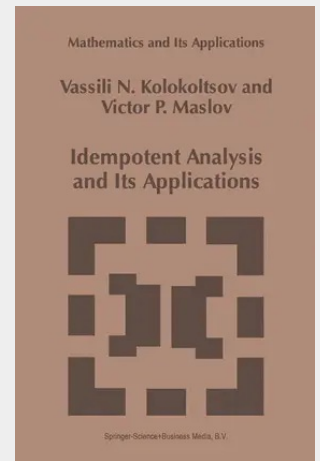


Idempotent Analysis and Its Applications

The first chapter deals with idempotent analysis per se. To make the presentation 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 semirings A_n , $n \in \mathbb{N}$, over a semiring A with idempotent addition; in other words, it studies systems of equations that are linear in an idempotent semiring. Probably the first interesting and nontrivial idempotent semiring, namely, that of all languages over a finite alphabet, as well as linear equations in this semiring, 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 optimization, 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 A_n are idempotent analogs of the finite-dimensional vector spaces $\mathbb{R}^n$ and hence endomorphisms of these semimodules can naturally be called (idempotent) linear operators on A_n .

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