Niraj Basnet

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Technical Skills

Robotics: Motion planning, Trajectory Optimization, Controls, Data structures and algorithms, AI, Optimization, Mapping, Localization, Sensor Fusion, Machine learning, Deep learning, Reinforcement Learning
Programming Languages: C/C++, Python, MATLAB
Software Frameworks: ROS, Gazebo, CARLA, OMPL, Tensorflow, Pytorch, OpenCV, Git, Jenkins, Docker, Linux

Experience

Graduate Research Assistant, *Oregon State University* Jun 2019 – Dec 2020

- Developed motion planning and controls stack of OSU team for autonomous F1/10 cars racing competition.
- Engineered a real-time(30Hz) model predictive contouring controller for generating and tracking locally optimal, high speed obstacle-avoiding racing trajectories, using kinematic and dynamic model of the car.
- Automated racetrack mapping and its relevant data extraction and pre-processing for autonomous cars racing.
- Adapted an evolutionary algorithm(CMA-ES) for raceline-optimization of a given racetrack.
- Developed a real-time(40Hz) hierarchical motion planner with autonomous overtaking feature.
- Evaluated trajectory tracking performance of various control strategies like PID, LQR, MPC and Pure Pursuit.

Graduate Teaching Assistant, *Oregon State University* Sep 2018 – May 2019

- Conducted various workshops on version control, interfacing sensors, ROS, etc. as an IOT community coordinator to garner students' interest and achieved membership boost of almost 20%.
- Provided course support and assisted in development of new course material for Autonomous car racing course.

Robotics Software Engineer and Co-founder, *Paaila Technology, Nepal* Dec 2016 – Sep 2018

- Led a team of 4 engineers for development of motion planning and control stack, collaborated with mechanical and electrical hardware teams, to create initial prototypes for waiter and service robot within 9 months.
- Deployed a multi-robot global path planner to plan collision-free paths within 1 second for waiter robots.
- Implemented and compared Extended Kalman filter and Unscented Kalman filter for indoor pedestrian tracking.
- Improved integration testing of various components of navigation stack by running simulation tests on dockerized Gazebo, thereby reducing the code deployment time by over 30%.

Projects

Motion planning for Self-driving cars in city traffic using Carla simulator | *Python, Carla, ROS* Oct 2020

- Integrated finite state machine based behaviour planner and conformal lattice planner to plan collision-free trajectories for self-driving car in city traffic.

Mapping, Localization and Motion planning algorithms | *C++, Python, ROS* Feb 2019 – Jun 2020

- Coded various planning algorithms like A*, Hybrid A*, PRM, RRT, RRT*, potential fields, etc.
- Implemented occupancy grid mapping and particle filter(Monte Carlo Localization) on simulated robots.

Deep Cross-Entropy Method based planner | *Python, Pytorch* Jan 2020

- Trained a Deep Cross-Entropy Method-based planner that uses the learnt state-space model of the environment to get feasible motion plans for a car driving in a track.

Autonomous wheelchair navigation in an indoor environment | *C++, Python, Arduino, ROS* Jul 2016

- Hands-on experience of building an autonomous wheelchair by adding sensors, motors and developing a light-weight navigation stack. Automated mapping of indoor environment by using frontier-based exploration.

Autonomous badminton playing robots | *C++, Python, Arduino, ROS* Jul 2015

- Tuned a holonomic drive controller(PID) and coded shuttlecock trajectory predictor for badminton playing robot.
- Awarded Best Idea and Best Engineering awards in ABU-Robocon, an International robotics competition.

Publication

- **N. Basnet** and H. Abbas, "Logical signal processing: A fourier analysis of temporal logic," in *Runtime Verification*, (Cham),pp. 359–382, Springer International Publishing, 2020. **(Best paper nominee)**

Education

Oregon State University Corvallis, OR
Masters of Science in Computer Science, GPA: 3.71 *Sep 2018 – Dec 2020*

Institute of Engineering, Pulchowk Campus Lalitpur, Nepal
Bachelors in Electronics and Communication Engineering, GPA: 3.8 *Sep 2012 – Sep 2016*