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Probabilistic process algebra to unifying quantum and classical computing in closed systems.
(English) Zbl 1428.81062

Summary: We have unified quantum and classical computing in open quantum systems called qACP which is a quantum generalization of process algebra ACP. But, an axiomatization of quantum and classical processes with an assumption of closed quantum systems is still missing. For closed quantum systems, unitary operator, quantum measurement and quantum entanglement are three basic components of quantum computing. This leads to probability unavoidable. Along the solution of qACP to unify quantum and classical computing in open quantum systems, we unify quantum and classical computing with an assumption of closed systems under the framework of ACP-like probabilistic process algebra. This unification make it can be used widely in verification of quantum and classical computing mixed systems, such as most quantum communication protocols.

MSC:
81P68 Quantum computation
68W01 General topics in the theory of algorithms
68Q85 Models and methods for concurrent and distributed computing (process algebras, bisimulation, transition nets, etc.)

Keywords: quantum processes; probabilistic process algebra; algebra of communicating processes; axiomatization

Full Text: DOI arXiv

References:
of Programming Languages (POPL 11), pp. 523-534. ACM Press (2011) - Zbl 1284.68425


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