Beyond ω-Regular Languages

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Abstract

What is a regular language of infinite words? The class of regular languages of *finite* words can be described in a number of equivalent ways (Myhill-Nerode equivalence, finite automata/semigroups, regular expressions, etc.). Adding any languages to this class is impossible without losing important properties. In this talk, I will argue that for ω-words the situation is different, and there are extensions of ω-regular languages that are still robust.

What are these extensions? From a logical point of view, the idea is to add new quantifiers to monadic second-order logic. Using these quantifiers, one can express nonregular properties such as "there are arbitrarily long blocks of consecutive a's in a word from $(b * a)^\omega$". From an automaton point of view, the idea is to add counters to the automaton, and test the asymptotic values of these counters in the acceptance condition. The automaton model is closely related to distance automata, which were studied in relation to the star-height problem.