

Sowa, Artur

Image processing via simulated quantum dynamics. (English) Zbl 1365.94053
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Summary: We apply simulated quantum evolution to image processing, and examine its practicality in the context of image denoising. More specifically, in our approach image processing consists of three stages: First, a digitized gray-scale image is represented as a quantum variable – typically, a density matrix. Second, the quantum variable is evolved via the Markovian master equation in Lindblad form. Third, the quantum variable is back-converted into an image. Numerical experiments indicate remarkable denoising results are obtained in this way for a suitable choice of flow parameters. To our knowledge the proposed image processing technique is conceptually new.

MSC:

- 94A08 Image processing (compression, reconstruction, etc.) in information and communication theory
- 60G35 Signal detection and filtering (aspects of stochastic processes)
- 68U10 Computing methodologies for image processing
- 81S22 Open systems, reduced dynamics, master equations, decoherence
- 93E11 Filtering in stochastic control theory

Keywords:

image processing; denoising; quantum dynamical semigroups; quantum reality; quantum geometry

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