Quantum Zeno Dynamics and Quantum Zeno Subspaces

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If very frequent measurements are performed on a quantum system, in order to ascertain whether it is still in its initial state, transitions to other states are hindered and the quantum Zeno effect takes place. This phenomenon stems from very general features of the Schrödinger equation, that yield quadratic behavior of the survival probability at short times.

However, the quantum Zeno effect does not necessarily freeze everything. On the contrary, for frequent projections onto a multi-dimensional subspace, the system can evolve away from its initial state, although it remains in the subspace defined by the measurement. This continuing time evolution within the projected subspace is named “quantum Zeno dynamics” and has interesting features.

Some significant examples will be proposed and their practical relevance discussed. We focus on decoherence and irreversibility.