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Decodoku: Quantum error rorrection as a simple puzzle game[1]

JAMES WOOTTON, University of Basel — To build quantum computers, we need to detect and manage any noise that occurs. This will be done using quantum error correction. At the hardware level, QEC is a multipartite system that stores information non-locally. Certain measurements are made which do not disturb the stored information, but which do allow signatures of errors to be detected. Then there is a software problem. How to take these measurement outcomes and determine: a) The errors that caused them, and (b) how to remove their effects. For qubit error correction, the algorithms required to do this are well known. For qudits, however, current methods are far from optimal. We consider the error correction problem of qubit surface codes. At the most basic level, this is a problem that can be expressed in terms of a grid of numbers. Using this fact, we take the inherent problem at the heart of quantum error correction, remove it from its quantum context, and presented in terms of simple grid based puzzle games. We have developed three versions of these puzzle games, focussing on different aspects of the required algorithms. These have been presented and iOS and Android apps, allowing the public to try their hand at developing good algorithms to solve the puzzles. For more information, see www.decodoku.com.

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