

Diffusion-steered super-resolution method based on the Papoulis–Gerchberg algorithm

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Abstract

Papoulis-Gerchberg (PG) algorithm, a technique to extrapolate signals, has attracted many researchers for its lower complexity, higher computational efficiency, and effectiveness. One field that receives these merits is super-resolution, which fuses multiple band-limited scenes to generate a high-resolution image. Most super-resolution methods based on the PG algorithm, however, underperform when input images are seriously degraded by blur, noise, and sampling. The current study addresses the challenges by embedding the PG algorithm into a super-resolution minimization problem. The proposed method is iterative and incorporates a diffusion-driven smoothness prior that updates its regularisation process according to the local image features. This well-crafted prior, which attempts to overcome the super-resolution ill-posedness, provides an automatic interplay between flat and contour regions, and ensures necessary levels of regularisations to generate sharper and detailed images. Results show that the current method outperforms some state-of-the-art super-resolution approaches including those based on total variation. Even more importantly, the authors' method contains a robust noise suppressor that treats comfortably noisy scenes.