Reversibility vs local creation/destruction

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Résumé

Consider a network that evolves reversibly, according to nearest neighbours interactions. *Can its dynamics create/destroy nodes ?* On the one hand, since the nodes are the principal carriers of information, it seems that they cannot be destroyed without jeopardising bijectivity. On the other hand, there are plenty of global functions from graphs to graphs that are non-vertex-preserving and bijective. The question has been answered negatively—in three different ways. Yet, in this paper we do obtain reversible local node creation/destruction—in three relaxed settings, whose equivalence we prove for robustness. We motivate our work both by theoretical computer science considerations (reversible computing, cellular automata extensions) and theoretical physics concerns (basic formalisms for discrete quantum gravity).

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