



Playing with Knowledge and Belief

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Abstract

This thesis contributes to the development of Soft Dynamic Epistemic Logic. Soft Dynamic Epistemic Logic has been introduced to deal with a number of informational phenomena, including belief revision. The work in this thesis extends the scope of Soft Dynamic Epistemic Logic to belief contraction, providing as such a framework which can now deal with belief change. This study of belief change contributes also to the study of the notion of knowledge. Nowadays, one of the main challenges in formal epistemology is to formally capture what is a correct definition of knowledge. To tackle this issue we need to be able to formally define the notions of evidence and justified true belief. In this thesis, we extend Soft Dynamic Epistemic Logic such that it can indeed deal with the notions of evidence and justification. In this context we provide a game semantics for “defeasible knowledge”, offering a new formalization of K. Lehrer’s concept of knowledge in terms of “undefeated justified acceptance”. This setting provides a new perspective for analysing epistemological problems such that the Gettier problem. This thesis also connects Soft Dynamic Epistemic Logic to two different approaches that have been studied in the literature. One of these other approaches is Dynamic Doxastic Logic, as introduced by K. Segerberg. An important part of the work we have done, compares Dynamic Doxastic Logic to Soft Dynamic Epistemic Logic. This comparison makes it possible to investigate what are the differences and the similarities between these two approaches. Finally we connect our work to the argumentative study of belief revision, offering an investigation of belief dynamics in a dynamic argumentative setting.

Chapter 2 presents a number of different settings of belief change that have been studied in the literature.

Chapter 3 introduces three notions of belief contraction that we choose from the literature: severe withdrawal, moderate contraction and conservative contraction. We define the corresponding belief contracting operations as operations on total plausibility models and axiomatize each of them in *DEL* style.

In chapter 4 we introduce the new framework of justification models as a general setting to model the information and evidence an agent has. We formally define what is a sound (true) argument and what is a justification.

Chapter 5 introduces the informal theory of knowledge of K. Lehrer as a solution to the Gettier problem and proposes a game semantics that formalises the notion of defeasible knowledge of K. Lehrer. Our ultra-justification game formally determines if an agent defeasibly knows a proposition (or merely believes but does not know this proposition): an agent (the Claimant) defeasibly knows a proposition P iff she has a winning strategy in the ultra-justification game corresponding to the claim P .

Chapter 6 compares Dynamic Doxastic Logic and Dynamic Epistemic Logic, studying full *DDL* from the perspective of Soft *DEL*. We provide several versions of *DDL* internalizing different belief revision operations, as well as several operations of expansion and contraction, showing that the *DDL* approach is at least as powerful as the *DEL* approach.

Chapter 7 introduces the branching-time belief revision logic of G. Bonanno and provides an argumentative study of this belief revision logic. We use the dialogical approach to logic and provide the language as well as the rules of our dialogical system of belief revision. We focus on the dialogical interpretation of the notions of belief and information.