Summary: Numerical P systems (NP systems, in short) are a class of distributed and parallel computation systems abstracted from the structure of biological cells. By introducing some control mechanisms to manipulate the application of programs, a number of NP systems have been proposed, including enzymatic NP systems and NP systems with thresholds/production thresholds. In order to control the application of programs more effectively, this paper introduces a control condition with Boolean form to propose a variant of NP systems, NP systems with Boolean condition (for short, BNP systems). Compared to the existing variants, BNP systems can provide flexible and more powerful program control ability. The computational power of the new variant is investigated. In particular, we prove that BNP systems as number generating/accepting devices and function computing devices, respectively, under three working modes (all-parallel, one-parallel and sequential), are Turing universal.

MSC: 68Q05 Models of computation (Turing machines, etc.) (MSC2010)

Keywords: membrane computing; numerical P-systems; numerical P-systems with Boolean condition; register machine; universality

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