

Dynamic Fitness in Barabasi-Albert Networks

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The Barabasi-Albert model of network growth extends earlier random models with the concept of preferential attachment, in which qualities of a node (number of links and fitness) determine the probability that it will receive a link. However, each node's fitness remains static through the life of the graph. Fitness does not seem like something that should remain fixed for the lifetime of the node in question.

We used the Swarm toolkit to experiment with various types of dynamic fitness and observe the effects they had on the scale-free properties of a BA graph. Aging of nodes causing a reduction of fitness has already been studied, and its effects on the graph have been noted. However, the age of a node is no guarantee that it is less fit. For example, in a competitive world such as the Internet, when one node or site gains an advantage, others may try to imitate its success.

This concept of dynamic fitness appears elsewhere. For example, population distributions are in constant flux, with the identities of the most densely populated areas changing over time, while the number of such places remains small. This property seems to carry over to graphs that follow a similar power-law distribution.