Games for clopen fixpoints and the mu-calculus

Clemens Kupke

(joint work with Nick Bezhanishvili)

Topological fixpoint logics form a family of fixpoint logics that are interpreted over topological models and where the fixpoint operators are defined with respect to these topological interpretations. In my talk I will discuss a variant of these logics for relational structures based on Stone spaces, where the fixpoint operators are interpreted via clopen sets. The motivation is two-fold: i) studying this semantics will shed new light on completeness proofs for modal fixpoint logics and ii) restricting the interpretation of formulas to so-called admissible subsets of the model adjusts the expressiveness of the logic to capture natural topological properties of the model (e.g. reachability-in-the-limit as opposed to standard reachability).

Games provide an intuitive operational semantics for fixpoint logics that often forms the basis of model-theoretic investigations and of the algorithmic verification of fixpoint properties using automata. I will present a game-theoretic semantics for the topological fixpoint logic mentioned above. As a warm-up I will introduce games that characterise clopen fixpoints of monotone operators on Stone spaces. After that, I will show how these fixpoint games allow us to characterise the semantics for the above mentioned topological fixpoint logics using two-player graph games. The adequacy of the evaluation game and a game-theoretic proof of bisimulation-invariance of the semantics will be the main technical results of my talk.