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Author(s)	,
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Abstract

Intuitionistic logic is the formalisation of the foundational ideas of Brouwer's mathematical programme of intuitionism. It is one of the earliest non-classical logics, which has been applied successfully in mathematics, computer science and philosophy. It has a close connection with modal logic, and many different kinds of its generalisation have been studied in various contexts, including intermediate (superintuitionistic) logics, substructural logics and subintuitionistic logics.

The difference between classical and intuitionistic logic may be interpreted to lie in the law of the excluded middle, which asserts that either a proposition is true or its negation is true. This principle is deemed unacceptable from a constructive point of view, in whose understanding the law has to mean that there is an effective procedure to determine the truth of each of the propositions. This understanding of the distinction between the two logics supports the view that negation plays a vital role in the formulation of intuitionistic logic.

Nonetheless, the formalisation of negation in intuitionistic logic has not been universally accepted. This is because some people believe it allows some problematic inferences, or it ignores certain aspects of the concept of negation. For instance, many have doubted in the past of the intuitionistic principle that any proposition can be deduced from a contradiction. For this reason, many different accounts of negation have been proposed, some seeking to weaken or strengthen intuitionistic negation, and others actively supporting negative inferences that are not possible with intuitionistic negation.

This thesis continues this tradition and investigates various aspects of negation in intuitionistic logic. We shall consider wide-ranging topics. Firstly, we shall look at how effectively one can conserve the deducibility of classical propositions in logics with weaker negation than intuitionistic logic, by assuming a certain atomic classes of non-constructive principles. Secondly, we study the relationship between the frameworks for weak negation, in order to make explicit the properties of weak logics. Thirdly, we investigate the ways to unify the formalisations of some logics with contra-intuitionistic inferences, which may be understood as a kind of intuitionistic modal logics. Finally, we shall consider actuality operator in intuitionistic logic, which can be seen as the dualisation of a contra-intuitionistic negation.

Keywords: intuitionistic logic, minimal logic, modal logic, negation, actuality.