

Towards the realization of synchronous sequential biological circuits

MIHA MOŠKON¹, MONIKA CIGLIČ², NIKOLAJ ZIMIC¹, MIHA MRAZ¹

¹Faculty of Computer and Information Science, Computer Structures and Systems Laboratory
University of Ljubljana
Tržaska cesta 25, 1000 Ljubljana
SLOVENIA

²Department of Biotechnology
National Institute of Chemistry
Hajdrihova 19, 1000 Ljubljana
SLOVENIA

miha.moskon@fri.uni-lj.si; monika.ciglic@ki.si; niko.zimic@fri.uni-lj.si; miha.mraz@fri.uni-lj.si

Abstract: Synthetic biology is an emerging field that is rapidly evolving and is promising many applications in the near future. Information processing capable systems are certainly one of them, especially because we are currently facing many problems with the existent technology upon which computer systems have based for the last 80 years. Here we present the next step towards the construction of a complex biological information processing capable systems which will in our opinion soon be comparable to computer systems used nowadays. We present the model of a first synchronous sequential circuits constructed with the use of gene expression based logic. With the promising results presented in the paper physical realization of the described circuit within the living cell can be initiated.

Key-Words: Synthetic biology, Protein-based computing, Sequential logic, Synchronization, Ordinary differential equations, Biological modelling, Circuits, Master-Slave flip-flop