On periodically driven quantum systems

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Stellingen

behorende bij het proefschrift

On periodically driven quantum systems

1. Unlike their static counterparts, the bulk topological properties of one-dimensional periodically driven quantum systems are characterized by *two* (not one) independent invariants.

   Chapter 2

2. The two invariants of a chiral symmetric driven system are the winding numbers on a torus of half the Floquet operator.

   Chapter 3, thesis cover

3. In an open driven quantum system, topological boundary states can actively trap particles from the bulk.

   Chapter 4

4. The magnetic-field dependent relaxation time τ_B for weak localization in a nanowire with a hexagonal cross-section depends on the width W with a non-integer exponent, $\tau_B \propto W^{-\gamma}$, $\gamma = 3.174 \pm 0.003$, hinting to hidden fractal properties of electron dynamics in that geometry.

   Chapter 6

5. The full density matrix simulation of the Surface-17 quantum error correction code, requiring thousands of CPU hours as reported by Tomita & Svore [PRA **90**, 062320 (2014)], can be reproduced in a few hours on a single GPU.

   `https://github.com/brianzi/quantumsim`

6. The computational universality of continuous-time quantum walks [Childs, PRL **102**, 180501 (2008)] is of little practical use, because one would need a universal quantum computer to produce the quantum walk in the first place.

7. The construction of "Majorana bound states in non-topological superconductors" described by San Jose et al. [Sci. Rep. **6**, 21427 (2016)] relies not only on charge-conjugation symmetry but also on chiral symmetry.

8. The runtime of a sufficiently accurate decoding algorithm based on minimal-weight matching for the surface code [Fowler et al., PRA **86**, 042313 (2012)] will be dominated not by the matching subroutine, but by the subroutine for weight calculation, especially for low-distance codes.

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