

Computing with Cells: Membrane Systems ^{*}

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Abstract. Membrane computing is a part of the general research effort of describing and investigating computing models, ideas, architectures, and paradigms from processes taking place in nature, especially in biology. It identifies an unconventional computing model, namely a P system, which abstracts from the way living cells process chemical compounds in their compartmental structure. P systems are a class of distributed maximally parallel computing devices of a biochemical type. We give a brief overview of the area and present results that answer some interesting and fundamental questions concerning issues such as determinism versus nondeterminism, membrane and alphabet-size hierarchies, various notions of parallelism, reachability, computational complexity. We also look at neural-like systems, called spiking neural P systems. Such systems incorporate the idea of spiking neurons in membrane computing. We study various classes and characterize their computing power and complexity.

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