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Orbital Modeling of Two-Electron Spin Qubits in Semiconductor Quantum Dots[1] ZACK WHITE[2], GUY RAMON, Santa Clara University — Semiconductor quantum dots (QDs) are an attractive platform for quantum computing due to their compatibility with existing microelectronic technologies. In particular, the singlet and triplet spin configurations of two electrons confined in double QDs have been considered as promising computational basis states for a robust and accessible qubit. This work develops an extended orbital model for two-electron states in double QDs that includes excited orbitals. The extended state basis is necessary to account for the dynamics of the qubit when operated under large bias, a working point accessed only recently by experiment that holds promise for better qubit performance. Our model is useful as a design tool in the analysis of decoherence mechanisms and manipulation protocols of current and new spin-based qubit devices.

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