Pina Kolling
piko0011

Summary: Lecture 6

Summary for the chapter *8.2.* [2, 1]

Title
Content

Completeness

- every language of a complexity class can be reduced to $L \rightarrow$ you only need what L describes

What does completeness do for us?

- a reduction definition is usefull because the complexity classe are closed under reduction
- examples look helpfull
- L and R seem to be important:

$$\begin{array}{ll} L' \in P & A \\ L \rightarrow L' & R \end{array}$$

- drawing set circle inclusion thing (P and NP)

P-completeness of CIRCUIT VALUE

Problem: CIRCUIT VALUE
The CIRCUIT VALUE Problem is the problem of computing the output of a given Boolean circuit on a given input. In terms of time complexity, it can be solved in linear time (topological sort).

- P-complete
- limit of power of reductions
- got a little tired and zoned out

The reduction (?)

Problem: CIRCUIT SAT
The circuit satisfiability problem (CIRCUIT SAT) is the decision problem of determining whether a given Boolean circuit has an assignment of its inputs that makes the output true. Input: a Boolean circuit C Question: Is there a truth assignment which makes C output the value true?

CIRCUIT SAT is NP-complete

- circuit decides nondeterministically (?)
- a variable is added n the nondeterministic Turing Machine
- check if one of the variables is tue: use this choice (?)

- problem: can we set thiese variables such that the Turing Machine accepts?
- answer corresponds direct to *is there a choice of nd decisions such that the turing machine accepts?*
- extremely direct reduction

TODO
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Questions:

References

[1] Martin Berglund. *Lecture notes in Computational Complexity.*

[2] Christos H. Papadimitriou. *Computational Complexity.* Addison-Wesley Publishing Company, 1994.