Fundamenta Informaticae 41 (2000) i–ii
IOS Press

Special issue on mathematical morphology

Preface

When we were invited to compose a special issue of Fundamenta Informaticae devoted to mathematical morphology, we were somewhat surprised. Fundamenta Informaticae is not a journal that is familiar to researchers active in our field. But soon we realised that accepting the offer would enable us to reach a completely new audience, and show them many of the interesting theoretical and practical aspects of morphological image processing and analysis.

We have tried to compose this issue with the readership of Fundamenta Informaticae in mind. In particular, this means that we have invited contributions that, on one hand represent modern developments in our area, and on the other hand may be of particular interest to an audience of (theoretical) computer scientists. We have invited some of the most prominent researchers in mathematical morphology to write a paper for this issue. It was an exceptional pleasure that they all accepted our invitation. As a result, this issue comprises eight papers dealing with a variety of theoretical and applied topics in the fascinating world of mathematical morphology.

We have decided to write an introductory paper that summarizes some basic notions and concepts of mathematical morphology. In this paper, a novice reader learns, among other things, that complete lattice theory is generally accepted as the appropriate algebraic framework for mathematical morphology.

In the second paper, Renato Keshet (Kresch) explains that, for a number of cases, the complete lattice framework is too limited, and that one should, instead, work on (complete) inf-semilattices.

In the third paper, Luc Vincent presents a comprehensive discussion on granulometries, one of the most practical tools of mathematical morphology, and discusses their implementation by means of opening trees.

Petros Maragos and Muhammad Akmal Butt have contributed a highly interesting paper that deals with some analytic aspects of mathematical morphology. In particular, they show how to model multiscale morphological dilations and erosions (the two most basic morphological transformations) using partial differential equations. Moreover, they explore common theoretical concepts and algorithms in mathematical morphology and curve evolution by using a contemporary approach based on level set methods.

The geometric character of mathematical morphology becomes clear in the paper by Pierre Soille. In this paper, it is explained how to define and compute the convex hull of a grey-scale image.

Jean Serra, who together with his colleague George Matheron, is one of the founders of mathematical morphology, has contributed a fascinating paper on connectivity. In this paper, he discusses the notion of connectivity in a morphological context, and explains how this notion gives rise to an entirely new family of morphological operators.

An important and very powerful morphological tool is the watershed transform, which is used for image segmentation. There exist many variants of this algorithm, and several of them are discussed in the paper by Jos Roerdink and Arnold Meijster. Moreover, their paper presents a survey of parallel implementations of this algorithm.

In the final paper, Junior Barrera, Routo Terada, and Roberto Hirata Jr introduce a formal language for morphological transformations, and show how this language can be used for automatic programming based on PAC learning.

The papers in this issue cover only part of current developments in mathematical morphology. Nevertheless, we hope and believe that they give the reader an impression of this research area, which has many interesting things to offer to researchers in computer science, mathematics, physics, electrical engineering, and other disciplines.

John Goutsias

Center for Imaging Science
and Department of Electrical
and Computer Engineering
The Johns Hopkins University
Baltimore, MD 21218, USA

Henk Heijmans

Centre for Mathematics
and Computer Science
P.O. Box 94079
1090 GB Amsterdam,
The Netherlands

December, 1999