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Open Quantum Walks and Dissipative Quantum Computing
FRANCESCO PETRUCCIONE, University of KwaZulu-Natal — Open Quantum Walks (OQWs) have been recently introduced as quantum Markov chains on graphs [S. Attal, F. Petruccione, C. Sabot, and I. Sinayskiy, E-print: http://hal.archives-ouvertes.fr/hal-00581553/fr/]. The formulation of the OQWs is exclusively based upon the non-unitary dynamics induced by the environment. It will be shown that OQWs are a very useful tool for the formulation of dissipative quantum computing and quantum state preparation. In particular, it will be shown how to implement single qubit gates and the CNOT gate as OQWs on fully connected graphs. Also, OQWS make possible the dissipative quantum state preparation of arbitrary single qubit states and of all two-qubit Bell states. Finally, it will be shown how to reformulate efficiently a discrete time version of dissipative quantum computing in the language of OQWs.

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