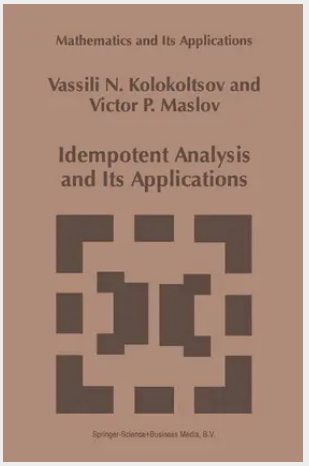
Kolokoltsov / Maslov

Idempotent Analysis and Its Applications

The first chapter deals with idempotent analysis per se. To make the pres- tation self-contained, in the first two sections we define idempotent semirings, give a concise exposition of idempotent linear algebra, and survey some of its applications. Idempotent linear algebra studies the properties of the semirn- ules An, n E N, over a semiring A with idempotent addition; in other words, it studies systems of equations that are linear in an idempotent semiring. Pr- ably the first interesting and nontrivial idempotent semiring, namely, that of all languages over a finite alphabet, as well as linear equations in this sern- ing, was examined by S. Kleene [107] in 1956. This noncommutative semiring was used in applications to compiling and parsing (see also [1]). Presently, the literature on idempotent algebra and its applications to theoretical computer science (linguistic problems, finite automata, discrete event systems, and Petri nets), biomathematics, logic, mathematical physics, mathematical economics, and optimizat ion, is immense; e. g., see [9, 10, 11, 12, 13, 15, 16, 17, 22, 31, 32, 35,36,37,38,39 ,40,41,52,53 ,54,55,61,62 ,63,64,68, 71, 72, 73,74,77,78, 79,80,81,82,83,84,85,86,88,114,125 ,128,135,136, 138,139,141,159,160, 167,170,173,174,175,176,177,178,179,180,185,186, 187, 188, 189]. In §1. 2 we present the most important facts of the idempotent algebra formalism. The semimodules An are idempotent analogs of the finite-dimensional v- n, tor spaces IR and hence endomorphisms of these semi modules can naturally be called (idempotent) linear operators on An.

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