THE CONDITIONS OF STRUCTURAL TENDENCIES

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Abstract. Structural tendencies are observed in simulation of adaptive evolution of Kauffman complex (chaotic) networks. Fitness is defined on external outputs of the network. The adaptive condition is by definition the main condition of structural tendencies. However, although the used model is simple, for the occurrence of particular tendencies a lot of different parameters of model must be chosen and they are also the conditions of these tendencies. The most important one is the decision whether to introduce a cost of maintenance of nodes in the network. Without the cost, the mechanisms leading to tendencies are gentle and sensitive to lot of parameters, the majority of changes accepted by adaptive condition concern the blind nodes (which have no path to system's external outputs on which fitness is defined) and transparent nodes (which do not change their input signals). Partial costs (cost of a blind and cost of transparency) make the process more similar to reality, but even together they are much weaker than full cost. Cost of a blind turns out to be better than earlier method of change in the pattern of addition. If full cost is used, then the growth of network may require a radical decrease in removing of nodes, the tendency of deep fadeout is strongly reduced. The influence of types of: network, fitness and depth measure on tendencies expression are also considered. Mechanisms of deep fadeout tendency and limitation of growth are discussed.

Keywords. Kauffman network; Boolean network; damage spreading; chaos; adaptive system.

1　Introduction

1.1　What are 'structural tendencies' ?

The 'structural tendencies' are some statistical effects observed in the structure of complex (chaotic) networks which are improved to better the realisation of an assumed task. In other words they are general statistical effects of adaptive condition of chaotic network growth.