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Extensions of Analytic Pure Sequent Calculi with Modal Operators

Analyticity is a crucial property of proof systems. In the case of fully-structural propositional sequent calculi it usually implies their decidability and consistency.

Simple and decidable syntactic criteria for analyticity in pure sequent calculi have been formulated in [1] and [2]. [1] provides such a criterion for the family of canonical calculi, and [2] generalizes this criterion to be applied on pure calculi in general. Both [1] and [2] go through a semantic interpretation of sequent calculi: in [1], this interpretation is given by Nmatrices, where in [2], the more general framework of bivaluations is employed.

In this talk we go beyond pure calculi, and show that the extension of an analytic pure calculus with impure rules for modal operators preserves analyticity. The rules for modal operators that we consider are those of the modal logics K, $K4$, $K45$, B, $B4$, as well as the modal logic of Kripke models in which the accessibility relation is a partial function (that we call PF). All these logics are considered with and without the addition of the reflexivity axiom T and the seriality axiom D. For PF with D (also known as KF), this was already proven in [3]. The semantics of the extended calculi is obtained by considering Kripke models, where in each possible world the truth values are restricted according to underlying pure calculus. We define a semantic counterpart of analyticity, namely, the ability to extend partial Kripke models to full ones. Thus, proving the analyticity of the extended calculus from that of the original one, amounts to extracting an extension method for partial Kripke models from an extension method for partial bivaluations.

References

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