Perturbed planar trinet computations with two rewrite rules

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Abstract
According to an NKS conjecture, trivalent graphs (networks) may represent the appropriate model for our dynamic physical space. We introduce a three-parameter algorithm for growing planar trivalent networks based on the mobile network automaton idea shortly mentioned in the NKS book, and on a complete set of two graph-rewrite rules only. The initial trinet is a two-node graph with three parallel edges. We expose complexity by means of a useful revisit indicator that provides a compact visual representation of computations, as an alternative to inspecting huge lists of graphs. The typical features that emerge in cellular automata -- periodicity, nesting, deterministic randomness -- are also detected by our indicator, and the corresponding trinets exhibit a variety of shapes, including regular or quasi-regular trees, 1-D or 2-D grids, and graphs with bounded chaotic and unbounded regular components. Furthermore, two most surprising computations are found that yield a remarkably fair, and uniform random-like revisit indicator (to be presented at NKS 2007 Conference).

In the context of the Summer School project, after substantially improving the M6 code for the above algorithm we have addressed the question: how do different trinet computations react/resist to perturbations, such as the loss of a portion of the graph, or a temporary alteration of an algorithm parameter?

Results
We have devised a simple way to introduce temporary perturbations in trinet computations, and have visualized their effects by the revisit indicator, which turns out to be especially useful for this purpose. This technique can indeed be used also for exploring behaviors starting from random initial conditions.
1. **Cellular automata vs. trivalent networks ('trinets')**

Trinets do not assume a predefined and rigid space, but *create* it!
2. Planar trinets, duals, and two rewrite rules

T2 ('Refin'), T1 ('Diags')

The dual graph -- white nodes -- is also planar, its faces are (possibly degenerate) triangles, and its nodes have unrestricted degree.
3. The planar trinet algorithm

three parameters: Threshold (3-\( \infty \)), RefinCode (1-18), DiagsCode(1-9)
4. Some computations

\{\text{Threshold, \{RefinCode, DiagsCode\}, Steps}\}
5. More computations
6. Some perturbations

Temporarily change value of threshold parameter to $\infty \implies$ only apply rule Refin) from step-i to step-k

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7. More perturbations

\{4, 0, 30, \infty\}, 16, 4, 2000

\{4, 0, 500, \infty\}, 17, 8, 3000

\{6, 0, 50, \infty\}, 10, 2, 500

\{6, 200, 500, \infty\}, 10, 2, 1000

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