Interpolation Meets Cyclic Proofs

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The usual proof-theoretic approach to Craig interpolation is algorithmic. It works by taking a proof π of a valid implication $\phi \to \psi$ and returning, simultaneously, a formula I (in the common vocabulary of ϕ and ψ) and proofs π_0 and π_1, respectively, of the implications $\phi \to I$ and $I \to \psi$, hence establishing that I is an interpolant for $\phi \to \psi$. The construction and verification of the procedure relies heavily on the salient qualities of the utilised proof system, such as cut-free completeness, form of the initial sequents or, more generally, the extent to which the vocabulary is preserved transiting from premise(s) to the conclusion of a rule.

In this talk, we will look at how the proof-theoretic method can be applied to the realm of cyclic proofs, wherein proofs are no longer finite trees but finite *graphs*. In particular, we will re-visit the question of uniform interpolation for the modal μ-calculus and its deep connection with completeness.