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Objet: *Rapport sur le mémoire de thèse de Jan Foniok.*

The dissertation written by Jan Foniok is well presented, it is composed of 79 pages, including the bibliography.

The author has already three published papers co-authored with Nešetřil and Tardif.

The main aim of this work is the study of homomorphisms of relational structures (Δ -structures). This is a continuation of previous works done by several authors (Komárček, Nešetřil, Pultr, Tardif).

Chapter 1 contains definitions, basic properties and examples.

Chapter 2 deals with homomorphism dualities. We recall that if F and D are relational structures, the pair $\{F, D\}$ is a duality pair if for every structure A there is a homomorphism from F to A if and only if there is no homomorphism from A to D . In this chapter, the finite dualities for single structures are fully characterized and a construction of the dual of a Δ -tree is given. This construction generalizes the *mosquito construction* of Komárček and the *bear construction* proposed by Nešetřil and Tardif. Then the author generalizes the notion of duality pairs by forbidding homomorphisms for a finite set of structures. This new notion is called finite homomorphism duality. It is proved that all finite homomorphism dualities are obtained from a new construction, called the transversal construction. This characterizes all finite homomorphism dualities.

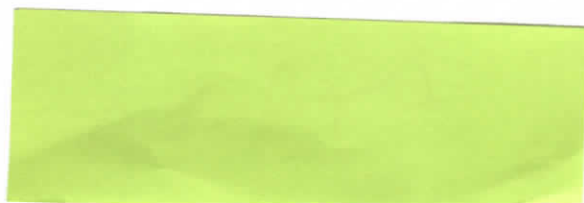
The existence of a homomorphism defines a relation that is a partial order on the classes of all Δ -structures. This partial order is the subject of Chapter 3. It is proved that almost all the maximal antichains have the splitting property. It was proved for the order of digraphs by Nešetřil and Tardif.

In Chapter 4 the complexity issues are considered. The MAC' problem is to decide whether an input finite non-empty set of relational structures is a maximal antichain in the homomorphism order. It is shown that the MAC' problem is decidable for relational structures having types with at most two relations.

The material of this dissertation is dense and many generalizations are done. It is well written, but it would be convenient to have at the end of each chapter a conclusion containing the feeling of the author and directions for further research.

As a final remark, I would like to say that the author shows a good understanding of the considered problems.

I recommend that this dissertation is accepted as a thesis for a doctorate degree.



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