Bruno Costa Coscarelli, ***Model Theory in a Paraconsistent Environment***, University of Campinas, Brazil, 2020. Supervised by Marcelo Esteban Coniglio. MSC: 03B53, 03C99, 03B70. Keywords: paraconsistent logics, Logics of Formal Inconsistency, Model Theory, first-order logics, Paraconsistent Logic Programming.

Abstract

The purpose of this thesis is to develop a paraconsistent Model Theory. The basis for such a theory was launched by Walter Carnielli, Marcelo Esteban Coniglio, Rodrigo Podiack, and Tarcísio Rodrigues in the article 'On the Way to a Wider Model Theory: Completeness Theorems for First-Order Logics of Formal Inconsistency' [***The Review of Symbolic Logic***, vol. 7 (2014)].

Naturally, a complete theory cannot be fully developed in a single work. Indeed, the goal of this work is to show that a paraconsistent Model Theory is a sound and worthy possibility. The pursuit of this goal is divided in three tasks: The first one is to give the theory a philosophical meaning. The second one is to transpose as many results from the classical theory to the new one as possible. The third one is to show an application of the theory to practical science.

The response to the first task is a Paraconsistent Reasoning System. The start point is that paraconsistency is an epistemological concept. The pursuit of a deeper understanding of the phenomenon of paraconsistency from this point of view leads to a reasoning system based on the Logics of Formal Inconsistency. Models are regarded as states of knowledge and the concept of isomorphism is reformulated so as to give raise to a new concept that preserves a portion of the whole knowledge of each state. Based on this, a notion of refinement is created which may occur from inside or from outside the state.

In order to respond to the second task, two important classical results, namely the Omitting Types Theorem and Craig's Interpolation Theorem are shown to hold in the new system and it is also shown that, if classical results in general are to hold in a paraconsistent system, then such a system should be in essence how it was developed here.

Finally, the response to the third task is a proposal of what a Paraconsistent Logic Programming may be. For that, the basis for a paraconsistent PROLOG is settled in the light of the ideas developed so far.

Abstract prepared by Bruno Costa Coscarelli.
E-mail: brunocostacoscarelli@gmail.com
URL: http://repositorio.unicamp.br/jspui/handle/REPOSIP/331697

Christian d'Elbée. ***Expansions and Neostability in Model Theory***, Institut Camille Jordan, Université de Lyon, Lyon, France, 2019. Supervised by Thomas Blossier and Zoé Chatzidakis. MSC: 03C10, 03C45, 03C64, 03C50, 03C60. Keywords: generic expansions, fields with generic subgroups, NSOP_1 theories, forking, Kim-forking, p-adic valuations on integers, finite dp-rank.

Abstract

This thesis is concerned with the expansions of algebraic structures and their fit in Shelah's classification landscape.

The first part deals with the expansion of a theory by a random predicate for a substructure model of a reduct of the theory. Let T be a theory in a language $\mathcal{L}$. Let T_0 be a reduct of T. Let $\mathcal{L}_S = \mathcal{L} \cup \{S\}$, for S a new unary predicate symbol, and T_S be the $\mathcal{L}_S$-theory that axiomatises the following structures: $(\mathcal{M}, \mathcal{M}_0)$ consist of a model $\mathcal{M}$ of T and S is a predicate for a model $\mathcal{M}_0$ of T_0 which is a substructure of $\mathcal{M}$. We present a setting for the existence of a model-companion TS of T_S. As a consequence, we obtain the existence of the model-companion of the following theories, for $p > 0$ a prime number:

- ACF_p, $\mathrm{SCF}_{e,p}$, Psf_p, ACFA_p, $\mathrm{ACVF}_{p,p}$ in appropriate languages expanded by arbitrarily many predicates for additive subgroups;

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- ACF_p, ACF_0 in the language of rings expanded by a single predicate for a multiplicative subgroup;
- PAC_p-fields, in an appropriate language expanded by arbitrarily many predicates for additive subgroups.

From an independence relation $\mathop{\smile\!\!\!\!\!\!|}^{T}$ in T, we define independence relations in TS and identify which properties of $\mathop{\smile\!\!\!\!\!\!|}^{T}$ are transferred to those new independence relations in TS, and under which conditions. This allows us to exhibit hypotheses under which the expansion from T to TS preserves NSOP_1, simplicity, or stability. In particular, under some technical hypothesis on T, we may draw the following picture (the left column implies the right column):

Configuration $T_0 \subseteq T$	Generic expansion TS
$T_0 = T$	Preserves stability
$T_0 \subseteq T$	Preserves NSOP_1
$T_0 = \emptyset$	Preserves simplicity

In particular, this construction produces new examples of NSOP_1 not simple theories, and we study in depth a particular example: the expansion of an algebraically closed field of positive characteristic by a generic additive subgroup. We give a full description of imaginaries, forking, and Kim-forking in this example.

The second part studies expansions of the group of integers by p-adic valuations. We prove quantifier elimination in a natural language and compute the dp-rank of these expansions: it equals the number of independent p-adic valuations considered. Thus, the expansion of the integers by one p-adic valuation is a new dp-minimal expansion of the group of integers. Finally, we prove that the latter expansion does not admit intermediate structures: any definable set in the expansion is either definable in the group structure or is able to "reconstruct" the valuation using only the group operation.

Abstract prepared by Christian d'Elbée.
E-mail: delbee@math.univ-lyon1.fr
URL: https://choum.net/~chris/page_perso

Bruno Jacinto, ***Necessitism, Contingentism, and Theory Equivalence***, University of St Andrews, St Andrews, Scotland, UK (SASP PhD Programme), 2016. Supervised by Stephen Read and Gabriel Uzquiano. MSC: 03B16, 03B45. Keywords: necessitism-contingentism debate, theory equivalence, higher-order modal logic.

Abstract

Necessitism, Contingentism, and Theory Equivalence is a dissertation on issues in higher-order modal metaphysics. Consider a modal higher-order language with identity in which the universal quantifier is interpreted as expressing (unrestricted) universal quantification and the necessity operator is interpreted as expressing metaphysical necessity. The main question addressed in the dissertation concerns the correct theory formulated in this language. A different question that also takes centre stage in the dissertation is what it takes for theories to be equivalent.

The whole dissertation consists of an extended argument in defence of the (joint) truth of two seemingly inconsistent higher-order modal theories, specifically:

1. *Plantingan Moderate Contingentism*, a theory based on Plantinga's [1] modal metaphysics that is committed to, among other things, the contingent being of some individuals and the necessary being of all possible higher-order entities;
2. *Williamsonian Thorough Necessitism*, a theory advocated by Williamson [3] which is committed to, among other things, the necessary being of every possible individual as well as of every possible higher-order entity.

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