Kybernetika

Book reviews

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Balanced Silverman Games on General Discrete Sets

Lecture Notes in Economics and Mathematical Systems 365.
Springer-Verlag, Berlin – Heidelberg – New York – London – Paris – Tokyo 1991.
140 pages.

The referred book deals with Silverman games which represent a specific case of two-player zero-sum games. Each player's strategy consists in an independent choice of a number from a given non-empty set. The player who chooses higher number wins its value unles his choice is "much higher" (it is T-times greater then his partner's choice where $T > 1$ is a number given by the rules of the game). In such case he pays a constant penalty to his partner.

The usual treatment of such games is based on the concept of reduced Silverman game derived from the original one by reducing the sets of strategies (i.e. the sets from which the numbers are chosen) where the set of optimal strategies keeps unchanged.

The brief survey of already existing results known from the literature displays that most of them is focused to rather special cases, namely to Silverman games with either disjoint or identical sets of strategies. The referred book is devoted to the general case with the sets of strategies between those two extremes. An effective tool for their investigation is represented by the concept of essential subgame with the sets of strategies reduced to in certain sense extreme or almost extreme elements. It is shown that some interesting and relatively large classes of Silverman games can be reduced to essential subgames with remarkably small number of strategies.

Seemingly the Silverman games form a highly specialized and perhaps rather abstract type of matrix games. This impression, as shown also in the book, is false. These games are the most adequate model of numerous strategical bidding or spending situations like spending on armaments, advertising spending or sealed bids in auctions. It means in the strategical decision-making in which the bigger spender wins but his victory turns into a loss if his spending is overdone.

The referred book offers an interesting and useful contribution to the theory of Silverman games and throughout their understanding it gives a specific view on the structure of matrix and antagonistic games in general. Specialists in the mathematical game theory as well as those who tend to apply that theory to the described type of situations find in this book a good and inspiring tool for their work.

Milan Mareš

VILÉM NOVÁK

Fuzzy Sets and their Applications

Adam Hilger Publishing Company Bristol, Philadelphia, and SNTL, Prague 1990.
240 pages; 18 figures, 7 tables.

The fuzzy set theory with its numerous applications and specific modifications like fuzzy logic, fuzzy numbers theory, fuzzy functions, etc., was suggested to be a mathematical model of non-stochastic uncertainty and vagueness. Its explosive development during last two decades indicates the need of such theory for adequate mathematical modelling of vague phenomena.

The amount of fuzzy set theoretical concepts, methods and results presented in the literature does not allow to deal all of them fully in any book of reasonable extent. Also the referred book, even if the area of its interest is relatively large, cannot cover all sub-branches of fuzzy set theory in an equivalent style. Some subjects are informatively described (e.g. the fuzzy numbers, fuzzy decision-making, fuzzy programming) some others (fuzzy reasoning, fuzzy logic) are presented more in details, and some (fuzzy games, fuzzy networks) had to be omitted. In such situation when the extent of the book admits only essential information on some of relevant subjects, good list of references becomes extremely important. The one summarized in the Novák's book is sufficiently rich and representative up to the situation

existing in the year of finishing the manuscript. It is creditable that the references include also some not commonly known but often interesting papers by Czech authors.

The book is divided in two main parts, each of them consisting of a few chapters. The first part deals with the theoretical principles. After introducing necessary mathematical fundaments the author presents the theory of fuzzy sets including operations on them and general fuzzy structures. Models of fuzzy variables and the natural language semantics are described in the next chapter. The first part is finished by a chapter devoted to fuzzy logic and reasoning.

Numerous application areas are shown in the second part of the book. Its chapters are devoted to fuzzy decision and control, fuzzy systems theory, fuzzy algorithms and programming languages and also some other more specialized applications of fuzzy sets, like fuzzy clusters, pattern recognition, psychology, situation analysis in power systems or linear programming are very briefly mentioned.

The book is written in lucid, consequently mathematical style. The statements are proved, notions are well defined and the presentation of the fuzzy set theory concepts is strictly logical. On the other hand, the mathematical apparatus used in the book is not very specialized and the reader, anyhow supposed to be informed about some mathematical notions, need not be a mathematician. Considering potential applicability of fuzzy sets, the acceptance of the book by researchers from non-mathematical branches is desirable. From this point-of-view the generalized concept of membership functions as mappings from a universum into lattice (instead of the closed [0, 1] interval) seems to be rather too formal and confusing for non-mathematical readers.

Anyhow, the referred book represents a well done work which can be recommended to anybody who wants to get good survey on the fundaments of the fuzzy set theory and on the most attractive of its applications. Such reader can be sure that the presentation of the subject is precise, and that the knowledge obtained from the book is based on solid fundaments. Regarding a summarizing book on applied mathematics areas, this quality evaluation means an doubtless sign of good level.

Milan Mareš

ANTONÍN VANĚČEK

Teorie řízených soustav

Academia, Praha 1990.
224 stran; 86 obr.; cena 35,– Kčs.

Kniha je věnována analýze a syntéze řízení, která vychází důsledně z maticové formulace stavového modelu řízeného systému, a metodicky navazuje na výsledky dosažené Maxwellem, Nyquistem, Bodem, Masonem, Bashkowem, Kalmanem, Popovem a O'Donnellem.

Autor se zaměřil hlavně na otázky stability a robustnosti stability a zabýval se metodami, jak tyto vlastnosti nejen zjistit, ale také zaručit pomocí stavových zpětných vazeb. Dospěl k závěru, že pro opakovanou analýzu a syntézu jsou vhodné metody akce parametrů a kořenů charakteristické rovnice, resp. vlastních čísel stavové matice. Soustavné použití Masonových grafů přispívá k názornosti fyzikálních představ o účincích vazeb ve stavovém modelu. Totéž lze říci o užitečnosti metody geometrického místa kořenů.

Stavový model ve tvaru matice lze uplatnit i pro mnoharozměrné soustavy. Jeho teorie je ovšem podstatně složitější než u jednorozměrných soustav. Dovoluje opět použití Masonova grafu, ne však Masonova pravidla, jehož platnost je omezena jen na jednorozměrné případy. Pro vícerozměrné regulační obvody není struktura regulátoru jednoznačně určena – autor dospěl k závěru, že takových struktur, splňujících jisté podmínky, je celkem šest.

Pokud jde o robustnost stability, autor upozorňuje na potíže při řešení tohoto problému.

Za hlavní autorův přínos k řešení této problematiky považuji nekonvenční přístup s vlastním pohledem na věc, nalezení souvislostí mezi výsledky různých autorů a sjednocení těchto výsledků. Tím lze vytvořit alternativu teorie řízení.

Knihu lze doporučit specialistům v oboru teorie řízení.

Jaroslav Maršík