

Procedural road network generation

Project proposal

Martin Engilberge
Florian Depraz

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Background:

With the increase of computing power, it is possible to render large virtual worlds. But creating these worlds from scratch might be time consuming. For example, the generation of mountains, water (lakes, rivers), roads and cities that make the environment realistic and non-repetitive is not an easy task.

Problem:

For this project, the focus will be on the road network generation of a city. Using some basic informations like height-map, and population's density. it will generate a plausible street network, connecting the neighborhoods. The size of the road will vary (street, major road, highway, avenue) depending on the traffic density and the places connected by the road.

Implementation:

First, two pictures representing the height-map and the density population are used as input. It will be converted to arrays where each pixel represents a cell. The main data structures used will be arrays. Then The generation of the streets will be done using L-systems. In the end the result will be converted from an array to a picture representing a 2D map. If possible, a second algorithm will be implemented to connect the cities previously generated. On a country scale using path finding (A^* , ...) and graph algorithms (Prim's, ...).

Evaluation:

To test the realism of the created maps, perceptual experiments could be done. Real data could be input to the algorithm to generate several road networks with different parameters. Participants will evaluate the realism of the networks. The results yield by these tests will show how the maps are perceived.

References:

Network generation using L-systems: <http://www.diva-portal.org/smash/get/diva2:663032/FULLTEXT01.pdf>

Network generation using graph and pathfinding algorithms: <http://scholarworks.rit.edu/cgi/viewcontent.cgi?article=6536&context=theses>