A Decidable Logic For Transductions with Regular Synthesis

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Transductions are binary relations from finite input to finite output words. We introduce a logic, called L_T, to express properties of transductions. In this logic, the dependency between input and output words is modeled via an *origin function* which associates with any position of the output word, the input position from which it originates. The logic L_T is expressive enough to define all MSO-definable *functions* of finite words, as defined by Courcelle, but also some interesting relations that are not definable by MSO-transducers, such as the shuffle, by which one obtains all permutations of a given input word. In this context a specification is given as an L_T formula and the regular synthesis problem amounts to obtaining a functional transducer satifying the specification. Despite the high expressive power of this logic we show that we can effectively uniformize an L_T definable transduction.