

Posudek

vedoucího oponenta
 diplomové bakalářské práce

Autor/Autorka: *Ján Puch*

Název práce: *"Bounded Arithmetic and Theory of Resonance and Radicals"*

Jméno vedoucího/opponenta: *Neil Thapar*

Matematická úroveň:

vynikající velmi dobrá průměrná podprůměrná nevyhovující

Grafická, jazyková a formální úroveň:

vynikající velmi dobrá průměrná podprůměrná nevyhovující

Výsledky:

originální původní i převzaté netriviální kompilace citované z literatury opsané

Použité metody:

nestandardní standardní obojí

Aplikovatelnost:

přínos pro teorii přínos pro praxi přínos pro praxi i teorii bez přínosu nedovedu posoudit

Věcné chyby:

téměř žádné vzhledem k rozsahu a pojednávanému tématu přiměřený počet méně podstatné četné závažné

Tiskové chyby:

téměř žádné vzhledem k rozsahu a pojednávanému tématu přiměřený počet četné

Celková úroveň práce:

vynikající velmi dobrá průměrná podprůměrná nevyhovující

Práci

doporučuji nedoporučuji

uznat jako diplomovou/bakalářskou. Návrh klasifikace přikládám na zvláštním papíru.

Připomínky a vyjádření vedoucího/opponenta:

See attached comments

Místo, datum, podpis vedoucího/opponenta:

Prague 15/6/09

Additional comments on "Bounded Arithmetic and Theory of Razborov and Rudich", Bachelor's Thesis, Jan Pich

The author has taken advanced mathematical material, mainly from references [18] and [12], and presented them in his own way. This shows that he has a reasonable understanding of the essentials of the results, has researched the background to them, and is able to communicate them in a suitable mathematical style. This leads me to recommend that the thesis should be accepted. Unfortunately the presentation is not great; where things have been changed from the original papers it often makes the mathematics harder to follow, and many things which have been added are not correct.

Some particular problems:

Chapter 2 was very difficult to follow without reference to [18] because of presentation and some language problems, in particular with the English prepositions "from/to/of/for". Reading these charitably, though, I think it's basically fine.

Page 9 - The use of $L(\alpha)$ leads to confusing notation. And in particular, does NP^α also have oracles for β etc.?

Theorem 3.1.14 is not in the given reference in quite this form, and is unlikely to be true, since it would imply that $S^2_2 = T^1_2$. (Although I think it would be true if the theory of true unrelativized arithmetic were added to the theories here.)

Remark 4.1.2 - A $\Sigma^b_i(\alpha)$ formula may naturally translate into something of high depth, because of the sharply bounded quantifiers. The issue with proving it equivalent to something with small depth is about the size of the proof in some system, rather than just the existence of a proof.

Theorem 4.1.3 - There is some confusion, at least in the presentation, between single inferences and sequences of inferences.

Theorem 4.2.2 - The proof is missing an explanation of why the condition on the variables holds at every sequent.

Theorem 4.2.3 - The first part doesn't say how the proof is kept small (using the bound c). In the second part I do not understand how the cut elimination works; in particular 1' and 2' do not look like single inferences that can be straightforwardly replaced in one step.

In section 4.3, the "circuit" formula is incorrect; also it is not made clear that the oracles should code computations on all inputs simultaneously, which is essential for the proof to work.

(And some general comments on presentation: starting a sentence with mathematical symbols can make things difficult to parse; see the second two paragraphs on page 4. And the thesis would benefit from being run through a spellchecker.)