Erosion Algorithms and Virtual Terrain Generation

When simulating an environment, especially something resembling terrain we are familiar with, it may not be enough to have a noise map to mimic the details of an ecosystem. When considering common environments that include structures resembling bodies of water, eroding rock formations, or the life cycle of plants it may be difficult to mimic these real-life scenarios with a noise generated map. Noise is generated to be uniform-random patterns that can have difficulty distinguishing one substance or physical relationship like a stream of water and the relationship to the terrain it is in (Vivo).

Hydraulic erosion simulates the relationship of water and terrain to better portray a dynamic environment. To create a hydraulic erosion algorithm, it can be either A 2D array is used to keep the position and pressure of water on the terrain. Every update would calculate the sediment and erosion of each cell as well as the movement of the water (Talle). Or it may be calculated by keeping reference of each water particle and its behaviour, including its position speed and sediment it erodes (Talle). These seem to be common approaches that can be written in “20 lines of code (McDonald).” However, there can always be added complexity. Water has many dynamic factors that affect its physics like momentum, temperature and purity or the amount of sediment carried (Tychonievich). Imagining the differences of rain and mud is enough to understand the dynamics that simulating water on terrain may have.

Although we can use noise generation to create a terrain, using an erosion algorithm would provide a more accurate and surreal environment. Erosion algorithms mimic real life erosion patterns that are responsible for creating terrains which causes the algorithm to generate a very detailed terrain that heavily imitates its real-world counterpart.

Citations:

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