A Modular and Dynamic GPU-based Maize Simulation Using L-Systems

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Plant field testing proves often a long and costly process crucial to the development of efficient agricultural techniques. We aimed to create a plant topology simulator that presents a significant improvement in speed over other plant simulators by utilizing the GPU to model accurately plant growth based on abiotic factors. Each plant, composed of a binary tree structure, is grown iteratively. Over each iteration, both the plant and the external environment are updated. Each node keeps track of values for various factors, which affect its growth in each iteration. Nodes are evaluated in parallel, using the GPU, which provides significant performance gains and runs stably on most consumer grade computers. We chose to focus on modelling corn, due to its status as a staple food in many parts of the world. Our final program generates data that is within a 95% CI for actual plant dimensions and plant resource consumption. Error can be attributed to lurking and confounding variables unable to be distinguished with the given datasets. Compugenesis has applications in 3D modeling of plants, particularly for real time renders and simulations, and uses in plant placement and crop yield optimization. In the future, we hope to expand our program to include a full-fledged plugin system to accommodate other types of plants.

Awards Won:
Third Award of $1,000