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Random sets and their intersections [Abstract of thesis]

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#### RANDOM SETS AND THEIR INTERSECTIONS

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The principal aim of the theoretical part is the study of the relation between the concept of random sets and random automorphisms. The properties of random sets and the limiting behaviour of intersections of independent uniformly distributed random sets are analyzed in detail. The connection between random sets and measurable zero-one processes is then used to provide a probabilistic interpretation of fuzzy sets.

Using some analogy with the theory of probabilistic sampling from finite populations and random sets, the probability of inclusion of a point in a random set is defined. Introducing the concept of "inspection process", a relation is established between these results and the results concerning weak convergence of continuous stochastic processes.

A method of estimating integrals of an unknown function whose values are observed on a random set only is presented next. The estimate is proved to be unbiased and asymptotically normally distributed.

The results are then applied to develop a mathematical model of the propagation of corrosion. The study is supplemented with simulation experiments concerning the above and the distribution of measure of intersections of random sets.

#### CONSTRUCTION OF COUNTABLE TERNARY RINGS OF SUITABLE TYPES

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In the present work, the problem of existence of some types of nonplanar ternary rings using the method of Hughes (Proc. AMS 6(1955)) is solved. The work consists of six parts.

The first part is an introductory part and contains in a brief form a characterization of the work, the description of methods and some basic results. In the second part, necessary facts about ternary rings and, especially, the classification given by Havel and Studnička are presented.

In the third part, two types of special maps so called  $\mathcal{P}$ -map and  $\mathcal{A}$ -map are studied in a detailed way.

In the next two parts, constructions of proper countable cartesian groups i.e. countable ternary rings of the type  $IV_{(1)}$  and  $IV_{(2)}$  are given. It is shown there that if we start with a partial algebra  $(R, +, \cdot, 0, 1)$  where  $(R, +)$  is a countable non necessary commutative group with the neutral element 0 and " $\cdot$ " is a partial binary operation with the right neutral element 1=0 and some additional conditions are fulfilled, then there exists a ternary ring  $(R, T, 0, 1)$  of the type  $IV_{(1)}$  or  $IV_{(2)}$  which has the additive group isomorphic to  $(R, +)$ . In the last sixth part, the results of the fifth part are used for a construction of a countable nonplanar and nonlinear ternary ring, i.e. a countable ternary ring of type  $IV_{(2)}$ .

#### SOME ALGEBRAIC MODELS FOR DIFFERENTIAL GEOMETRY OF SECOND ORDER

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In the first part of the thesis (chap. 1-3), algebraic models of some geometric objects are studied. Categories of double vector spaces and double