



THE CHINESE UNIVERSITY OF HONG KONG
Department of Electronic Engineering

SEMINAR

**Recent Advances in Autonomous Flight and Team Explorer's Approach to
the DARPA SubT Challenge**

By

Dr. Sebastian Scherer

Date: 18 April, 2019 (Thursday)

Time: 4:00 p.m.

Venue: Room 418 Ho Sin Hang Engineering Building

Abstract:

Autonomy holds a great promise by improving the applications, safety, and efficiency of flight. If little operator input is necessary, unmanned rotorcraft have a wide range of applications ranging from cargo delivery to inspection. While great capabilities have been shown there exists a gap between nominal flight and reaching levels that can replace a pilot. A capable autonomous rotorcraft will have to react quickly to previously unknown obstacles, land at unprepared sites, handle emergencies and fly with semantic information to enable long-term autonomy in cluttered environments.

In this talk we present how pushing the performance and safety of these systems requires us to develop novel approaches in perception and motion planning utilizing machine learning. In particular, we go in depth on motion planning, show some recent results for autonomous flight, and outline some future challenges.

While great results have been demonstrated, fundamental limitations remain in the fragile, myopic and static nature of these systems. In our research we are addressing these issues by developing rich planning problem representations and approaches that can adapt to and solve these problems. This will permit unmanned rotorcraft to operate where they have their greatest advantage: In unstructured, unknown environments at low-altitude.

Additionally, we will present our recent advances in the DARPA SubT challenge. In this challenge teams of robots will explore and map underground spaces to locate objects, navigate difficult terrain, and send back objects and map updates over long distances. CMU has formed a team to compete in the challenge. In this talk I will convey the challenges, design, and methods of our team's system, show recent results, and give an outlook of the path forward.

Biography:

Sebastian Scherer is a Senior Systems Scientist at the Robotics Institute (RI) at Carnegie Mellon University (CMU). His research focuses on enabling autonomy for unmanned rotorcraft to operate at low altitude in cluttered environments. He and His team have shown the fastest and most tested obstacle avoidance on an Yamaha RMax (2006), the first obstacle avoidance for micro aerial vehicles in natural environments (2008), and the first (2010) and fastest (2014) automatic landing zone detection and landing on a full-size helicopter. Dr. Scherer received his B.S. in Computer Science, M.S. and Ph.D. in Robotics from CMU in 2004, 2007, and 2010. He is a Siebel scholar and a recipient of multiple paper awards and nominations, including AIAA@Infotech 2010 and FSR 2013. His research has been covered by the national and internal press including IEEE Spectrum, the New Scientist, Wired, der Spiegel, and the WSJ. His work on self-landing helicopters has received the Popular Science Best of What's New 2010 Award, in Fall 2016 he demonstrated his inspection robots to President Obama, and more recently the autonomous helicopter work was nominated for the 2017 Collier Trophy, received the Howard Hughes, AUVSI XCELLENCE, and Aviation Week Network's annual laureate award.



ALL ARE WELCOME

For enquiries: Prof. Q.H. Meng email:qhmeng@ee.cuhk.edu.hk