AUTOMATA AS COALGEBRAS IN CATEGORY OF MATRICES

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ABSTRACT

This paper considers automata as models of systems used for information processing and computational execution. Special attention is devoted to the coalgebraic approach and the category of matrices as modern methods for the formal description of dynamic and state-based systems. By viewing automata as coalgebras, it becomes possible to model system behavior through sets of states and transitions while emphasizing behavioral equivalence. On the other hand, the category of matrices provides a natural algebraic framework for representing transitions, relations, and weights between states. The combination of these approaches establishes a unified theoretical model suitable for the analysis of finite, probabilistic, and weighted automata, as well as for applications in formal verification, communication protocols, and programming language theory. The results indicate that the coalgebraic interpretation within the category of matrices enables a deeper understanding of the structure and behavior of computational systems, thereby connecting automata theory with modern developments in computer science.

Keywords: Automaton, coalgebra, category of matrices.