

Performance Characterization in Computer Vision

Computational Imaging and Vision

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Performance Characterization in Computer Vision

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Preface

This edited volume addresses a subject which has been discussed intensively in the computer vision community for several years. Performance characterization and evaluation of computer vision algorithms are of key importance, particularly with respect to the configuration of reliable and robust computer vision systems as well as the dissemination of reconfigurable systems in novel application domains. Although a plethora of literature on this subject is available for certain areas of computer vision, the research community still faces a lack of a well-grounded, generally accepted, and—eventually—standardized methods.

The range of fundamental problems encompasses the value of synthetic images in experimental computer vision, the selection of a representative set of real images related to specific domains and tasks, the definition of ground truth given different tasks and applications, the design of experimental test-beds, the analysis of algorithms with respect to general characteristics such as complexity, resource consumption, convergence, stability, or range of admissible input data, the definition and analysis of performance measures for classes of algorithms, the role of statistics-based performance measures, the generation of data sheets with performance measures of algorithms supporting the system engineer in his configuration problem, and the validity of model assumptions for specific applications of computer vision.

The plan to edit this book was conceived in March 1998 at the ninth meeting on "Theoretical Foundations of Computer Vision" which was held in the castle of Dagstuhl, Germany. Many of the chapters presented in this volume are extended and updated versions of lectures at the workshop. However, this volume cannot be called a Proceedings of the workshop, because it contains—in addition to a selection of the subjects presented at the workshop—several chapters which were solicited by the editors to give a more complete overview of the topic.

The chapters in this volume have been grouped in six parts as follows: General Issues; Methodical Aspects; Statistical Aspects; Comparative Studies; Selected Methods and Algorithms; and finally a domain-specific part on Evaluation in Medical Imaging. All chapters in this volume have been reviewed independently by three reviewers ad minimum.

The volume editors are indebted to the "Schloss Dagstuhl International Conference and Research Center for Computer Science" in Wadern, Germany for creating an inspiring and free-of-duty environment. The exchange

of ideas and the discussions between participants of the Dagstuhl workshop have greatly contributed to the quality of the present volume. We thank our colleague Prof. R.M. (Bob) Haralick of Washington University, Seattle, for his contributions to the organization of the meeting. We furthermore acknowledge the enthusiasm of Dr. Paul Roos of Kluwer Academic Publishers for this book project, and the pleasant communication with him concerning editorial matters.

During the preparation of this book we learned with deep regret that our colleague Dr. Piero Zamperoni (Technical University Braunschweig, Germany) passed away in August 1998. He authored many journal papers and books on image processing and analysis. Dr. Zamperoni was recognized by the international community as a gifted lecturer and an enthusiastic promoter of engineering education in image processing.

Dr. Zamperoni contributed to the success of the 1998 Dagstuhl Seminar through his encouraging personality and his sharp comments. Because of his illness, it was not feasible for him to finalize his book chapter. We include in this volume the extended abstract which was written by him for the Dagstuhl Seminar report, as a token of appreciation of Dr. Zamperoni's contributions to the field of computer vision.

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Auckland, Hamburg, Utrecht, August 1999.