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Improving Performance of an Analog Electronic Device Using Quantum Error Correction[1] COREY OSTROVE, BRIAN LA COUR, S. ANDREW LANHAM, GRANVILLE OTT, The University of Texas at Austin — The use of analog classical systems for computation is generally thought to be a difficult proposition due to the susceptibility of these devices to noise and the lack of a clear framework for achieving fault-tolerance. We present results for the application of quantum error correction techniques to a prototype analog computational device called a quantum emulation device (QED). It is shown that for the gates tested (Z, X and SH) there is a marked improvement in the performance characteristics of the gate operations. Gate performance after QEC, as measured by the average log-fidelity ($-\log_{10}(1-F)$), increases by 2.15. This corresponds to a reduction in the infidelity of the gate operation by more than two orders of magnitude on average. Comparison to numerical modeling of device errors shows that the errors in the device are well modeled by a combination of small random perturbations in the gate coefficients and by a baseline degradation from additive white gaussian noise (AWGN).

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