Epistemic logics for ignorance representation

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In our talk we will consider three epistemic logics for ignorance representation. The overall objective of the talk is to provide a comparative analysis of these three settings and evaluate the extent to which each logic succeeds in formalizing ignorance.

Keywords: Epistemic logic, ignorance that, ignorance whether, factive ignorance, frame definability.

Several current works in epistemic logic focus on finding a way to model the notion of ignorance (see, e.g., [4, 7, 3, 5]). One of the difficulties in achieving this task is that there is no agreement on exactly which notion one is trying to model. For instance, van der Hoek & Lomuscio [4] take ignorance to be "not knowing whether", which is formally represented as an operator I definable via K in standard Kripke semantics as $\neg K\varphi \wedge \neg K\neg\varphi$, while Steinsvold [7] considers ignorance as "unknown truth", formalized as $\varphi\wedge\neg K\varphi$. Indeed, even from an epistemological perspective, there exist at least two different definitions of ignorance. The Standard View takes ignorance as the "absence of knowledge", while the so-called New View takes it as the "absence of true belief" (see [6]). Recently, Kubyshkina and Petrolo [5] introduced an alternative system for representing ignorance which is in line with the definition provided by the New View. The basic idea of the authors was to represent ignorance as a factive notion, i.e., if an agent is ignorant of φ, then φ is true, via a primitive modality I which is undefinable in terms of standard epistemic operator K. The main objective of our presentation is to provide a comparative analysis of the three approaches for ignorance representation.

The first definition we consider is the one of van der Hoek & Lomuscio [4], who provide a system for representing ignorance whether. Semantically, they use standard Kripke semantics, in which ignorance is represented via a primitive modality (we call it I^w) as follows:

- $M, w \vDash I^w\phi$ iff there exists w' such that Rww' and $M, w' \nvDash \varphi$ and there exists w'' such that Rww'' and $M, w'' \nvDash \neg\varphi$.

The second definition belongs to Steinsvold [7, 8]. We call his operator Iu. It is defined on Kripke frames as follows:

- $M, w \vDash I^u\phi$ iff $M, w \vDash \phi$ and there exists w' such that Rww' and $M, w' \vDash \varphi$.

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The third option for ignorance representation is provided by Kubyshkina & Petrolo [5] and developed in Gilbert et al. [2]. We dub the ignorance operator I^f and it can be defined on Kripke frames as follows:

- $M, w \models I^f\phi$ iff for all w' such that w' is not w, $M, w' \not\models \varphi$ and $M, w \vDash \phi$.

All these three semantic frameworks characterize complete systems, the language of which is an extension of the language of classical propositional logic by the corresponding ignorance operator.

In our talk we will compare the three operators by considering their frame definability (see [1]) for the results on I^u operator). On this basis, we draw some conclusions on the expressivity of the languages containing ignorance operators, as well as on the specific conditions in which they can be used as primitive ones. This, in turn, will allow us to evaluate the extent to which each operator succeeds in formalizing its target concept.

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