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Synchronicity for quantum non-local games. (English) Zbl 07623009

Summary: We introduce concurrent quantum non-local games, quantum output mirror games and concurrent classical-to-quantum non-local games, as quantum versions of synchronous non-local games, and provide tracial characterisations of their perfect strategies belonging to various correlation classes. We define $\ast$-algebras and $C^\ast$-algebras of concurrent classical-to-quantum and concurrent quantum non-local games, and algebraic versions of the orthogonal rank of a graph. We show that quantum homomorphisms of quantum graphs can be viewed as entanglement assisted classical homomorphisms of the graphs, and give descriptions of the perfect quantum commuting and the perfect approximately quantum strategies for the quantum graph homomorphism game. We specialise the latter results to the case where the inputs of the game are based on a classical graph.

MSC:
81Pxx Foundations, quantum information and its processing, quantum axioms, and philosophy
46Lxx Selfadjoint operator algebras ($C^\ast$-algebras, von Neumann ($W^\ast$)-algebras, etc.)
05Cxx Graph theory

Keywords:
non-local games; tracial $C^\ast$-algebras; graph homomorphism

Full Text: DOI

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