Monadic Second-Order Model Checking with Fly-Automata

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A well-known algorithmic meta-theorem states that every graph property expressible by a monadic second-order (MSO in short) sentence possibly using edge set quantifications can be checked in linear time for graphs of bounded tree-width; furthermore, every graph property expressible by an MSO sentence not using edge set quantifications can be checked in linear time for graphs of bounded clique-width given by an appropriate algebraic term. The standard proofs construct from the sentences and the given bounds on tree-width or clique-width automata intended to run on tree-decompositions or clique-width terms. However, they have so many states that these constructions are not usable in practice. This is unavoidable by Frick and Grohe. To overcome this difficulty in cases that are not "toy examples", we have introduced fly-automata that do not store states and transitions but compute them whenever needed. They have been implemented and tested, in particular for checking colorability and so-called acyclic colorability. A subset of the implemented functionalities will be demonstated by using a web interface in the first part of the lecture.