

# Visual Models of Plants Interacting with Their Environment

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## Abstract

Interaction with the environment is a key factor affecting the development of plants and plant ecosystems. In this paper we introduce a modeling framework that makes it possible to simulate and visualize a wide range of interactions at the level of plant architecture. This framework extends the formalism of Lindenmayer systems with constructs needed to model bi-directional information exchange between plants and their environment. We illustrate the proposed framework with models and simulations that capture the development of tree branches limited by collisions, the colonizing growth of clonal plants competing for space in favorable areas, the interaction between roots competing for water in the soil, and the competition within and between trees for access to light. Computer animation and visualization techniques make it possible to better understand the modeled processes and lead to realistic images of plants within their environmental context.

**Keywords:** scientific visualization, realistic image synthesis, software design, L-system, modeling, simulation, ecosystem, plant development, clonal plant, root, tree.

## Reference

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