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Gerhard Goos, Juris Hartmanis, and Jan van Leeuwen

Daniel Cremers Marcus Magnor
Martin R. Oswald Lihi Zelnik-Manor (Eds.)

Video Processing and Computational Video

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Volume Editors

Daniel Cremers
Technische Universität München, Germany
E-mail: daniel.cremers@in.tum.de

Marcus Magnor
Technische Universität Braunschweig, Germany
E-mail: magnor@cg.cs.tu-bs.de

Martin R. Oswald
Technische Universität München, Germany
E-mail: martin.oswald@in.tum.de

Lihi Zelnik-Manor
The Technion, Israel Institute of Technology, Haifa, Israel
E-mail: lihi@ee.technion.ac.il

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Preface

With the swift development of video imaging technology and the, drastic improvements in CPU speed and memory, both video processing and computational video are becoming more and more popular. Similar to the digital revolution in photography of fifteen years ago, today digital methods are revolutionizing the way television and movies are being made. With the advent of professional digital movie cameras, digital projector technology for movie theaters, and 3D movies, the movie and television production pipeline is turning all-digital, opening up numerous new opportunities for the way dynamic scenes are acquired, video footage can be edited, and visual media may be experienced.

This book provides a compilation of selected articles resulting from a worshop on "Video Processing and Computational Video", held at Dagstuhl Castle, Germany in October 2010. During this workshop, 43 researchers from all over the world discussed the state of the art, contemporary challenges, and future research in imaging, processing, analyzing, modeling, and rendering of real-world, dynamic scenes. The seminar was organized into 11 sessions of presentations, discussions, and special-topic meetings. The seminar brought together junior and senior researchers from computer vision, computer graphics, and image communication, both from academia and industry to address the challenges in computational video.

For five days, workshop participants discussed the impact of as well as the opportunities arising from digital video acquisition, processing, representation, and display. Over the course of the seminar, the participants addressed contemporary challenges in digital TV and movie production; pointed at new opportunities in an all-digital production pipeline; discussed novel ways to acquire; represent and experience dynamic content; accrued a wish-list for future video equipment; proposed new ways to interact with visual content; and debated possible future mass-market applications for computational video.

Viable research areas in computational video identified during the seminar included motion capture of faces, non-rigid surfaces, and entire performances; reconstruction and modeling of non-rigid objects; acquisition of scene illumination, time-of-flight cameras; motion field and segmentation estimation for video editing; as well as free-viewpoint navigation and video-based rendering. With regard to technological challenges, seminar participants agreed that the "rolling shutter" effect of CMOS-based video imagers currently poses a serious problem for existing computer vision algorithms. It is expected, however, that this problem will be overcome by future video imaging technology. Another item on the seminar participants' wish list for future camera hardware concerned high frame-rate acquisition to enable more robust motion field estimation or time-multiplexed acquisition. Finally, it was expected that plenoptic cameras will hit

the commercial market within the next few years, allowing for advanced post-processing features such as variable depth-of-field, stereopsis, or motion parallax.

The papers presented in these post-workshop proceedings were carefully selected through a blind peer-review process with three independent reviewers for each paper.

We are grateful to the people at Dagstuhl Castle for supporting this seminar. We thank all participants for their talks and contributions to discussions and all authors who contributed to this book. Moreover, we thank all reviewers for their elaborate assessment and constructive criticism, which helped to further improve the quality of the presented articles.

August 2011

Daniel Cremers
Marcus Magnor
Martin R. Oswald
Lihi Zelnik-Manor

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