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COMPLEXITIES FOR JUMPS AND SWEEPS

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ABSTRACT

The recently introduced model of one-way jumping finite automata skips over letters for which it does not have defined transitions instead of halting and rejecting as classical machines do. It is known that as an acceptor it is strictly more powerful than classical finite automata. The extra power comes from the ability of temporarily jumping over parts of the input. Here we define classes of machines and their accepted languages when this resource is bounded asymptotically, similar to computational complexity classes. We initiate the study of the gap between the resulting constant and linear jumping complexity classes. We conjecture that there is no intermediate jumping complexity but show that for a restriction of the model where the length of the jumped-over factors is limited, machines with logarithmic jumping complexity exist. We also introduce a measure called sweep complexity in order to get closer to a characterization of the regular language class in terms of one-way jumping machines with limited resources.

Keywords: finite automata, one-way jumping automata, complexity, non-contiguous processing

1. Introduction

Jumping finite automata (JFA) have been introduced to model non-contiguous computations with finite state control and no storage [13]. The model can accept some non-regular languages by checking linear relationships between letter counts, but at the price of giving up most information on the order of the letters, jumping around nondeterministically in the input. This also means that JFA accept only permutation-closed languages, therefore not all regular languages. JFA has been studied extensively with regards to the class of accepted languages, pumping lemmas for them [12] and parsing complexity [8]. From the beginning (see general JFA [13]) the model has been extended to reduce its nondeterminism. The model was also combined with Watson-

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