Review of: "NP on Logarithmic Space"

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Version 4

Overview:

The paper presents a weak prove that NP is in L. To do this, the author introduce many basic concepts: alphabet, languages, Turing Machines, enumerators, languages decidable by Turing Machines, notions of complexity (number of steps), run time, complexity classes (languages decided in P and verified P (NP), the problem P versus NP.

He proceeds (in the Hypothesis section) presenting TM computing functions, reductions, NP -Complete class, SAT problem, propositional logic, CNF and 2 CNF.

At this moment, he changes to Space complexity definitions: Log space TM, classes L and NL and co-NL. The concept of log space computable functions is also introduced in the sequence. And after introduces a partial result that 1L \neq 1NL. Finally, definition 1 presents the concept of “logarithmic space verifier”.

In the sequence, oracle Turing Machine are introduced, and Deterministic oracles computing in Space class and computing on nondeterministic Space class are presented, conduction to the main result of the paper.

Considerations:

In the introduction section, despite of be very interesting to have all these definitions, no mention is made to L or NL or Space complexity. The main results on this area are not presented. L and NL classes are the core of the paper and should be properly introduced in the beginning of the paper.

L and NL are introduced after, in 1.1 section but the main results in complexity of space are omitted. Why CNF, SAT and propositional logic are presented and the Savich’s Theorem or the NL = coNL prove are not?

I didn’t understand the phrase “the logarithmic space reduction is used for the completeness of the complexity classes L, NL and P among others.” For NL and NP classes I understand the completeness of the complexity class, but there is not a P-complete class or a L-complete class. What does the author intend to say?

In the next paragraph, a result obtained by Hartmanis and Mahaney is presented. What is the intention behind this construction? Maybe to induce a parallel comparison among the proposal presented in this paper and the weak result 1NL

\subseteq L. Is it? Some explanation here could help us to follow the intention of the author. Besides that some example using the certificate “u” could help to better understand how the definition works. I understand the definition, but I don’t understand why it is important, once the L and NL compute in log space. Neither why a certificate in polynomial size could be useful to improve the space complexity.

Theorem 2 follows from the use of oracles and certificates. It seems correct, but if and only if the Hypothesis 1 is correct. Unfortunately, I am not sure about hypothesis 1. I recommend to rewrite the article to make it easy to follow, adding comments about the author’s intention behind the definitions and assumptions. I understand that the author intended to be concise, but without this, following the paper could be hard. When the author proposes to characterize NL as the class of languages verified using a polynomial size certificate, what is the intention? Maybe putting this on focus, we can understand the real paper contribution.