Synthesis Lectures on
Image, Video, and Multimedia Processing

SYNTHESIS
COLLECTION OF TECHNOLOGY

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Image Fusion in Remote Sensing

Conventional and Deep Learning Approaches

Springer

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Editor
Alan C. Bovik, ***University of Texas, Austin***

The Lectures on Image, Video and Multimedia Processing are intended to provide a unique and groundbreaking forum for the world's experts in the field to express their knowledge in unique and effective ways. It is our intention that the Series will contain Lectures of basic, intermediate, and advanced material depending on the topical matter and the authors' level of discourse. It is also intended that these Lectures depart from the usual dry textbook format and instead give the author the opportunity to speak more directly to the reader, and to unfold the subject matter from a more personal point of view. The success of this candid approach to technical writing will rest on our selection of exceptionally distinguished authors, who have been chosen for their noteworthy leadership in developing new ideas in image, video, and multimedia processing research, development, and education.

In terms of the subject matter for the series, there are few limitations that we will impose other than the Lectures be related to aspects of the imaging sciences that are relevant to furthering our understanding of the processes by which images, videos, and multimedia signals are formed, processed for various tasks, and perceived by human viewers. These categories are naturally quite broad, for two reasons: First, measuring, processing, and understanding perceptual signals involves broad categories of scientific inquiry, including optics, surface physics, visual psychophysics and neurophysiology, information theory, computer graphics, display and printing technology, artificial intelligence, neural networks, harmonic analysis, and so on. Secondly, the domain of application of these methods is limited only by the number of branches of science, engineering, and industry that utilize audio, visual, and other perceptual signals to convey information. We anticipate that the Lectures in this series will dramatically influence future thought on these subjects as the Twenty-First Century unfolds.

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ISBN: 978-3-031-01128-3 paperback
ISBN: 978-3-031-02256-2 ebook
ISBN: 978-3-031-00217-5 hardcover

DOI 10.1007/978-3-031-02256-2

A Publication in the Springer series
SYNTHESIS LECTURES ON INFORMATION SECURITY, PRIVACY, AND TRUST

Lecture #13
Series Editor: Alan C. Bovik, *University of Texas, Austin*
Series ISSN
Print 1559-8136 Electronic 1559-8144

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SYNTHESIS LECTURES ON IMAGE, VIDEO, AND MULTIMEDIA PROCESSING #13

ABSTRACT

Image fusion in remote sensing or pansharpening involves fusing spatial (panchromatic) and spectral (multispectral) images that are captured by different sensors on satellites. This book addresses image fusion approaches for remote sensing applications. Both conventional and deep learning approaches are covered. First, the conventional approaches to image fusion in remote sensing are discussed. These approaches include component substitution, multi-resolution, and model-based algorithms. Then, the recently developed deep learning approaches involving single-objective and multi-objective loss functions are discussed. Experimental results are provided comparing conventional and deep learning approaches in terms of both low-resolution and full-resolution objective metrics that are commonly used in remote sensing. The book is concluded by stating anticipated future trends in pansharpening or image fusion in remote sensing.

KEYWORDS

image fusion in remote sensing, pansharpening, deep learning-based image fusion, fusion of spatial and spectral satellite images