Growth of tree with allocation rules.

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Abstract

The object of study are transportation networks as they may exist in physics, engineering and biology such as for the transport of water, electricity, oxygen etc. A typical approach to study these kind of systems is an optimization one. However networks do not emerge fully formed but are evolving and growing systems that may be shaped by local interactions (rivers, plants). To account for and study this phenomenon, we allow the network to evolve in time according to how the transported resource is distributed within the network. An example of such system are biological trees as the allocation of sugar across itself would influence which part of the tree grows and, thus, drives its geometry and the topology of the network the tree can be represented with. As such, we construct a model inspired by biological trees. We then progressively add physical constraints to this model such as some spatial exclusion factors, gravitational loads and light interception, and study their influence of the dynamics of the system.

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