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Quantum control and robust quantum information

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Controlling the time evolution of quantum states and quantum logic operations in an optimal manner gives rise to various desiderata depending on the physical constraints. In addition to fidelity optimization with respect to systematic and environmental errors, there may be requirements to optimize with respect to time or energy. We describe several approaches to control of logic operations on quantum bits that illustrate these different aspects, including both analytic and numerical tools. Applications are made to high fidelity quantum operations on solid state quantum bits.