Quantum image coding with a reference-frame-independent scheme

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Résumé en anglais	For binary images, or bit planes of non-binary images, we investigate the possibility of a quantum coding decodable by a receiver in the absence of reference frames shared with the emitter. Direct image coding with one qubit per pixel and non-aligned frames leads to decoding errors equivalent to a quantum bit-flip noise increasing with the misalignment. We show the feasibility of frame-invariant coding by using for each pixel a qubit pair prepared in one of two controlled entangled states. With just one common axis shared between the emitter and receiver, exact decoding for each pixel can be obtained by means of two two-outcome projective measurements operating separately on each qubit of the pair. With strictly no alignment information between the emitter and receiver, exact decoding can be obtained by means of a two-outcome projective measurement operating jointly on the qubit pair. In addition, the frame-invariant coding is shown much more resistant to quantum bit-flip noise compared to the direct non-invariant coding. For a cost per pixel of two (entangled) qubits instead of one, complete frame-invariant image coding and enhanced noise resistance are thus obtained.
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