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## Undecidability of the spectral gap in one dimension

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The spectral gap problem consist in deciding, given a local interaction, whether the corresponding translationally invariant Hamiltonian on a lattice has a spectral gap independent of the system size or not. In the simplest case of nearest-neighbour frustration-free qubit interactions, there is a complete classification. On the other extreme, for two (or higher) dimensional models with nearest-neighbour interactions this problem can be reduced to the Halting Problem, and it is therefore undecidable.

There are a lot of indications that one dimensional spin chain are relatively simpler than their counterparts in higher dimensions. Nonetheless, I will present a construction of a family of nearest- neighbour, translationally invariant Hamiltonians on a spin chain, for which the spectral gap problem is undecidable.

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