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Die Optimalisation und die numerische Analyse der Reaktorsysteme

*Commentationes Mathematicae Universitatis Carolinae*, Vol. 28 (1987), No. 1, 195--196

Persistent URL: <http://dml.cz/dmlcz/106526>

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ABSTRACTS OF CSc. (Candidatus Scientiarum) THESES IN MATHEMATICS  
defended recently at Charles University, Prague

ON ESTIMATING THE DIFFUSION COEFFICIENT

G. DOHNAL, Faculty of Engineering, Technical University, Karlovo nám. 13, 12135 Praha, Czechoslovakia  
(6.1. 1986, supervisor P. Mandl)

The abstract was published in Announcements of new results in this journal, issue 27,1(1986), p. 205.

MODEL AND METHOD FOR ANALYSIS OF CATEGORICAL DATA WITH RELATIONS

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(13.2. 1986, supervisor F. Fabian)

The aim of the dissertation is to propose a general model which enables us to develop descriptive measures for distributions on various types of classifications with relations. The simple, ordered and quantitative classifications will be special cases of this model.

Chapter 1 introduces a generalized categorical variable, basic characteristics of its distribution, their properties and a distance of two distributions.

Chapter 2 gives properties of the distance of two distributions of the generalized categorical variable.

Chapter 3 provides a decomposition of the generalized variance, introduces measures of the explanatory and predictive power of decomposition and their properties.

Chapter 4 specifies the preceding results for nominal, ordinal and cardinal variables and provides two more special types of the generalized categorical variable.

Chapter 5 gives first two moments for some of the characteristics of the distribution.

Chapter 6 provides asymptotic distributions of the coefficients of the explanatory power and partial association.

Chapter 7 deals with testing hypotheses of goodness-of-fit and homogeneity of independent samples.

As the whole, the theory provides a tool for analyses of frequency distributions in which one wants to take into account the numerically expressed relations among categories.

DIE OPTIMALISATION UND DIE NUMERISCHE ANALYSE DER REAKTORSYSTEME

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(8.4. 1986, supervisor I. Marek)

In der Dissertation werden die Eigenschaften der  $u_0$ -positiven kompakten Operatoren, die einen gegebenen reellen Banachraum in sich abbilden, untersucht. Es wird gezeigt, dass aus der monotonen Abhängigkeit und Stetigkeit eines solchen Operators - der Funktion  $T = T(\gamma)$  bezüglich des Parameters  $\gamma \in \langle 0, +\infty \rangle$  die Monotonie und Stetigkeit der dominierenden positiven Eigenzahl  $\lambda_0 = \lambda_0(\gamma)$  als der Funktion dieses Parameters folgt. Es ist möglich, diese Ergebnisse für den Beweis der Existenz und der Eindeutigkeit des kritischen Parameters des Kernreaktors zu benutzen.

Das nächste Kapitel behandelt die Lösung des Problems der minimalen kritischen Menge des Treibstoffes im Kernreaktor. Es ist nötig, eine solche Verteilung des Spaltmaterials im Reaktor zu bestimmen, dass dieser Reaktor im kritischen Zustand ist und dass dabei die betreffende kritische Menge des Treibstoffes minimal wird. Diese Aufgabe hat höchstens eine Lösung, und ähnlich ist es auch bei der Diskretisierung. Auf einer geeigneten Funktionsmenge werden die notwendigen und ausreichenden Bedingungen des Extrems eines gewissen Funktional, der von der Funktion der Treibstoffverteilung abhängt und der die Menge des Treibstoffes charakterisiert, untersucht.

Die approximative Lösung der Optimalisationsaufgabe gründet sich auf die Approximation der Lösung des elliptischen Systems der Differentialgleichungen für die Komponenten des Neutronenstroms. Diese Approximation wird auf der Basis der Galerkinmethode vorgeschlagen. Die Ergebnisse der formalen Diskretisierung dieses Gleichungssystems werden dann auf eine konkrete Methode der Endelemente angewandt.

#### MOMENT PROBLEM AND ITS APPLICATION

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(14.4. 1986, supervisor J. Štěpán)

The thesis deals with the theory of the general moment problem and its engineering applications.

Simplicial measures - the extreme points in the marginal moment problem on a product of two spaces are investigated by means of so-called A-sets. A characterization of the A-sets is given and the relation between the support of a simplicial measure and an A-set is studied. The whole theory essentially generalizes the known results.

The optimization moment problem theory makes it possible to construct optimal conservative estimators of the expectation of a function of random parameters with a partially known distribution. This model is suitable in engineering for the evaluation of the fatigue-life of machine components. The presented method was used when testing the working reliability of a compressor during surging.

#### FINE LOCALIZATION IN POTENTIAL THEORY

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(7.5. 1986, supervisor J. Lukeš)

The dissertation is devoted to the fine Dirichlet problem and fine hyperharmonicity in the axiomatic potential theory. It is shown that the structure of standard H-cones (see [1]) is rich enough to develop the potential theory on open and finely open subsets of the underlying space including the Dirichlet problem.

The substantial part of the dissertation treats the capacity with values in the cone of all positive superharmonic functions on a finely open set and related quasi-topological notions.

The main results, in a very rough formulation, are as follows:

Theorem A. Let  $U$  be a finely open set. For each boundary function  $f$  which is integrable with respect to the harmonic measure there exists a unique finely harmonic function  $h$  on  $U$  which