FACULTY OF ARTS
Charles University

Department of Logic

Supervisor's report on the doctoral thesis by Adam Přenosil: Reasoning with Inconsistent Information

The thesis concerns the extensions and expansions of the four-valued Belnap-Dunn logic, called super-Belnap logics, which are studied in the framwork of algebra, abstract algebraic logic and Gentzen-style proof theory. The thesis applies new insights and presents new results in this, surprisingy undeveloped area. In particular, the author in the thesis:

- Introduces a notion of explosive extensions (extensions by antitheorems) and applies them to prove new completeness theorems for super-Belnap logics,
- Describes the structure of the lattice of finitary super-Belnap logics,
- Shows how this lattice can be fully described in terms of certain classes of finite graphs, allowing theorems of graph theory be used to prove non-trivial results about super-Belnap logics,
- Develops Gentzen-style proof theory for super-Belnap logics, studies asmissibility and antiadmissibility of cut and identity, and proves new interpolation theorems as well as presents new proofs of known interpolation theorems for super-Belnap logics,
- Studies the expansion of the Belnap-Dunn logic by the truth operator delta.

The thesis is very well structured, precisely written, providing a well-balanced level of detail in proofs and context in motivational and explanatory parts. Some results of the thesis have already been published, in particular "Cut elimination, identity elimination, and interpolation in super-Belnap logics" (Studia Logica 2017) and "The lattice of super-Belnap logics" (under review). I wish to stress that the thesis is not simply all the papers Adam wrote during his doctoral studies put together: other papers, not contained in the thesis, include "Contradictory information as a basis for rational belief" (LORI 2017 best student paper award), or "Reductio ad contradictionem: an algebraic perspective" (Studia Logica 2016). Rather then putting all his papers together, Adam wrote a compact and well focused thesis which can be used as a basic reference text to the study of super-Belnap logics.
In general the thesis reads well and leaves a little to be desired. For me there is one minor point concerning the last part of the thesis: I find the alternative presentation of de Morgan algebras with delta (the distributive lattices with nabla and delta) a bit baroque and not really motivated or used for anything special in the thesis.

To say a few words about Adam's time at the Department of Logic, he has been with us from his undergraduate studies till now, he taught several courses in the Logic study programe during his Ph.D. studies, participated in my project "From Shared Evidence to Group Attitudes", working on applications of some of his results on paraconsistent logics in epistemic context, and organised a conference PhDs in Logic 2018. He clearly is one of the best students, both undergraduate and graduate, we ever had at the department.

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Adam has an outstanding talent for research, with a strong background in mathematics and logic combined with the ability of broadening it with a concentrated study of additional disciplines. In his conference talks and papers he always makes a strong point of motivations, articulates the results clearly, and puts them in a broader context. For the whole period of his doctoral studies Adam has been independent and autonomous in obtaining his results, and congenial and proficient in their presentation. He did not need much supervision, and he has used the freedom to choose areas of his interests and topic of his research extremely well. It has been a great pleasure to have such a student around.

Let me finally state that in my opinion Adam Přenosil, with the thesis presented, as well as his overall performance as a Ph.D. student, proved himself to be an independent researcher without any doubt. Therefore I recommend the thesis as a basis for awarding the doctoral degree Ph.D.

Praha, 11 th June 2018 Mgr. Marta Bílková, Ph.D., supervisor