

# Commentationes Mathematicae Universitatis Carolinae

---

Josef Úlehla

Behaviour of finite automata in infinite environment [Abstract  
of thesis]

*Commentationes Mathematicae Universitatis Carolinae*, Vol. 31 (1990), No. 1,  
195

Persistent URL: <http://dml.cz/dmlcz/106844>

## Terms of use:

© Charles University in Prague, Faculty of Mathematics and Physics, 1990

Institute of Mathematics of the Academy of Sciences of the Czech Republic  
provides access to digitized documents strictly for personal use. Each copy  
of any part of this document must contain these *Terms of use*.



This paper has been digitized, optimized for electronic  
delivery and stamped with digital signature within the  
project *DML-CZ: The Czech Digital Mathematics Library*  
<http://project.dml.cz>

regular ring of cardinality  $\aleph_1$ , then  $R$  is a  $\otimes$ -ring iff  $R$  is simple and completely reducible.

In chapter 2, the notion of a Whitehead property of modules is introduced. A ring is said to be a left Ext-ring if each module has the Whitehead property. The following result is proved: a ring  $R$  is a left artinian left non-singular left Ext-ring iff  $R = S$  or  $R = T$  or  $R = S \boxplus T$ , where  $S$  is a completely reducible ring and there is a division ring  $K$  such that the ring  $T$  is Morita equivalent to the ring of all upper triangular matrices of degree 2 over  $K$ .

The main result of chapter 3 states that if  $R$  is a simple countable regular ring such that  $R$  is not completely reducible, then the assertion "every countable module has the Whitehead property" is independent of ZFC + GCH.

### BEHAVIOUR OF FINITE AUTOMATA IN INFINITE ENVIRONMENT

J. ÚLEHLA, KAM MFF UK, Malostranské nám. 25, 118 00 Praha 1, Czechoslovakia

(27.9.1989, supervisors B.Novák, A.Pultr)

An algebraic theory of formal languages is presented. It can be looked on as a first order axiomatic theory.

The properties of the ordered monoid of all formal languages over a given set are investigated. Such an ordered monoid is called a babylon. Several types of morphisms among babylons are studied. Some of them are standard (homomorphism, substitution), others are new. A relation similar to the Galois connection is introduced; and found useful.

Systems of linear equations in babylons are considered. This leads to a theorem which generalizes both the theorem "an inverse homomorphism preserves regular languages" and the theorem "a two-way automaton accepts a regular language".

A characterization of the behaviour of the finite automaton in the Abelian group with two pebbles is given. This generalizes the folklore case the Abelian group being  $\mathbb{Z}^2$ .

### SOLUTION OF SUBSONIC ROTATIONAL NONVISCOUS FLOW IN THREE-DIMENSIONAL AXIALLY SYMMETRIC CHANNELS

V. ORŠULÍK, SVÚSS, 190 11 Praha 9 - Běchovice, Czechoslovakia

(28.9.1989, supervisors J.Polásek, M.Feistauer, J. Citavý)

The thesis is concerned with the mathematical study of a stationary, subsonic, generally rotational flow of an ideal fluid in three-dimensional axially symmetric channels. The author formulates the physical situation as a two-dimensional boundary value problem for the stream function which satisfies a nonlinear, elliptic partial differential equation. The essence of the work lies in a profound theoretical analysis of the weak formulation of the mentioned boundary value problem supplemented by some numerical results.

The finite element method is used for the discretization, firmly linear triangular elements. Detailed investigation of the discrete problem properties leads to two