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

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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

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

An algebraic theory of formal languages is presented. It can be locked 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

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(28.9.1989, supervisors J.Polášek, 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