

Survey on Cellular Automata and Articulation Point applications on graphs and networks

Bogdan-Eduard-Mădălin Mursa

Faculty of Mathematics and Computer Science, Babeş-Bolyai University

`bmursa@cs.ubbcluj.ro`

From micro to macro systems, our Universe is driven by interactions between entities. Even if entropy looks to be the main characteristic of these systems behaviour, recent studies shown that these systems can incapsulate different patterns which can be studied as separate system organisms, in order to conclude system behaviour. A such approach are network motifs - data structures that represent a pattern of interconnections which can occur in a number significantly higher in complex networks, than in randomized networks that keep the same degree distribution as the initial network [2]. Even if the most network motifs studies were based on graph and network theory, we think that there are other fields from which we can borrow concepts that could lead to interesting and valuable solutions.

The scope of this paper is to present a concise review of Cellular Automata (CA) applications on graphs or networks and the concept of Articulation Points (AP). We will discuss around applications' papers proposals, following their scope and results and finally we will propose research directions of CA and AP in network motif discovery field.

References

- [1] P.B. González, M. Gomez-Delgado and F.A. Benavente, “Vector-based Cellular Automata: exploring new methods of urban growth simulation with cadastral parcels and graph theory”, *Computers Environment and Urban Systems*, Vol. 54, pp. 119-131, 2015.
- [2] R. Milo, S. Shen-Orr, S. Itzkovitz, N. Kashtan, D. Chklovskii and U. Alon, “Network motifs: simple building blocks of complex networks”, *Science*, Vol. 298, pp. 824-827, 2002.
- [3] E. Remila, “Recognition of graphs by automata”, *Theoretical Computer Science*, Vol. 136, pp. 291-332, 1994.
- [4] L. Tian, A. Bashan, D.N. Shi and Y. Y. Liu, “Articulation points in complex networks”, *Nature communication*, Vol. 8, 2017.
- [5] S. Wolfram, “Statistical mechanics of cellular automata”, *Reviews of Modern Physics*, Vol. 55, pp. 601-644, 1983.