

## ***New Algorithms for Single and Multi-Agent Path Finding***

**12:30-1:30pm**  
**Friday, October 12, 2018**

**Dr. Satish Thittamaranahalli**

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University of Southern California



### *Abstract:*

In this talk, I will present my recent work in path finding algorithms for single and multiple agents. For the single-agent shortest path problem, I will present a new pre-processing algorithm called FastMap that embeds the nodes of a given edge-weighted undirected graph into a Euclidean space in near-linear time. The Euclidean distance between any two nodes in this space approximates the length of the shortest path between them in the given graph. Later, at runtime, a shortest path between any two nodes can be computed with an A\* search using the Euclidean distances as heuristic. For the multi-agent path finding (MAPF) problem, I will present a novel approach called MAPF-POST that makes use of a simple temporal network to post-process the output of a MAPF solver in polynomial time to create a plan-execution schedule that can be executed on robots with kinodynamic constraints. This schedule works on non-holonomic robots, takes their maximum translational and rotational velocities into account, provides a guaranteed safety distance between them, and exploits slack to absorb imperfect plan executions and avoid time-intensive replanning in many cases.

### *About the Speaker:*

*Prof. Satish Kumar Thittamaranahalli (T. K. Satish Kumar) leads the Collaboratory for Algorithmic Techniques and Artificial Intelligence at the Information Sciences Institute of the University of Southern California. He has published extensively on numerous topics in Artificial Intelligence spanning such diverse areas as Constraint Reasoning, Planning and Scheduling, Probabilistic Reasoning, Robotics, Combinatorial Optimization, Approximation and Randomization, Heuristic Search, Model-Based Reasoning, Knowledge Representation and Spatio-Temporal Reasoning. He has served on the Program Committees of many international conferences in Artificial Intelligence and is a winner of the 2016 Best Robotics Paper Award and the 2005 Best Student Paper Award from the International Conference on Automated Planning and Scheduling. Prof. Kumar received his PhD in Computer Science from Stanford University in March 2005. In the past, he has also been a Visiting Student at the NASA Ames Research Center, a Postdoctoral Research Scholar at the University of California, Berkeley, a Research Scientist at the Institute for Human and Machine Cognition, a Visiting Assistant Professor at the University of West Florida, and a Senior Research and Development Scientist at Mission Critical Technologies.*

***Reception in Dunn Hall 351 - 1:30pm***