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Near-optimal measurement-based feedback control for a single qubit ASHKAN BALOUCHI, Hearne Institute for Theoretical Physics and Department of Physics and Astronomy, Louisiana State University, KURT JACOBS, Department of Physics, University of Massachusetts at Boston and Hearne Institute for Theoretical Physics, Louisiana State University, — Feedback control of quantum systems via continuous measurements involves complex nonlinear dynamics. As a result, even for a single qubit the optimal measurement for feedback control is known only in very special cases. We show here that for a broad class of noise processes, a series of compelling arguments can be applied to greatly simplify the problem of steady-state preparation of the ground-state, while loosing little in the way of optimality. Using numerical optimization to solve this simplified control problem, we obtain for the first time a non-trivial feedback protocol valid for all feedback strengths in the regime of good control. The protocol can be described relatively simply, and contains a discontinuity as a function of feedback strength.

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