

## Hypersequent Calculi – Theory and Application

The present work is a methodological study on different methods of proving cut eliminability in the framework of hypersequent calculi. In particular we provide axiomatic and semantical characterization of modal logic S5 which will serve as a running example of logic for which several solutions were provided. Since our aim is the study of methods not of logics we decided not to introduce the proliferation of logics but to show how different methods work for the same case. A problem of cut rule and its elimination will be discussed in general and we will show why this result fails to hold for standard sequent calculus for S5. We will introduce hypersequent calculi and characterize several solutions provided for S5 in this setting. Also we will illustrate different methods of proof of cut elimination in hypersequent calculi such a semantical way of proving a system cut-free and a syntactical proof of cut elimination, a general strategy of proof for hypersequent calculi. Finally we briefly describe a new approach to hypersequents which is based on their interpretation as finite lists of sequents. Such an approach seems to offer much better proof-theoretical characterization of many modal logics but requires a new method of proving cut elimination which is for the time being an open problem.

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