SEMINAR ANNOUNCEMENT

DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING
COLLEGE OF DESIGN AND ENGINEERING
Website: https://cde.nus.edu.sg/ece

Area: Control, Intelligent System & Robotics

Host: Assistant Professor Zhao Lin

TOPIC	:	**Learning Agile Flight Maneuvers: Deep SE(3) Motion Planning and Control for Quadrotors**
SPEAKER	:	**Mr. Wang Bingheng** **Graduate Student, ECE Dept, NUS**
DATE	:	**Monday, 10 April 2023**
TIME	:	**3:00PM to 3:30PM**
VENUE	:	**Join Zoom meeting:** **https://nus-sg.zoom.us/j/88237897877?pwd=VHZ5b21sRWVhWm0vanNjV3FTZzdTZz09** **Meeting ID: 882 3789 7877** **Passcode: 647386**

ABSTRACT

Agile flights of autonomous quadrotors in cluttered environments require constrained motion planning and control subject to translational and rotational dynamics. Traditional model-based methods typically demand complicated design and heavy computation. In this paper, we develop a novel deep reinforcement learning-based method that tackles the challenging task of flying through a dynamic narrow gate. We design a model predictive controller with its adaptive tracking references parameterized by a deep neural network (DNN). These references include the traversal time and the quadrotor SE(3) traversal pose that encourage the robot to fly through the gate with maximum safety margins from various initial conditions. To cope with the difficulty of training in highly dynamic environments, we develop a reinforce-imitate learning framework to train the DNN efficiently that generalizes well to diverse settings. Furthermore, we propose a binary search algorithm that allows online adaption of the SE(3) references to dynamic gates in real-time. Finally, through extensive high-fidelity simulations, we show that our approach is adaptive to different gate trajectories, velocities, and orientations.

BIOGRAPHY

Mr. Wang Bingheng is currently pursuing his Ph.D. at the Department of Electrical and Computer Engineering, National University of Singapore under the supervision of Prof. Zhao Lin. His research area lies in learning-based control and motion planning for aerial robots.