

Proceedings of the

Computer Vision Winter Workshop 2003

Valtice, Czech Republic, February 3–6, 2003

Ondřej Drbohlav (ed.)

Computer Vision — CVWW'03

Proceedings of the 8th Computer Vision Winter Workshop

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Czech Pattern Recognition Society
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Editor

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Organisation

The CVWW'03 is organised jointly by the Center for Machine Perception at CTU Prague, and the Czech Pattern Recognition Society.
Local Organising Committee:
Martina Budošová, Center for Machine Perception
Eva Matysková (chair), Center for Machine Perception

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Preface

The CVWW'03 is the eighth in a series of workshops founded in 1996:

1996	Planneralm	(Austria)
1997	Milovy	(Czech Republic)
1998	Gozd Martuljek	(Slovenia)
1999	Rastenfeld	(Austria)
2000	Peršlák	(Czech Republic)
2001	Bled	(Slovenia)
2002	Bad Aussee	(Austria)
2003	Valtice	(Czech Republic)

The primary goal of the workshop is to increase awareness of new scientific results obtained in the following four groups: the Pattern Recognition and Image Processing Group, TU Wien (W. Kropatsch), the Computer Vision Lab, University of Ljubljana (F. Solina), the Institute for Computer Graphics and Vision, TU Graz (H. Bischof), and the Center for Machine Perception, Czech Technical University in Prague (V. Hlaváč). A second important objective of the workshop is to give an opportunity to PhD students and young researchers to present their work, to test their presentation skills and to appreciate the benefits of conference experience.

Besides papers that were selected in the reviewing process, two invited talks were included; and I would like to express my thanks to Prof. Ernst D. Dickmanns (University of the Federal Armed Forces, Munich) and Prof. David Hogg (University of Leeds) for accepting the invitation, giving their talks, and sharing their expertise with us.

On behalf of all authors, I would like to thank the members of the programme committee for the effort they put into the reviewing process. We are grateful to Vít Zýka who updated the \LaTeX package for paper formatting. He also prepared the proceedings for printing. We want to thank Daniel Večerka for maintaining the web-based paper submission and review system. The workshop would have been difficult to prepare without the help from my colleagues at the CMP, namely Václav Hlaváč. Last but not least: A special acknowledgment is due to Eva Matysková for her invaluable contribution to the workshop organisation.

Prague, January 2003

Ondřej Drbohlav

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2 Integrating Qualitative and Quantitative Approaches to Computer Vision⁴

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Expectation-Based, Multi-Focal, Saccadic (EMS-) Vision for Vehicle Guidance

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Abstract A reassessment is given of two decades of developments in the field of dynamic machine vision for vehicle control. The '4-D approach' developed integrates expectation-based methods from systems dynamics and control engineering with methods from AI. The third-generation system 'EMS-vision', developed from 97 to 02, implements the object-oriented approach on a cluster of commercial-off-the-shelf (COTS) PC's in C++. As the latest achievement, perceptual and behavioral capabilities are represented in explicit form in the system allowing more flexibility, adaptability and growth potential. Dynamic vision is considered to be an animation process exploiting background knowledge on dynamical systems while analyzing parallel image sequences and inertial measurement data simultaneously; this time oriented approach combining differential and integral models has allowed to create vehicles with unprecedented capabilities in the technical realm. VaMoRs (a 5-ton van) and VaMP (Mercedes SEL 500) have demonstrated the following capabilities: Autonomous road vehicle guidance in public traffic on freeways at speeds beyond 140 km/h, mission performance in a network of minor roads including turn-offs onto cross-roads, leaving for and entering roadways from cross-country driving by way-point navigation, detecting negative obstacles (ditches) and avoiding them by circumnavigation with gaze fixation. On-board-autonomous landing approaches of aircraft and landmark navigation for helicopters in low-level flight have been demonstrated in real-time hardware-in-the-loop simulation. Some of these results will be shown by video sequences.

Integrating Qualitative and Quantitative Approaches to Computer Vision

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Abstract In the early days of research into Computer Vision, there was great interest in applying qualitative methods in the interpretation of images. For example, object recognition can be achieved by graph matching using qualitative spatial relations between homogeneous regions of colour and texture. The close link with predicate logic offered an enticing but largely unrealized unifying mechanism for this approach.

In recent years, there has been a shift in emphasis towards quantitative methods over continuous feature spaces—building on earlier work on statistical pattern recognition and geometric modelling. This approach underlies deformable shape models, 3-D model-based methods, support vector machines, and much of machine learning in general. The integration of quantitative and qualitative methods provides a promising way to extend the capabilities of both approaches, leading perhaps to the creation of smarter vision systems. Recent work on this integration will be described, together with illustrative applications.

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