Abstract Submitted
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Speed cubing and secret sharing MICHAEL FARHY, IAN MORRISON, West Chester University — We develop an analogy between the $4\times4\times4$ Rubiks cube and systems envisioned for topological quantum computing. We construct an energy function which assigns an energy to each Rubiks cube pattern (state) and which is minimized by the solved pattern. Face turns correspond to low-energy excitations while slice" moves are high-energy excitations. Low-energy states correspond to the solved and nearly-solved patterns. These low-energy states separate into four superselection sectors which are distinguished by topological properties of their patterns (regarded as permutations of the solved pattern). These topological properties cannot be altered by low-energy excitations of the cube. Thus, at least at low energies, it is possible to encode information in the $4 \times 4 \times 4$ Rubiks cube in a way that is topologically protected. High-energy excitations of the cube can alter the topological properties of a pattern and change the superselection sector. The energy function we use is motivated by speed cubing: the steps typically performed to solve the cube correspond to systematically minimizing the energy function. The superselection sectors we use to encode information are commonly encountered when speed cubing and are known in this setting as parities."

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