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Decomposition of quantum Markov chains and its applications

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## Highlights

- We develop a new decomposition technique, namely periodic decomposition, for quantum Markov chains.
- We give several characterizations of limiting states of quantum Markov chains in terms of aperiodicity, irreducibility, and eigenvalues.
- The problem of finding a maximum dimensional noiseless subsystem of a quantum communicating system has been studied employed by  $C^*$ -algebra and operator error correction. We present a new algorithm to solve this problem using decomposition techniques of quantum Markov chains.

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