappers for seamless communication of our libraries with AirSim.
- Both DQN and DDQN took a long time to train but were able to learn a general obstacle avoidance policy. Policy Gradient approach was able to learn the policy faster but wasn't tested thoroughly for generalization

Set point control of Handle robot modelled as a Triple Pendulum, WPI **August 2017-December 2017**

- The Handle robot was considered as a triple pendulum mounted on a mobile base and was subjected to PID and LQR control to observe and optimize it's performance in setpoint position and velocity control.
- Derived the dynamical model, implemented the controllers and justified the difference in performance between the controllers.
- The resulting LQR controller performance was decent for set point control with external disturbances for small deviations around the operating point. A degradation in performance was observed for large disturbances applied to the system. The robustness of the controller was further validated by modeling input and estimation noise into the system and also by testing for stability when external impulses were applied.

Game AI Development **February 2017-September 2017**

- Developed an AI for 2048 game using Deep Reinforcement Learning in Python to test its performance against the current search based AI algorithms.
- Implemented Deep Q Networks using Keras with additional techniques like Experience replay, reward heuristics and shaping function for better performance.
- Though the model required long period of training, it performed decently but not better than search based AI. The conventional Q learning algorithm and the network architecture need to be finetuned according to the application to achieve comparable results. Better methods like Hierarchical Reinforcement Learning are available for sparse reward scenarios such as this game.

Modelling of Optical Image Stabilization System (OIS), NITK **December 2014-April 2015**

- Developed and analyzed a model of a magnetically actuated OIS to compensate for trembling of human hand during photography as a part of a team.
- Formulated the mathematical model and linearized it to model it in LabView. The actuation source was assumed to be a solenoid with an oscillating current of various input frequencies. These frequencies were extracted from a simulated accelerometer after applying Fast Fourier Transform to the accelerometer readings.
- The result demonstrated a fair amount of stability in the simulated camera module with some minor jitters due to unaccounted noise. A combination of frequencies further improved performance as it took into account many frequencies over a particular threshold. A more comprehensive noise model would further increase the stabilizing performance.

MEMS system design of vibratory gyroscope, NITK **December 2013-March 2014**

- Developed and analyzed a model of an electrostatically actuated X/Y vibratory gyroscope to assess the challenges while designing a MEMS Gyroscope.
- Developed a parametric model of the gyroscope and analyzed its stability in Simulink and its design in COMSOL Multiphysics for different values of parameters.
- Quadrature errors were eliminated by adopting a design that separated the X and Y modes of spring forces.
- The set of parameters obtained demonstrated a fairly accurate read of angular velocity within the desired range despite some errors due to approximation of non-linearities. An actual physical Gyroscope would also have errors due to parasitic capacitance and residual stresses which were unaccounted for in the simulated model. These errors can be minimized by selecting an appropriate manufacturing process.

Mechatronic system design project on Smart Wipers, NITK **December 2012-May 2013**

- Developed an automatic wiper system based on capacitive sensor to test its performance against widely used optical sensor as a part of team.
- The rain would change the fringe field capacitance of the sensor which would be registered as the sensor was connected as a part of full bridge. This magnitude of change was used to drive the wiper motor at appropriate speed.
- The sensor required a careful calibration to detect rain and also would suffer from ghost triggers due to external physical and electromagnetic disturbances. But it required less power and proved to be more cost effective as compared to the more prominent optical sensors.

WORK EXPERIENCE

Associate Software Engineer, Cadsol Pvt. Ltd, Mumbai, India **Aug 2016-April 2017**

- Developed a C# application to enable hand gesture based interaction in SEIMENS Solidedge using Leap Motion.
- Automated computer aided design of mechanical Cams by developing a C# application to learn sample cam profiles and output best fit cam profiles within 6% error for random user input, thus reducing design time by 80%.
- Developed a .NET application to automate computer aided design of pharmaceutical blister packs. Implemented genetic algorithm for design parameter search.

Graduate Engineer Trainee, ACG Pharmapack Pvt. Ltd, Shirwal, India **July 2015-June 2016**

- Conducted man and motion studies, surveys and experiments to determine the process bottlenecks, feasibility and design of schematics for automating packing and palletizing line.
- Reduced coating machine downtime by 8% by revising maintenance schedules, conducting training for revised Standard Operating Procedures and implementing new PVDC tray design.

SKILLS

Programming Languages: Python, C/C++, C#, Java
Software Tools and services: ROS, CATIA, Autodesk Inventor, COMSOL Multiphysics, MATLAB/Simulink, GitHub, JIRA, LaTeX, Microsoft Office Suite
Platforms: Linux, Windows, Android