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Maxim Likhachev

Title: Search-based Planning with Incomplete Information and its Application to Robotics

Abstract:
For many problems in robotics, environments at the time of planning are only partially-known. For example, robots often have to navigate partially-known terrains, unmanned aircrafts often have to select a landing site with imperfect knowledge about the terrain, and multi-robot systems often have to operate under uncertainty in the quality of communication. To be robust, robotic systems need to use planners that reason over the incomplete information and produce plans that take into account the uncertainty about the environment. Unfortunately though, these planners can rarely satisfy real-time constraints of robotic systems and typically do not scale up to large-size problems that show up in real-world.

In this talk, I will present some of our work on planning with incomplete information using graph searches. While typically graph searches cannot be used for probabilistic planning, I will show several classes of problems for which planning with incomplete information can be decomposed into a series of graph searches. This decomposition allows the planners to run much faster and to scale up to much larger problems than probabilistic planning. On the theoretical side, these algorithms come with strong theoretical guarantees on the quality of the generated plans. On the experimental side, these algorithms have been shown to be suitable to running on real robotic systems in real-time.