<u>Semantic Investigation of Basic Sequent Systems</u>

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Our research aims at a unified semantic theory for Gentzen-type systems and their proof-theoretic properties. We put our focus on the family of *basic systems* – a large family of fully-structural propositional sequent systems including arbitrary derivation rules of a certain general structure. Various sequent calculi that seem to have completely different natures belong to this family. This includes, for example, standard sequent calculi for modal logics, as well as multiple-conclusion systems for intuitionistic logic, its dual, and bi-intuitionistic logic. We present a general uniform method, applicable for every system of this family, for providing (potentially, non-deterministic) strongly sound and complete Kripke-style semantics. Many known soundness and completeness theorems for sequent systems easily follow using this general method. The method is then extended to the cases when: (i) some formulas are not allowed to appear in derivations, (ii) some formulas are not allowed to serve as cut-formulas, and (iii) some instances of the identity axiom are not allowed to be used. This naturally leads to semantic characterizations of analyticity (in a general sense), cut-admissibility and axiom-expansion in basic systems. In turn, the obtained semantic characterizations make it possible to provide semantic proofs (or refutations) of these proof-theoretic properties. In many cases such proofs are simpler and easier to verify than their proof-theoretic counterparts. We believe that these results provide useful tools, intended to complement the usual proof-theoretic methods.

Based on:

Ori Lahav and Arnon Avron, *A Unified Semantic Framework for Fully-structural Propositional Sequent Systems*, accepted to Transactions on Computational Logic).