



Nano-assembly with cells from particle interaction based on collisions of mobile localizations in cellular automata

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Complex Cellular Automata (LCCOMP, México, DF; ICUC, Bristol, UK)

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An automatic process is proposed by construct nano-assembly devices, derived from a set of synchronised collisions between multiple particles, such an automation is based on programming regular expressions and finite state machines.

A cellular automaton CA is a 4-tuple $A = \langle \Sigma, u, \varphi, c_0 \rangle$ evolving in d -dimension, where $d \in \mathbb{Z}^+$. Such that:

- ▶ Σ represents the alphabet
- ▶ u the local connection, where, $u = \{x_{0,1}, \dots, x_{n-1,d} | x \in \Sigma\}$, therefore, u is a neighborhood
- ▶ φ the local function, such that, $\varphi : \Sigma^u \rightarrow \Sigma$
- ▶ c_0 the initial condition, such that, $c_0 \in \Sigma^{\mathbb{Z}^d}$

Also, the local function induces a global transition between configurations:

$$\Phi_\varphi : \Sigma^{\mathbb{Z}^d} \rightarrow \Sigma^{\mathbb{Z}^d}.$$

Cells represent states of atoms and the local function construct a family of particles. Later, these particles are coded based regular expressions for assembly during its evolution. This way, an automatic system can be implemented for construct initial conditions and design different nano-structures dynamically.

Nano-structure constructed from collisions of mobile and stationary localizations in cellular automata and excitable media. "Initial experiments". Next simulation evolves on 152,012,025 cells.

cell codification:

