Games with perfect information
Relevant material for the exam

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Summer term 2017

General information:

- The first question in the exam will be "What did we do in the lecture?" We expect you to give a overview of the topics covered in the lecture in 5-10 minutes. Try to highlight the important results and techniques for each topic. Prepare the overview properly – presenting your summary is a good way to get rid of any nervousness that you might have.
- In the rest of the exam, we will ask you question on the various topics that we covered. We expect you to know all important definitions, results, concepts and techniques. We also will ask for proofs of important results (unless we excluded them explicitly, see below).

  Don't worry: Even for long proofs, they key idea can usually be summarized in a few sentences. Most steps of each proof are just plugging in definitions and using known properties of the objects that we use (e.g. the attractor). This is true in particular for most technical lemmas.
- We will not explicitly ask for the material that we only covered in the exercise class (e.g. proofs that we did not do in the lecture, but on an exercise sheet). Still, the exercises are very important as they provide in-depth understanding of the important concepts.

Included and excluded material in each section:

Section 3: Nim

Not relevant for the exam.

Section 4: Basic concepts

Very relevant for the exam! You should know all these definitions by heart by now.

Section 5: Reachability games

Very relevant for the exam!

Section 6: Scheduling games

Relevant for the exam.

The problem itself and its encoding as reachability game is important for the exam. You should have an idea on how tba-sims can be used to optimize the performance. We will not ask for the implementation details (i.e. the part of the lecture notes that starts with Lemma 6.13).

Section 7: Büchi games

Very relevant for the exam!

We will not ask for the proofs of the technical Lemmas 7.8 and 7.10. (Although even those are just applying basic properties of the controlled predecessors.)

Section 8: Parity games

Very relevant for the exam! The proof of Zielonka's result is long, but if you memorize its structure, it will not be too difficult.

We will not ask for the material that has only been covered in the exercise classes, i.e. Zielonka's algorithm and the complexity-theoretic considerations.

Section 9: Rabin's tree theorem

Relevant for the exam. You should in particular know tree automata, how the acceptance of a tree resp. the emptiness of an automaton can be encoded as parity game.

We will not ask for the technical details of the proof of Rabin's tree theorem, but you should know the structure of the proof.

We will not ask for S2S, as it has only been covered in the exercise classes.

Section 10: Zero-sum games and mean payoff games

Very relevant for the exam!

Will will not ask for the technical details of the proofs (e.g. the estimation in the proof of Lemma 10.17), but you should know the ideas that are used in each proof.

We will not ask for the complexity-theoretic considerations, as they only have been covered in the exercise classes.

Section 11: Determinacy and the Borel hierarchy

You should know how a Gale-Stewart game works.

We will not ask for the technical details of the proof of the existence of an undetermined game. You should know the structure of the proof.

We will not ask for the definition of the Borel hierarchy or any corresponding proof.