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Conditional Doxastic Logic and Learning

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Abstract

In this thesis we discuss belief revision in static and dynamic version. We present a model for static belief revision theory that is obtained by incorporating of epistemic logic and belief revision theory, and also a model for dynamic belief revision theory by incorporating of dynamic epistemic logic and belief revision theory.

Belief revision theory: Belief revision theory is a theory in formal epistemology, which deals with the process of changing beliefs to reflect the acquisition of new information. The aim of epistemology is to propose a sufficient explanation of the processes of changing rational beliefs.

Epistemic logic and dynamic epistemic logic: Epistemic logic is a modal logic with operators for belief and knowledge. Its focus is on reasoning about knowledge. Dynamic epistemic logic is the extension of epistemic logic with action operators for formalizing information change.

We study belief revision by conditional doxastic models and action conditional doxastic models in conditional beliefs context. We formalize learning by conditional beliefs and question-answer process in epistemic logic and dynamic epistemic logic context. Also we try to develop these studies by category theory and coalgebras.

Chapter 1: Introduction. In this chapter we introduce elements of epistemology, syntax and semantics of basic epistemic logic for knowledge and belief. Then we will define belief revision theory and tools of basic epistemic logic. Also the elementary concepts of category theory are presented, which we will need those in chapter 4.

Chapter 2: Static belief revision theory. In this chapter we introduce axioms of epistemic belief revision theory. Two epistemic models- plausibility models and conditional doxastic models- as epistemic substitution for it are presented. We look at the syntax and semantics of plausibility models and conditional doxastic models and we show how these models capture belief revision theory.

Chapter 3: Dynamic belief revision theory. This chapter is about formalizing action operators. Action plausibility models and action conditional doxastic models can formalize them. In this chapter we say how action models act on the state of models and we will define updated models. In this chapter the role of action priority update is important, because it can unify different actions.

Chapter 4: Categorical view to epistemic logic. In this chapter by using of epistemic models and action epistemic models we construct a category. We study properties of this category in the context of category theory. This category creates a new context for epistemic studies. For example we show how we can define the concept of time as a functor for this category. By using this category we introduce a subcategory in measurable spaces. We use syntax and semantics of coalgebra on the category of measurable spaces for our studies.(Full version of thesis is in Persian but chapter 4 can be seen in the paper `` Dynamic Epistemic Logic and Category Theory ''.)