Tissue-like P Systems with Polarizations

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Problems & Ideas

- Problems of conventional tissue-like P systems:
  - Conventional tissue-like P systems do not have polarizations on cells. Nevertheless, polarizations may exist in actual biological tissues.
  - The computational power of tissue-like P systems is restricted, , e.g. with a rule length of at most 2.
- Ideas: Inspired by the biological phenomenon of polarization on cells of actual tissues, the variant tissue-like P systems with polarizations is proposed, in which the execution of rules may be influenced by polarizations on cells.

Main Contributions

- Contributions:
  - Inspired by the biological phenomenon of polarization on cells of actual tissues, a novel variant of tissue-like P systems is proposed, namely, tissue-like P systems with polarizations, in which the execution of rules may be influenced by polarizations on cells.
  - Currently, the computational power of conventional tissue-like P systems with a rule length of at most 2 is restricted; however, we deploy the novel variant to obtain the same computational power as a Turing machine.
  - Cell division rules with polarizations are introduced to solve the classical **SAT** problem, passing from non-efficiency to efficiency, by combining antiport rules and symport rules, where the total number of objects participating in the rules is 2;
  - The strategy of applying rules with polarizations is introduced into tissue-like P systems, which provides a more flexible and accurate approach for using rules in tissue-like P systems. Hence, in some sense, the variant can be more suitable for some applications.