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MRI Image Fusion Based on Optimized Dictionary Learning and Binary Map Refining in Gradient Domain

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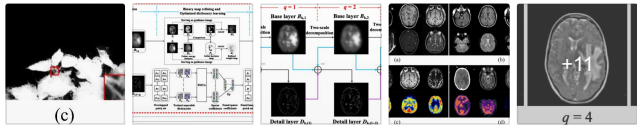
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Abstract and Figures

The insufficient ability of edge feature extraction and high complexity limit the ability of sparse representation to obtain better medical image fusion performance. In this letter, we propose a novel multimodal medical image fusion method with optimized dictionary learning and binary map refining. The optimized dictionary learning uses loop iterations between separable FISTA and manifold-based conjugate gradient algorithm to catch detail texture features in detail layer, and the binary map refining solution adopts Gabor energy measurement with GDGIF to reserve structure and brightness characteristics in base layer. Experimental results of various medical images and clinical applications indicate the effectiveness of the proposed method.



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# MRI Image Fusion Based on Optimized Dictionary Learning and Binary Map Refining in Gradient Domain

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## Abstract

The insufficient ability of edge feature extraction and high complexity limit the ability of sparse representation to obtain better medical image fusion performance. In this letter, we propose a novel multimodal medical image fusion method with optimized dictionary learning and binary map refining. The optimized dictionary learning uses loop iterations between separable FISTA and manifold-based conjugate gradient algorithm to catch detail texture features in detail layer, and the binary map refining solution adopts Gabor energy measurement with GDGIF to reserve structure and brightness characteristics in base layer. Experimental results of various medical images and clinical applications indicate the effectiveness of the proposed method.

**Keywords** Clinical application · Medical image fusion · Dictionary learning · Fast iterative shrinkage thresholding algorithm · Gradient domain guided image filtering

## Abbreviations

GDGIF	Gradient Domain Guided Image Filtering
CT	Computerized Tomography
MR	Magnetic Resonance
PET	Positron Emission Tomography
SPECT	Single-Photon Emission Computed Tomography
HVS	Human Visual System

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... Additionally, considering the similarities and differences between approaches can provide valuable perspectives for refining fusion models and addressing specific challenges in infrared and visible image fusion [9], [10]. Sparse regularization [11], [12], dictionary learning [13], [14], alternating optimization [15], and performance evaluation against state-of-the-art methods, enhance the effectiveness and efficiency of infrared and

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