**COLLOQUIUM**

Department of Computer Science and Engineering

University of South Carolina

### **On the Study, Design, and Evaluation of Exploration Strategies for Autonomous Mobile Robots**

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# Abstract

Exploration of initially unknown environments through the deployment of multirobot systems is an effective technique for many real-life applications, including map building and search and rescue. One of the most important and challenging aspects that could significantly impact system autonomy and performance is the decision about where to go next (exploration strategy) and about which robot goes where (coordination method) given current knowledge of the environment. In this talk, I will present some results that contribute to the study, the design, and the evaluation of some aspects of such a decision-making process.  
In the first part, I will show a method for studying the optimal behavior obtainable by an exploring robot with limited and discrete visibility in a given environment represented as a grid. Further, I will present a worst- and average-case analysis of some exploration strategies used in practice on a graph-based environment. In the second part, I will present a multirobot exploration system based on semantic information, which contributes to improve the online exploration performance. In the third part, I will discuss how to improve the experimental assessment of multirobot exploration systems, specifically by calculating the competitive ratio of some online exploration strategies and by systematically assessing some important factors affecting the exploration process, through repeatable experiments.  
The long-term endeavor is to contribute to make robots more efficient and autonomous, by shifting from the ‘how to go there?’ to the ‘where to go?’ paradigm.  
 **Alberto Quattrini Li** received a M.Sc. in Computer Science and Engineering (2011) and a Ph.D. in Computer Science and Engineering (2015) from the Politecnico di Milano (Italy), working with Professor Francesco Amigoni. In 2014 he was a visiting scholar in the Robotic Sensor Networks Lab (led by Professor Volkan Isler) of the Department of Computer Science and Engineering at the University of Minnesota. His research belongs to the areas of Artificial Intelligence, Multi-Agent Systems, and Robotics, and mainly focuses on the design and analysis of decision-making techniques in robotics exploration.