



Contribution ID: 93

Type: Oral Presentation

Efficient Quantum Simulation of Markovian Quantum Dynamics of a Qubit

Wednesday, 9 July 2014 15:00 (20 minutes)

**Abstract content (Max 300 words)
Formatting &
Special chars**

One of the primary motivations for the development of quantum computation is the possibility of efficiently simulating quantum systems, as originally suggested by Feynmann. The natural first step towards this vision is the simulation of closed quantum systems, undergoing Hamiltonian generated evolution, and over the past two decades consistent progress has been made in this field. However, despite this progress, not until recently has much work focused on computation and simulation within the more general context of open quantum systems. In this presentation we focus on presenting methods for the simulation of arbitrary Markovian quantum dynamics, within the conventional unitary circuit model of quantum computation. In particular, we provide an efficient quantum circuit, consisting only of gates from a specified universal gate set, for the simulation of arbitrary Markovian dynamics of a qubit. In order to motivate the results obtained, all necessary background theory will be reviewed. In particular, emphasis will be placed on presenting key concepts and historical developments within quantum information science, in order to locate the results obtained within the current drive for a universal quantum simulator.

**Apply to be
 considered for a student
 award (Yes / No)?**

Yes

**Level for award
 (Hons, MSc,
 PhD)?**

PhD

**Main supervisor (name and email)
and his / her institution**

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**Would you like to
 submit a short paper
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 Proceedings (Yes / No)?**

Yes

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Session Classification: Theoretical

Track Classification: Track G - Theoretical and Computational Physics