RW778: Implementation and Application of Automata, 2006 Week 3 Lecture 1

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Graphics Modelling with Cellular Automata

References:

- 1. Handout (ca.html)
- 2. Druon, Crosnier and Brigandat: Efficient Cellular Automata for 2D/3D Free-form Modelling.
- 3. Arata, Takai, Takai, Yamamoto: Free-form Shape Modelling by 3D Cellular Automata.



Graphics Modelling with Cellular Automata

Many applications of CA in graphics modelling:

- Cluster shape modelling
- Texture generation
- Virtual clay modelling
- Erosion of the bones
- ► Parallel particle systems
- Artificial life





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- Repartition excess clay according to formula:

IAA2006-W3L1 - (10)



For each block

For each cell *c* over threshold

$$dm_k \leftarrow m_k * \alpha$$
$$m_k \leftarrow m_k - dm_k$$

For each cell j under threshold

$$m_j \leftarrow m_j + (dm_1 + \ldots + dm_r)/n$$

 α : distribution rate (0.3) dm_k : excess clay in cell k r, n: number of cell over/under threshold

IAA2006-W3L1 - (11)



Cellular Automata: Examples Virtual Clay Model (Arata)

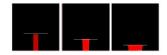


Figure 4.1: Results obtained with repartition law 1



Figure 4.2: The density in the object is now homogeneous

Figure: Clay deformation with Druon's extensions: rule 1

IAA2006-W3L1 - (12)

Cellular Automata

Homework: Adapt your implementation of CA to implement 2D shape modelling (based on 2D CA). Generate a 2D graphical output representing the transformation. Bonus: Extend to 3D.