Regularized Multiframe Super-Resolution Image Reconstruction Using Linear and Nonlinear Filters

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JOURNAL OF ELECTRICAL AND COMPUTER ENGINEERING

Volume: 2021

Article Number: 8309910

DOI: 10.1155/2021/8309910

Published: DEC 18 2021

Indexed: 2022-01-08

Document Type: Article

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Abstract

The primary goal of the multiframe super-resolution image reconstruction is to produce an image with a higher resolution by integrating information extracted from a set of corresponding images with low resolution, which is used in various fields. However, super-resolution image reconstruction approaches are typically affected by annoying restorative artifacts, including blurring, noise, and staircasing effect. Accordingly, it is always difficult to balance between smoothness and edge preservation. In this paper, we intend to enhance the efficiency of multiframe super-resolution image reconstruction in order to optimize both analysis and human interpretation processes by improving the pictorial information and enhancing the automatic machine perception. As a result, we propose new approaches that firstly rely on estimating the initial high-resolution image through preprocessing of the reference low-resolution image based on median, mean, Lucy-Richardson, and Wiener filters. This preprocessing stage is used to overcome the degradation present in the reference low-resolution image, which is a suitable kernel for producing the initial high-resolution image to be used in the reconstruction phase of the final image. Then, L-2 norm is employed for the data-fidelity term to minimize the residual among the predicted high-resolution image and the observed low-resolution images. Finally, bilateral total variation prior model is utilized to restrict the minimization function to a stable state of the generated HR image. The experimental results of the synthetic data indicate that the proposed approaches have enhanced efficiency visually and quantitatively compared to other existing approaches.

Keywords

Keywords Plus: HALF-QUADRATIC ESTIMATION; REGISTRATION

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Categories/Classification

Research Areas: Computer Science

Funding

Funding agency	Grant number
Funding agency	Grant number

Deanship of Scientific Research at King Khalid University	GRP/332/42

Funding Table

View funding text

Document Information

Language: English

Accession Number: WOS:000737255500001

ISSN: 2090-0147

eISSN: 2090-0155

Other Information

IDS Number: XY9AF

— See fewer data fields

Journal information

JOURNAL OF ELECTRICAL AND COMPUTER ENGINEERING

ISSN: 2090-0147

eISSN: 2090-0155

Current Publisher: HINDAWI LTD, ADAM HOUSE, 3RD FLR, 1 FITZROY SQ, LONDON, W1T 5HF, ENGLAND

Research Areas: Computer Science

Web of Science Categories: Computer Science, Information Systems

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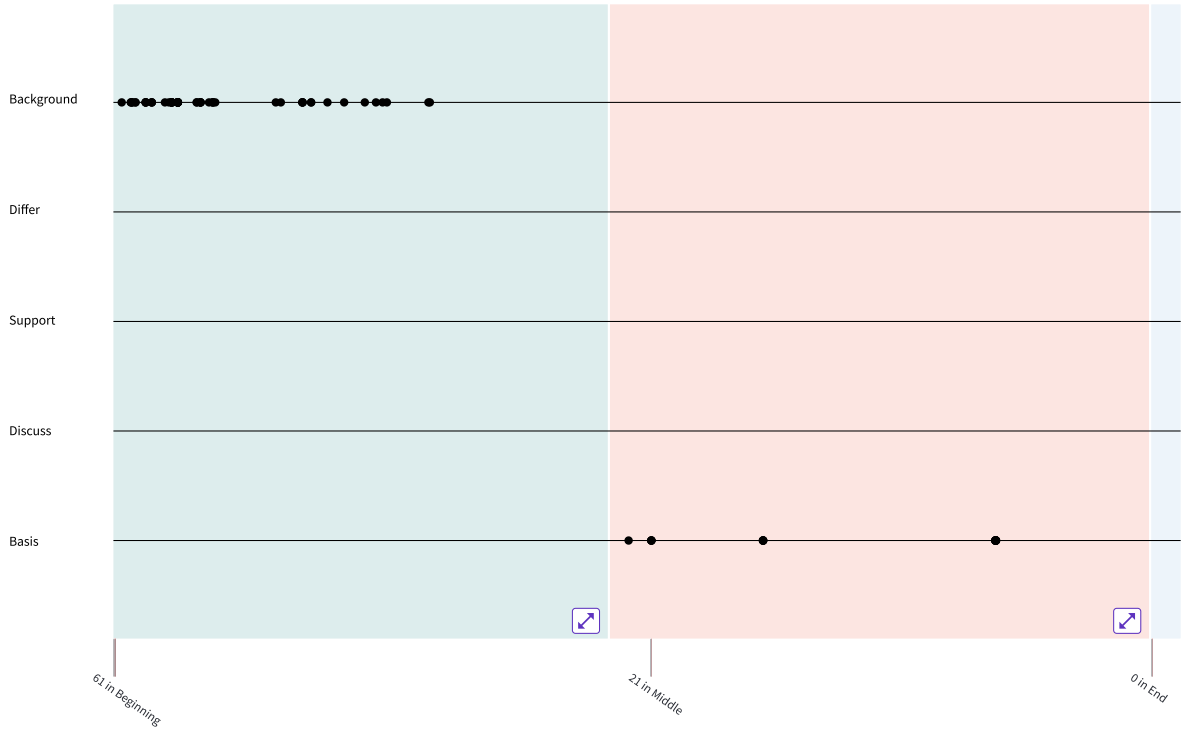

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