Quantum Zeno effect and strong damping for infinite dimensional open quantum systems

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We prove the quantum Zeno effect in open quantum systems whose evolution, governed by quantum dynamical semigroups, is repeatedly and frequently interrupted by the action of a quantum operation. For the case of a quantum dynamical semigroup with a bounded generator, our analysis leads to a refinement of existing results and extends them to a larger class of quantum operations. We also prove the existence of a novel strong quantum Zeno limit for quantum operations for which a certain spectral gap assumption, which all previous results relied on, is lifted. The quantum operations are instead required to satisfy a weaker property of strong power-convergence and the result is proved by a novel pertubation series approach. In addition, we establish, for the first time, the existence of a quantum Zeno limit for the case of unbounded generators. Moreover, using the mentioned perturbation series approach, we prove the first strong damping result for infinite-dimensional open quantum systems
with unbounded generators.