WEIYI TANG

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EDUCATION

University of Pennsylvania ***Philadelphia, PA*** *(Aug 2018-May 2020)*

Master of Science in Engineering: Electrical Engineering, GPA: 3.97/4.0

Relative courses: Autonomous Racing, Model Predictive Control, Control System for Robotics, Deep Learning, Machine Perception, Reinforcement Learning.

Hunan University ***Changsha, China*** *(Sep 2014-Jun 2018)*

Bachelor of Engineering: Electrical Engineering and Automation, GPA: 3.6/4.0 (Rank: 11.6%)

Relative courses: Principle of Automatic Control, Introduction to Computer Science, Programming Practice.

Awards:

Outstanding graduate of Hunan University *Jun 2018*

Excellent graduation thesis of Hunan University *Jun 2018*

The Second-class Scholarship (top 15%) *2015-2017*

RESEARCH

Kod-Lab, UPenn GRASP LAB, Daniel E. Koditschek Group's Research Assistant ***Philadelphia, PA*** *(Apr 2019-Present)*

- Used multiple VL53L0X (distance sensor) to measure the velocity of Minitaur leg.
- Used SolidWorks to design ODrive controller/motor/encoder mounts, then made them via 3D printer, next assembled different parts together to have a 2 DoF ODrive based Minitaur hopper. Finally utilized C++ with Arduino IDE to control this hopper to continue jumping in a vertical orbit.
- Joined NSF project "Collaborative Robotic Systems for Geosciences Field Research" and operated X-Rhex robot with Minitaur leg which was used as force sensor to inter into soil to provide preliminary map of soil erodibility.
- (On going) Applied Reinforcement Learning to a single leg of a direct-drive robot like Minitaur to learn a reactive controller. The Observations are body position, body velocity, toe position and toe position, and the actions are leg stiffness and leg damping. SAC was used as the learning model and reward function was created to make hopper jump in different ground (ground can be seen as a spring, so different ground has different stiffness and damping).

Daniilidis Group, UPenn GRASP LAB, Robot Vision Project Researcher ***Philadelphia, PA*** *(Feb 2020-Present)*

- (On going) Utilized RoboNet to allow manipulation to learn dynamics models and inverse model via observation images, then applied dynamics and inverse model to RRT algorithm to predict next image. To be more specific, our robot's task was trying to avoid obstacles and reach destination with only observed images. And a model was learned to predict further image. For RRT part, we first sampled point in free space, then computed the flow between sample point and closest node of RRT tree. Next applied computed flow and images to inverse model to get predicted action, finally applied this action and images to dynamics model to get predicted flow which would give us the next predicted position of robot.

Undergraduate Thesis: Research and simulation of synchronous motor control system for electric vehicle

Changsha, China *(Feb 2018-Jun 2018)*

- This article focused on the study of the control method of the synchronous motor for electric vehicle, and designing a reasonable control system, then I modeled and simulated the designed control system and analyzed the results. The control strategy used in this paper: the speed of PMSM is controlled by the maximum torque /current under the base speed. When the speed is greater than the base speed, the control of the weak magnetic flux is adopted.

At the same time, aiming at the coupling problem of the current link at high speed, the feedforward voltage compensation method is adopted to improve the dynamic performance of the system.

TECHNICAL REPORT

Weiyi Tang, Sonia Roberts, Daniel E. Koditschek. *Control and Design of an Open-Source Two-Degree-of-Freedom Hopping Robot.*

COURSE PROJECTS

F1/10 Autonomous Racing, **UPenn ESE 615 (F1/10 Autonomous Racing Cars) Course Project** *Spring 2020*

- Reactive Method: Utilized ROS(C++) to implement Point-To-Line ICP and follow the gap algorithm to avoid obstacles in a simulator, then applied this strategy to a real F1/10 car to have a race with classmates.
- Final Racing strategy: Utilized SLAM (Google Cartographer) to locate car, then utilized Particle Filter to collect car's waypoints. Compared the performance of B-RRT* and ODG-PFM (Obstacle-Dependent Gaussian Potential Field) in simulator. Next designed algorithm: using Pure Pursuit as a global planner and B-RRT* as a local planner to have end-to-end race and got the first place.

Computer Vision, **UPenn CIS 581 (Computer Vision) Course Project** *Fall 2019*

- Image Stitching: Utilized Harris method to extract feature points and used Adaptive Non-maximal Suppression to pick feature points, then matched feature points by applying Descriptor, next used RANSAC to filter bad match point pairs. Finally, computed Homograph matrix to transfer three different view images to a one-view big image.
- Optical Flow: Applied the Kanade-Lucas-Tomasi tracking procedure to track the features and plotted bounding box by using Similar Transformation.

Robot Obstacle Avoidance Project, **UPenn MEAM 523 (Control Systems for Robotics) Course Project** *Spring 2019*

- Utilized MATLAB to form path to avoid obstacles by implementing different algorithm (A*, Dijkstra and Potential Field Method), then formed cost function with Control Lyapunov Function as terminal cost to construct a MPC controller to track the trajectory formed by different tracking method. For the MPC solver, Batch approach was used to solve this Constraints Finite Time Optimal Control problem.

Deep Learning, **UPenn ESE 546 (Principles of Deep Learning) Course Project** *Fall 2019*

- The goal of this project was trying to predict bone age with an X-ray of a person's left hand. In this project, we utilized Image Processing Technology, SingleShot MultiBox Detector (SSD) and Mask R-CNN to remove annotation markers and background border from image, because these could be noise for prediction, then fed processed pictures to GoogLeNet with Transfer Learning to predict the age of bone.

SKILLS

Model Predictive Control, Adaptive Control, Robotics, Motion Planning, Machine Perception, Computer Vision, Deep Learning, Reinforcement Learning, Analog/Digital Circuits, Power Electronics.

Programming: C/C++, Python, Java, MATLAB, GAMS, Assembly language, Mathematica.

Tools and OS: ROS, PyTorch, TensorFlow, OpenCV, OpenAI, SolidWorks, Arduino, Latex, Microsoft Office, Ubuntu.

ACTIVITIES

Freshman Class Advisor of Electrical Engineering and Automation, Grade 2016, Class 6 *2016-2018*

Head of Culture and Sports Department, Student Union, Hunan University 11/2014-present *2016-2017*

- Organizer and planner of campus important activities, including Campus Top Ten Singers Contest of Hunan University, Campus Top Ten Host Contest of Hunan University

Member of the Badminton Team of College of Electrical and Information Engineering, Hunan University *2014-2018*