Informatik-Oberseminar

Fachgruppe Informatik

Lehrstuhl für Informatik 7

RHEINISCH-WESTFÄLISCHE TECHNISCHE HOCHSCHULE AACHEN

EINLADUNG

Zeit: Freitag, 25.01.2013, 11:15 Uhr

Ort: AH III, Ahornstr. 55

Referent: Dipl.-Inform. Jörg Olschewski

Titel: Languages and Strategies: A Study of Regular Infinite Games

Abstract:

The theory of two-player infinite games provides a framework for studying the controller synthesis problem in reactive system. This problem was solved for regular winning conditions for the first time in the fundamental Büchi-Landweber Theorem. The present work extends this result by investigating possibilities to measure the “complexity” of strategies in infinite games.

In the first part of this work, we improve a 50 years old algorithm, the Ramsey-based Büchi automata complementation method, both on the practical as well as on the theoretical side. On the practical side, we present some heuristics for improving the Ramsey-based approach, which we also implemented in a Java program. By conducting experimental studies, we show that this algorithm in fact can compete with the more modern ones. On the theoretical side, we introduce a novel Ramsey-based complementation construction with a 2^O(n log n) upper bound on the size of the complement automaton.

In the second part, we embed the concept of games into the domain of formal languages. By doing this, we are able to give a qualitative measure of the complexity of a winning strategy, as well as of the complexity of the corresponding winning condition. In this way, we extend and refine the fundamental Büchi-Landweber Theorem to languages classes below the class of regular languages.

In the third part, we introduce a measure for the complexity of strategies on graph-games with parity conditions. This measure is of quantitative nature and it determines the permissiveness of a given nondeterministic strategy. We reduce the problem of determining the value of such a mean-penalty parity game to the value problem of a corresponding mean-payoff parity game, and we show that both problems are in NP and coNP. We revisit the study of mean-payoff parity games and obtain a deterministic algorithm, which computes the value and which runs faster than all previously known algorithms. A similar algorithm for mean-penalty parity games is developed as well.

Es laden ein: Die Dozenten der Informatik