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Error Mitigation via Stabilizer Measurement Emulation

Dynamical decoupling (DD) is a widely-used quantum control technique that takes advantage of temporal symmetries in order to partially suppress quantum errors without the need resource-intensive error detection and correction protocols. This and other open-loop error mitigation techniques are critical for quantum information processing in the era of Noisy Intermediate-Scale Quantum technology. However, despite its utility, dynamical decoupling does not address errors which occur at unstructured times during a circuit, including certain commonly-encountered noise mechanisms such as cross-talk and imperfectly calibrated control pulses. Here, we introduce and demonstrate an alternative technique --- `quantum measurement emulation' (QME) --- that effectively emulates the measurement of stabilizer operators via stochastic gate application, leading to a first-order insensitivity to coherent errors. The QME protocol enables error suppression based on the stabilizer code formalism without the need for costly measurements and feedback, and it is particularly well-suited to discrete coherent errors that are challenging for DD to address.