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Feasibility analysis of realization of primitive computer structures based on DNA assembly elements

ABSTRACT

The purpose of this work is to introduce biocomputing as a possible way of processing in the future. The registry of standard biological parts named Biobricks is our fundamental source of assembly parts, which are already distributed among individual groups by function.

By searching for similarities between functions of electronic components and functions we can produce from DNA sequence, we presented a method to compose primitive logic structures. Digital devices are mainly made of logic gates. By creating biological gates and classifying them as a functionally complete set we can by definition assemble any logic function we can think of. Connecting output to input signal in a biological circuit is a challenge comparing to connection in electronic circuits, because here we don't have a universal current between components. In order to create it we introduced an additional device that converts intensity of protein generation into signal.

A reliable biological circuit is the result of planning, choosing proper assembly elements, modeling, analyzing and testing. We introduced an algorithm that will lead us step-by-step towards a working and reliable biological structure.

Multicellular and intelligent systems mostly have to be synchronized; for that purpose we presented the necessary communication structures, challenges and terms for reliable and efficient communication function.

This paper is the groundwork for future research and realization of biological system that will reliably perform any chosen process.

Key words: biobricks, biocomputing, nanocomputing, bio logic gates, multicellular system.