

# DISCRETE 2014: Fourth Symposium on Prospects in the Physics of Discrete Symmetries



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## Quantum mechanical models, conservation laws and a discrete action principle

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It has been shown that the dynamics of discrete (integer-valued) Hamiltonian cellular automata can only be defined consistently, if it is linear in analogy to the linearity of unitary evolution in quantum mechanics. This suggests to look for an invertible map between such automata and continuous quantum mechanical models. Based on sampling theory, such a map can indeed be constructed and leads to quantum mechanical models which incorporate a fundamental scale. The admissible observables, the one-to-one correspondence of the respective conservation laws, and the existence of solutions of the modified dispersion relation for stationary states are discussed.

References:

- H.-T. Elze, Action principle for cellular automata and the linearity of quantum mechanics, Phys. Rev. A 89, 012111 (2014) [arXiv:1312.1615];
- H.-T. Elze, JPCS 504 (2014) 012004 [arXiv:1403.2646];
- H.-T. Elze, EPJ WoC 78, 02005 (2014) [arXiv:1407.2160].

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