

CMSC 858M: Algorithmic Lower Bounds
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Chapter 16: Beyond PSPACE

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1 Overview

2 12.1

Seems fine - I have no real comments. You might want better graphics for the game examples.

3 12.2

Seems fine, although I think it would benefit from a comment on these SAT games and why they are what they are - they seem arbitrary/contrived. Perhaps note that they're used in the next section to show that more natural problems are EXP-complete.

4 12.3

Seems fine - although figure 16.4 is oddly out of place. If it would be possible to move it closer to relevant text, it would be much better.

5 12.4

Seems ok - this whole section so far is a little strange in that it just lists other people's results and doesn't really elaborate. For example, it's not clear to me what "x" and "y" are in the conditional no-repeat rules.

6 12.5

Seems fine, although extremely short.

7 12.6

This is quite interesting, and I enjoyed it most out of any section I read up to this point. I might like to see some background about what Conway's game of life is and how it came about.

8 12.7

I quite enjoyed this chapter. I hadn't realized how much complexity could be induced in Conway's Game of Life.

9 12.8

This is an interesting approach to team games I didn't expect. The chapter seems fine.

10 Relevant Problems

- Two player "Pebble Games", including Chinese Checkers. Proved EXPTIME-complete by Kasai, Adachi, and Iwata [1].
- Existential pebble games, a variant of the above, proved EXPTIME by Kolaitis [6].
- Shogi, proved EXPTIME-Complete by Adachi, Kamekawa and Iwata [2].
- Quixo, a two player game of moving cubes to create lines. Proved EXPTIME-complete by Mishiba and Takenaga [3].
- Cops and Robbers, a game played on a graph where a robber is trying to escape a group of cops trying to encircle them. Proved EXPTIME-complete by Kinnersley [4].
- The Custodian Capture game, where pieces move like rooks and capture by being on either side of a piece, was proved EXPTIME-complete by Ito et al. [5].
- Reachability-Time Games on Timed Automata, showed EXPTIME-complete by Jurdzinski and Trivedi [7].
- Streett games with costs, shown by Fijalkow and Zimmermann to be EXPTIME-complete [8].

- Specific versions of Angry Birds, as described in a paper of Stephenson, Renz, and Ge [9].
- Graph Request-Response games, as described by Chatterjee, Henzinger, and Horn [10].

References

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