AUTOMATIC STRUCTURES: OVERVIEW AND FUTURE DIRECTIONS [1]

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ABSTRACT

The theory of automatic structures is presented in relation to model theory, algebra, complexity theory and automata theory. We survey basic results and present possible directions for future research in the area.

Keywords: Automatic presentations, model theory, complexity theory, synchronous n-tape automata

1. Introduction

The theory of automatic structures in its modern form is relatively new though its roots go back to the beginning of the developments of finite automata theory. The term *automatic structure* in the sense presented in this paper first appeared in Hodgson [13] in the early eighties. Informally, a structure is automatic if it can be presented by finite automata. One can view the theory of automatic structures as

Automata Theory + Model Theory + Universal Algebra + Complexity Theory

The fact that the foundations of the theory come from the interactions of well-established areas with their own techniques, methods, and problems places it on solid ground.

A remarkable point is that an interest in the area arose from investigations of research groups with different mathematical interests and motivations. One is the group of Cannon, Epstein and Thurston and their collaborators in the theory of

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[1] Full version of a lecture presented at the Workshop *Weighted Automata: Theory and Applications* (Dresden University of Technology, Germany, March 4–8, 2002).