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Chapter 8

Conclusions

In this work, we examined the properties of a number of doxastically inspired variants of Dependence Logic. The author's aims in pursuing this research program were

1. To *explore* the space of the possible variants of Dependence Logic;

2. To *achieve*, through the above mentioned analysis, a fuller understanding of the potential and the properties of Team Semantics;

3. To *analyze* the dynamics of information change which lies underneath this semantics;

4. To *argue* that first-order logics of imperfect information provide a natural framework for reasoning about beliefs and belief updates in a first order setting.

According to my current doxastic state, all of these objectives have been met in full.

Sadly, none of the logics considered in this work is capable of expressing statements about higher-order beliefs; and therefore, I find myself unable to formulate exactly my hope that the reader's belief state is now, if not necessarily in complete agreement with the above evaluation, at least not incompatible with a certain degree of satisfaction and of interest in the possibilities of Team Semantics and in its doxastic interpretation.

One research question which I left essentially untouched, and which is related to the issue of higher-order beliefs, consists in the relationship between our approach and dynamic modal logics of belief and knowledge [5, 60, 70]. We studiedly avoided such a comparison, even though many of the notions which we

considered (the announcement operators of Chapter 3, for example, or the team update operations considered in Chapters 6 and 7) have clear parallels in such formalisms: indeed, an overeager attempt of establishing connections between Kripke Semantics and Team Semantics could have risked hiding some of the peculiarities and possibilities of the latter.[1] However, the doxastic interpretation of Team Semantics is now, in the opinion of the author, more than mature enough for such comparisons to be opportune: the groundwork for a more formal study of the connections between these two subjects is more than ready, and – in particular – the analysis of Chapter 7 appears to be a promising starting point for such an enterprise.

Another interesting possibility is to consider graded beliefs and finer variants of Team Semantics. Studying the Nash Equilibria of semantic games, after [61, 25, 62, 31], is surely an option; but another, perhaps more promising one is to take Team Semantics as primary, as we did in all of this work, and adapt it to "probabilistic teams" after the fashion of [25]. But of course, one must also keep in mind that probability theory is not the only available means for representing graded beliefs. Another, perhaps even more intriguing in our framework, one is to consider *fuzzy teams* (that is, fuzzy sets of assignments), thus developing an Team Semantics analogue of Cintula and Mayer's Game Theoretic Semantics for Fuzzy Logic [12].

Also, the classification of variants of Dependence Logic through generalized dependence atoms which we begun in Chapter 4 is far from complete. The most outstanding open problem, in the opinion of the author, consists in the characterization of the expressive power of Inclusion Logic; but more in general, it is clear that the space of all semantically interesting dependence notions is largely unexplored, and that its systematic study promises to hold many interesting results and surprises.

Finally, the formal properties of the Team Transition Semantics of Chapter 6 are far from entirely known, and definitely deserving of further analysis.

I conclude this work on this note. The field of Dependence Logic and Team Semantics is in a state of very rapid growth; and I can only express the hope that the results described in this thesis may be of some utility for the further development of this fascinating area of research.

[1] Also, from a practical point of view, it was simpler for the author to mostly focus on a single semantical framework and its variants.