

# Automatic structures: the complexity of some natural decision problems

Computable structures, while being a natural class of relational structures, suffer from the high complexity of all associated decision problems: typically, they are either arithmetical or even in low levels of the analytical hierarchy.

To overcome this high complexity, we consider structures that are described by finite automata in much the same way that computable structures are described by Turing machines. A typical example of an automatic structure is formed by the additive group of integers (coded in binary). Over the past 20 years, many problems for such automatic structures have been shown decidable. This involves in particular the elementary theory of any automatic structure as well as theories of logics properly between first-order and second-order logic. The computational complexity of these theories span a wide range of complexity classes.

Other problems, that are undecidable for recursive structures, either become simpler (measured in the arithmetical hierarchy) or preserve their full complexity when considered for automatic structures.

The talk gives an overview over the results, proof techniques, and some open problems in this spectrum.

# Curriculum vitae

## Dietrich Kuske

Dietrich Kuske is professor for theoretical computer science and heads the Automata and Logics group at the Technische Universität Ilmenau (Germany). Currently, he serves as academic dean of the Department of Computer Science and Automation. He is also board member of several scientific organisations: European Association for Computer Science Logic (EACSL), Deutsche Vereinigung für Mathematische Logik und für Grundlagenforschung der Exakten Wissenschaften (DVMLG), and Special interest group “Logic in Computer Science” of the German Computer Science Foundation (FG Logik in der Informatik der GI).

Dietrich Kuske studied mathematics in Dresden, he obtained his doctorate (Dr. rer. nat.) from Essen university and his habilitation (Dr. rer. nat. habil.) from Technische Universität Dresden. He held positions in Dresden (D), Leicester (UK), Leipzig (D), and Bordeaux (F), and visiting and proxy positions in Halle an der Saale (D), Marseille (F), and Paris (F).

His research interests are centered around algorithmic aspects of logics, in particular when related to automata theory. In this and neighboring areas, he published about 50 papers in peer reviewed journals and more than 50 papers at peer reviewed conferences. Besides, he was invited to contribute survey articles to several collections.

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