NALIN BENDAPUDI

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EDUCATION

University of Michigan - Ann Arbor September 2019 - Dec 2020
Master of Sciences in Robotics, GPA:3.98/4 Ann Arbor, MI

Indian Institute of Technology - Delhi July 2013 - May 2017
Bachelor of Technology in Mechanical Engineering (Minor in Computer Science), GPA: 8.91/10 New Delhi, India

RELEVANT COURSES AND SKILLS

Coursework	Self-driving Vehicles, Robotic Systems Lab, Robot Modelling & Control, Mobile Robotics (SLAM), Deep Learning for Vision, Robot Operating Systems, Data Structures & Algorithms, Machine Learning
Skills	C++, Python (Pytorch, Tensorflow), MATLAB, Simulink, R, Java, Javascript, ROS, CARLA, Linux

EXPERIENCE

BOSCH Engineering and Business Solutions Aug 2017 - May 2019
Senior Engineer, Automation Team Bangalore, India

- Analyzed trend and seasonality of time series data, and developed applications for anomaly detection and forecasting of automobile metrics. These modules, used across nine departments in Mercedes-Benz, have minimum accuracy of 92.7%
- Utilized deep-NLP on unstructured error logs to develop a recommendation engine to identify potential high-impact issues
- Applied unsupervised learning to associations among data that helped reduce resolution & root-cause analysis time by 40%

PROJECTS

Simulation and Failure-mode Detection of Autonomous Vehicle Software Aug 2020 - Present

- Integrated Comma AI's OpenPilot self-driving code and the CARLA simulator with tunable environment parameters
- Generated rare-event scenarios by selecting initial conditions and disturbances to find failure modes of the AI system

Trajectory Optimization using Discrete Model Predictive Control Feb 2020 - Apr 2020

- Built a PID controller to drive a non-linear vehicle model on Texas Austin's F1 circuit to achieve a track-time of 92.1s
- Designed a model predictive controller for a linearized trajectory to achieve safe tracking even with sensor noise of 5%
- Solved a non-linear optimization problem to calculate control inputs to track an obstacle course with 0% collision rate

Visual Inertial SLAM with Invariant Extended Kalman Filtering Feb 2020 - Apr 2020

- Utilized invariant kalman filter to propagate IMU pose uncertainty and parallelly maintained the visual correction algorithm
- Improved OpenVINS code by substituting the ORB feature extractor with deep-learning based SuperPoint visual descriptor

Occupancy-Grid SLAM for Autonomous Ground Robot Sep 2019 - Dec 2019

- Implemented particle filter localization using 2D-LiDAR sensor and an efficient mapping algorithm on a 40,000 cell grid
- Incorporated an exploration strategy to search for new frontiers in the SLAM map and reach them using A⋆ path planning

Linear Quadratic Regulator for Wheeled Inverted Pendulum Sep 2019 - Dec 2019

- Formulated state space model of a 2-DOF mobile inverted pendulum by linearizing the Lagrangian dynamics of the system
- Combined balancing LQ regulator, in-plane angle stabilizer and a tracking controller to limit position error to 0.05m

Computer Vision assisted Pick & Place Robotic Arm and Gripper Sep 2019 - Dec 2019

- Employed Kinnect depth sensor and RGB camera to implement block detection algorithm with a mean accuracy of 98%
- Developed a trajectory module to generate smooth and safe paths by integrating obstacle avoidance with path-smoothing

Computed Torque Controller for Wheeled Mobile Robot Jan 2017 - Aug 2017
This work was published in 15th *IEEE International Workshop on Advanced Motion Control (AMC-2018)*

- Devised a novel three-stage controller which included a Lyapunov stability based controller on position error, a PID controller applied on the robot velocity, and a non-linear compensator to calculate motor torques using inverse dynamics
- Simulated the controller for a system with modelling uncertainties & disturbances; demonstrated max tracking error is 4cm

Off-line Programming and Simulation Module for Industrial Robot Jul 2016 - Dec 2016

- Developed a kinematic simulator for KR5-arc robot on MATLAB SimMechanics using STL files & DH parameters
- Built an automatic KUKA Robot Language code generator to translate the simulated motion to robot motion