

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(upto 8m/s) obstacle-avoiding racing trajectories, using kinematic and dynamic model of the car.
- Developed a real-time(40Hz) hierarchical motion planner with autonomous overtaking feature.
- Automated racetrack mapping and its relevant data extraction and pre-processing for autonomous cars racing, thereby slashing preparation time before the race, by almost half.
- Adapted an evolutionary algorithm(CMA-ES) for raceline-optimization of a given racetrack.
- 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 robots 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(FSM) 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.

Multi-robot task allocation for warehouse environment | Python, Pytorch Dec 2018

- Explored cooperative co-evolutionary algorithms for distributed task-allocation in a warehouse environment.
- Attained a 7% improvement over the centralized sequential task allocation approach.

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. Accomplished best final year undergraduate project award.

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

- Tuned PID controller for holonomic control of robot and also coded shuttlecock trajectory predictor.
- Achieved Best Idea and Mabuchi Motor 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(OSU) Corvallis, OR
Masters of Science in Computer Science, GPA: 3.71 Sep 2018 – Dec 2020

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