Stochastic games

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Game theory is the study of interaction between agents in the rich spectrum of relationships ranging between conflict and cooperation. The study of game theory was originally proposed as the mathematical foundation for behavior of rational agents in economics, and over the last few decades has proved its usefulness by providing new techniques and insights in logic and set theory, auction design and implementation, the design and study of the internet, verification, and biology.

Dynamic games are used to model competitive processes evolving over time. Stochastic transitions are used for abstraction in modeling or to formalize inherent uncertainty, leading to quantitative statistical analysis. Stochastic games are dynamic games with stochastic transitions. They have a wide range of applications including economics, cell, population and evolutionary biology, queueing theory and performance evaluation, and quantitative temporal model checking. In this tutorial we explore the spectrum of stochastic game models ranging from Markov chains, to Markov decision processes, to 2-player perfect-information stochastic games. We will focus on the application of stochastic games in verification, and consider omega-regular objectives encompassing safety, liveness and parity objectives used in temporal logic model checking. The tutorial will describe some of the key techniques in analysis of stochastic games.

References

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