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Key Laboratory of System Control and Information Processing, Ministry of Education

学术报告会

时间：2012年12月26日(周三)14:00

地点：电院群楼2-410会议室

Topologically Modeling for Robotic Mapping, Localization and Navigation

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Abstract:

Mobile robots are intelligent agents to be designed to serve people in various circumstances. The target environments can be ranged from indoor to outdoor, 2D to 3D, structured to unstructured etc. With time, more and more robots will share these environments with humans. These special robots act as intelligent team-members of the rescue team. In all these cases above, it is important that the robots are able to provide an efficient representation of the environment, which can be used as a common understanding among all involved subjects in the scenario. Works by psychologists demonstrated that Humans can understand their surroundings by mostly topological meanings. An example can be observed as for service robots. In most situations, human may like to control the robot by naming - go to the “kitchen” or “grandpa’s bed”. Topological modeling of the environment would greatly help these applications. Moreover, the navigation among topological nodes in the environment is essential to carry out practical services. Based on these observations, with this talk, I present contributions in the field of robotics navigation, robot mapping, visual control, unsupervised and semi-supervised clustering algorithms, information theory based validation, parallel computing etc. Especially, all these aspects are tightly integrated with topological environment models.

Biography:

Dr. Ming Liu is an IEEE Student member since 2012. During his master study at Tongji University, he stayed one year in Erlangen-Nünberg University and Fraunhofer Institute IISB, Germany, as a visiting scholar. Since 2009, he has been working as PhD student in the Mechanical and Process Engineering department of ETH Zürich. He is a founding member of Shanghai Swing Automation Ltd. Co. He is also conducted with several NSF projects, and National 863-Hi-Tech-Plan projects in China, on dynamic system modeling and environment perception. Ming Liu’s research interests include dynamic environment modeling, 3D mapping, machine learning and visual control. For further information please visit: http://www.asl.ethz.ch/people/lium/personal