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A COLLECTION OF NEW PLANNING PROBLEMS WITH COMPLEX GOALS IN ROBOTICS

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ABSTRACT

This talk will present a collection of new optimal planning problems with complex goals in robotics using automata-theoretic approaches. In these approaches, one models all possible behaviors of the system using a discrete model and specifies all desired behaviors for planning using an automaton then solves the planning problem on a product automaton constructed from the model and the automaton. This talk will present several planning problems solved using these approaches. First, it will present a problem in which the objective is to choose a minimum number of sensors placed in the environment such that using those sensors, the system can guarantee whether the execution of an agent in the environment fits a pre-disclosed itinerary or not. This problem is useful for a variety of applications including security and surveillance, (physical) design and logistics of scientific experiments, control and monitoring of infrastructures, and early detection of outbreaks. Next, it will consider a problem in which a single robot must observe a stochastic environment to make a 'chronicle' of occurrent events that meets a given specification. The objective is to minimize the expected time to make such a chronicle. This problem is useful for applications where a robot is tasked with autonomously recording a structured video or documentary of the events occurring unpredictably in the environment. A multi-robot extension of this problem is then discussed. The talk then will present a temporal logic planning problem given both hard and soft specifications of the mission . The challenge is that the soft specifications might be conflicting. The objective is to synthesize a plan that satisfies an optimal selection of those soft specifications and has a minimum length. It then will introduce a multi-objective problem that combines the ideas of the last two mentioned problems. Finally, the talk will discuss several future directions of these problems.

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