

# Nonlinear projection digital image inpainting and restoration methods

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## Abstract

This paper concerns with nonuniform sampling and interpolation methods combined with variational models for the solution of a generalized image inpainting problem and the restoration of digital signals. In particular, we discuss the problem of reconstructing a digital signal/image from very few, sparse, and complete information and a substantial incomplete information, which will be assumed as the result of a nonlinear distortion. As a typical and inspiring example, we illustrate the concrete problem of the color restoration of a destroyed art fresco from its few known fragments and some gray picture taken prior to the damage. Numerical implementations are included together with several examples and numerical results to illustrate the proposed method. The numerical experience suggests furthermore that a particular system of coupled Hamilton-Jacobi equations is well-posed.

**AMS subject classification:** 35A15, 65M06, 65M32, 68U10, 70H20, 94A08, 94A14, 94A20

**Key Words:** signal and image dynamic processing, inpainting, art restoration, variational calculus, nonuniform sampling.

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