# A fractional inpainting model based on the vector-valued Cahn–Hilliard equation

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The Cahn–Hilliard equation provides a simple and fast tool for binary image inpainting. By now, two generalizations to gray value images exist: Bitwise binary inpainting and TV-$H^{-1}$ inpainting. This paper outlines a model based on the vector-valued Cahn–Hilliard equation. Additionally, we generalize our approach to a fractional-in-space version. In doing so, we replace the standard differential operator by a corresponding fractional differential operator. Fourier spectral methods provide efficient solvers since they yield a fully diagonal scheme. Furthermore, their application to three spatial dimensions is straightforward. Numerical examples show the superiority of the fractional approach over the classical one. It improves the peak signal-to-noise ratio and structural similarity index. Likewise, the experiments confirm that the proposed model competes with previous inpainting methods, such as the total variation inpainting approach and its fourth-order variant.