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Tissue-like P systems with evolutionary symport/antiport rules. (English) Zbl 1429.68074


Summary: Tissue P systems with symport/antiport rules are a class of distributed parallel computing models inspired by the cell intercommunication in tissues, where objects are never modified in the process of communication, just changing their place within the system. In this work, a variant of tissue P systems, called tissue P systems with evolutional symport/antiport rules is introduced, where objects are moved from one region to another region and may be evolved during this process. The computational power of such P systems is studied. Specifically, it is proved that such P systems with one cell and using evolutionary symport rules of length at most 3 or using evolutional antiport rules of length at most 4 are Turing universal (only the family of all finite sets of positive integers can be generated by such P systems if standard symport/antiport rules are used). Moreover, cell division rules are considered in tissue P systems with evolutional symport/antiport rules, and a limit on the efficiency of such P systems is provided with evolutional communication rules of length at most 2. The computational efficiency of this kind of models is shown when using evolutional communication rules of length at most 4.

MSC:

68Q07 Biologically inspired models of computation (DNA computing, membrane computing, etc.)

Keywords:

bio-inspired computing; membrane computing; tissue P system; symport/antiport rule; cell division; universality

Full Text: DOI

References:


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