Research Report 2016

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Publications

[1] Universal Control Induced by Noise
Christian Arenz, Daniel Burgarth, Paolo Facchi, Vittorio Giovannetti, H. Nakazato, Saverio Pascazio and Kazuya Yuasa
Phys. Rev. A **93** No. 6 (2016, June) 062308 (10 pages)

[2] Exactly solvable time-dependent models of two interacting two-level systems
Roberto Grimaudo, Antonino Messina and H. Nakazato
Phys. Rev. A **94** No. 2 (2016, August) 022108 (13 pages)

[3] Can decay be ascribed to classical noise?
Daniel Burgarth, Paolo Facchi, Giancarlo Garnero, H. Nakazato, Saverio Pascazio and Kazuya Yuasa
Open Systems & Information Dynamics, **24** No. 01 (2017, March) 1750001 (18 pages)

Research summary in 2016

1. On the basis of the quantum Zeno effect, it has been shown that a strong-amplitude-damping process applied locally on a part of a quantum system can have a beneficial effect on the dynamics of the remaining part of the system, contrary to a physical intuition. This idea is generalized by identifying decoherence-free subspaces (DFSs) as the subspaces in which the dynamics becomes more complex. The set of reachable operations within the DFSs is characterized according to the quantum control theory.

2. Two coupled two-level systems placed under external time-dependent magnetic fields are modeled by a general Hamiltonian endowed with a symmetry that enables us to reduce the total dynamics into two independent two-dimensional subdynamics. Each of the subdynamics is shown to be brought into an exactly solvable form by appropriately engineering the magnetic fields and thus we obtain an exact time evolution of the compound system. Several physically relevant and interesting quantities are evaluated exactly to disclose intriguing phenomena in such a system.

3. Quantum dissipation can take different forms and the corresponding master equations have different mathematical features and physical meaning: for instance, some physical features of dephasing are often reflected in the self-duality of the quantum dynamical map. We have answered the following questions, first clarifying their meanings: are these different physical and mathematical features mirrored in the Wiener process associated with the corresponding quantum Langevin equation? More specifically: can decay be ascribed to "classical" noise? Moreover, how the afore-mentioned features affect the Hamiltonians of the associated Ito and Stratonovich stochastic equations is clarified.