上海交通大学自动化系
Department of Automation
Shanghai Jiao Tong University

系统控制与信息处理教育部重点实验室
Key Laboratory of System Control and Information Processing, Ministry of Education

学术报告会

时间：2016年9月21日(周三)13:30
地点：电院群楼2-410会议室

From Rats to Robot Navigation and Beyond

Prof. Michael Milford
Queensland University of Technology, Australia

Abstract:

The brain circuitry involved in perceiving and encoding the world has been extensively tested over the past forty years, with an ever increasing body of knowledge about the components and wiring involved in navigation and perception tasks. The learning and recall of spatial features is known to take place in and around the hippocampus of the rodent, where there is clear evidence of cells that encode the rodent's position and heading. RatSLAM is a primarily vision-based robotic navigation system based on current models of the rodent hippocampus, which has achieved several significant outcomes in vision-based Simultaneous Localization And Mapping (SLAM), including mapping of an entire suburb using only a low cost webcam, and navigation continuously over a period of two weeks in a delivery robot experiment. This research led to recent experiments demonstrating that impressive feats of vision-based navigation can be achieved at any time of day or night, during any weather, and in any season using visual images as small as 2 pixels in size. In our current research we are investigating the problem of place recognition, visual navigation and general perception from two angles. The first is from a neuroscience-inspired perspective, modelling the multi-scale neuronal map of space found in the mammalian brain and the variably tolerant and selective visual recognition process in the primate and human brain. The second is from an algorithmic perspective, utilizing state of the art deep learning techniques. Together, these approaches are being applied in a wide range of domains, including navigation systems for underground mining vehicles, environmental and infrastructure monitoring and for visual servoing of sensor arms on planetary rovers. I will discuss the insights from this research, as well as current and future areas of study with the aim of stimulating discussion and collaboration.

Biography:

Michael Milford is a leading robotics researcher conducting interdisciplinary research at the boundary between robotics, neuroscience and computer vision, and a multi-award winning educational entrepreneur. His research models the neural mechanisms in the brain underlying tasks like navigation and perception in order to develop new technologies, with a particular emphasis on challenging application domains where current techniques fail such as all-weather, anytime positioning for autonomous vehicles. He currently holds the position of Associate Professor at the Queensland University of Technology, as well as Australian Research Council Future Fellow, Microsoft Research Faculty Fellow and Chief Investigator on the Australian Centre for Robotic Vision. As an educational entrepreneur, Michael has written and produced innovative textbooks for high school students for fifteen years, with more than 6000 physical sales and educational website and YouTube views in excess of 1.5 million. He is currently launching the company Math Thrills, an initiative combining mass market entertainment and STEM education. Math Thrills received pre-seed funding on Kickstarter ($2500) and seed funding ($50,000) from QUT Bluebox and is in initial school trials. The initiative has led to awards including the 2015 Queensland Young Tall Poppy of the Year Award and a 2015 TedXQUT talk. Michael has dual citizenship between Australia and the United States, and has lived and worked in locations including Boston, USA and Edinburgh and London in the UK, collaborating with organizations including Harvard University, Boston University, Oxford University, MIT, Edinburgh University, Imperial College London, Caterpillar, the US Air Force and NASA's Jet Propulsion Laboratory.