

# The Virtues of Automated Theorem Proving in Metaphysics

## A Case Study: E. J. Lowe's Modal Ontological Argument

David Fuenmayer<sup>1</sup>, Christoph Benzmüller<sup>2,1</sup>, Alexander Steen<sup>1</sup>, Max Wisniewski<sup>1</sup>

<sup>1</sup>*Freie Universität Berlin, Germany*

<sup>2</sup>*University of Luxembourg, Luxembourg*

We present a study on *Computational Metaphysics*: a computer-assisted assessment of Lowe's ontological argument [2] using the interactive theorem prover *Isabelle*. Our approach builds on previous work on the semantic embedding of quantified multi-modal logics in classical higher-order logic (*Isabelle/HOL*) [1]. By discussing two (of several possible) formalization alternatives for this argument, we highlight the ambiguities of natural-language argumentation and present a case study for the adoption of computer-supported argumentation in philosophy.

We show how the practical benefits of Automated Theorem Proving (ATP) go beyond mere quantitative aspects (easier, faster and more reliable proofs). The advantages of ATP are also qualitative, since a different, *holistic* approach to argumentation is fostered: We can work *iteratively* on an argument by fixing truth-values and inferential relationships among its sentences, choosing a logic for formalization, and then working back and forth on its axioms and theorems by making gradual adjustments while getting automatic feedback about the suitability of our speculations. We engage in this way in a deliberative process where we progressively shed light on the meanings of words and sentences (cf. *semantic holism*) and continuously revise our beliefs and commitments until arriving at a state of *reflective equilibrium*: A state where our beliefs have the highest degree of coherence and acceptability.

Our findings, regarding Lowe's ontological argument, include the need for additional essentialist assumptions in the modal variant, and the possibility of a non-modal, first-order interpretation of this argument, motivated by a simplified, literal reading of its premises and conclusion. In both formalizations only a subset of Lowe's premises has been needed to justify the conclusion (the existence of a necessary concrete being). Moreover, we were able to demonstrate premises' consistency for all different variants.

The work presented here originates from the *Computational Metaphysics* lecture course held at the FU Berlin in Summer 2016. In this course we pioneered the computer-assisted, deep logical assessment of rational philosophical arguments in the classroom.

### Bibliography

1. Benzmüller, C. and Paulson, L., "Quantified Multimodal Logics in Simple Type Theory", *Logica Universalis* (Special Issue on Multimodal Logics) 7(1) (2013) 7-20.
2. Lowe, E. J., "A Modal Version of the Ontological Argument", in: James Porter Moreland, Khalidoun A. Sweis, and Chad V. Meister (eds.), *Debating Christian Theism*, Oxford University Press, 2013.