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Computer Vision in Human-Computer Interaction

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Proceedings

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Preface

The interests and goals of HCI (human–computer interaction) include understanding, designing, building, and evaluating complex interactive systems involving many people and technologies. Developments in software and hardware technologies are continuously driving applications in supporting our collaborative and communicative needs as social beings, both at work and at play. At the same time, similar developments are pushing the human–computer interface beyond the desktop and into our pockets, streets, and buildings. Developments in mobile, wearable, and pervasive communications and computing technologies provide exciting challenges and opportunities for HCI.

The present volume represents the proceedings of the HCI 2006 Workshop that was held in conjunction with ECCV 2006 (European Conference on Computer Vision) in Graz, Austria. The goal of this workshop was to bring together researchers from the field of computer vision whose work is related to human–computer interaction. We solicited original contributions that address a wide range of theoretical and application issues in human–computer interaction.

We were very pleased by the response and had a difficult task of selecting only 11 papers (out of 27 submitted) to be presented at the workshop. The accepted papers were presented in four sessions, as follows:

Face Analysis

- In their paper "Robust Face Alignment Based On Hierarchical Classifier Network" authors Li Zhang, Haizhou Ai, and Shihong Lao build a hierarchical classifier network that connects face detection and face alignment into a smooth coarse-to-fine procedure. Thus a robust face alignment algorithm on face images with expression and pose changes is introduced. Experiments are reported to show its accuracy and robustness.
- In "EigenExpress Approach in Recognition of Facial Expression using GPU" authors Qi Wu, Mingli Song, Jiajun Bu, and Chun Chen present an efficient facial expression recognition system based on a GPU-based filter for preprocessing and EigenExpress and Modified Hausdorff distance for classification.
- In "Face Representation Method Using Pixel-to-Vertex Map for 3D Model-Based Face Recognition" authors Taehwa Hong, Hagbae Kim, Hyeonjoon Moon, Yongguk Kim, Jongweon Lee, and Seungbin Moon describe a 3D face representation algorithm to reduce the number of vertices and optimize its computation time. They evaluate the performance of the proposed algorithm with the Korean face database collected using a stereo-camera-based 3D face capturing device.
- In "Robust Head Tracking with Particles Based on Multiple Cues Fusion" authors Yuan Li, Haizhou Ai, Chang Huang, and Shihong Lao present a fully automatic and highly robust head tracking algorithm that fuses the face cues from a real-time multiview face detection with color spatiogram and contour

gradient cues under a particle filter framework. Experiments show that this algorithm is highly robust against target position, size, and pose change, as well as unfavorable conditions such as occlusion, poor illumination, and cluttered background.

Gesture and Emotion Recognition

- In "Vision-Based Interpretation of Hand Gestures for Remote Control of a Computer Mouse" authors Antonis A. Argyros and Manolis I. A. Lourakis present a human–computer interaction system that is capable of recognizing hand gestures and of interpreting them to remotely control a computer mouse. This work is based on their previous work on 2D and 3D tracking of colored objects. Two different gestural vocabularies are investigated, based on 2D and 3D hand information, respectively. Experiments are used to compare these vocabularies in terms of efficiency, robustness, reliability, and ease of use.
- In "Computing Emotion Awareness Through Facial Electromyography" authors Egon van den Broek, Marleen Schut, Joyce Westerink, Jan van Herk, and Kees Tuinenbreijer use coarse time windows to discriminate between positive, negative, neutral, and mixed emotions. They use six parameters (i.e., mean, absolute deviation, standard deviation, variance, skewness, and kurtosis) of three facial EMGs: zygomaticus major, corrugator supercilii, and frontalis. The zygomaticus major is shown to discriminate excellently between the four emotion categories and, consequently, can facilitate empathic HCI.

Event Detection

- In "Silhouette-Based Method for Object Classification and Human Action Recognition in Video" authors Yiğithan Dedeoğlu, B. Uğur Töreyin, Uğur Güdükbay, and A. Enis Çetin present an instance-based machine learning algorithm and a system for real-time object classification and human action recognition which makes use of object silhouettes. An adaptive background subtraction model is used for object segmentation. A supervised learning method based on template matching is adopted to classify objects into classes like human, human group, and vehicle, and human actions into predefined classes like walking, boxing, and kicking.
- In "Voice Activity Detection Using Wavelet-Based Multiresolution Spectrum and Support Vector Machines and Audio Mixing Algorithm" authors Wei Xue, Sidan Du, Chengzhi Fang, and Yingxian Ye present a voice activity detection (VAD) algorithm and efficient speech mixing algorithm for a multimedia conference. The proposed VAD uses MFCC of multiresolution spectrum as features and classifies voice by support vector machines (SVM).
- In "Action Recognition in Broadcast Tennis Video Using Optical Flow and Support Vector Machine" authors Guangyu Zhu, Changsheng Xu, Wen Gao, and Qingming Huang present a novel approach to recognize the basic player actions in broadcast tennis video where the player is only about 30 pixels

tall. A new motion descriptor based on optical flow is proposed where the optical flow is treated as spatial patterns of noisy measurements instead of precise pixel displacements. Support vector machine is employed to train the action classifier.

Applications

- In "FaceMouse — A Human-Computer Interface for Tetraplegic People" authors Emanuele Perini, Simone Soria, Andrea Prati, and Rita Cucchiara propose a new human–machine interface particularly conceived for people with severe disabilities (specifically tetraplegic people), that allows them to interact with the computer. They have studied a new paradigm called "derivative paradigm," where the users indicate the direction along which the mouse pointer must be moved. The system that uses this paradigm consists of a common, low-cost webcam and a set of computer vision techniques developed to identify the parts of the user's face and exploit them for moving the pointer.
- In "Object Retrieval by Query with Sensibility Based on the KANSEI-Vocabulary Scale" authors Sunkyoung Baek, Myunggwon Hwang, Miyoung Cho, Chang Choi, and Pankoo Kim propose the KANSEI-Vocabulary Scale by associating human sensibilities with shapes among visual information. They construct the object retrieval system for evaluation of their approach and are able to retrieve object images with the most appropriate shape in terms of the query's sensibility.

We would like to thank the contributing authors and Springer's LNCS team for their help in preparation of the workshop proceedings. There would not be a workshop to begin with had it not been for the invaluable help we received from the Program Committee members (listed later in the book) and their careful reviews of submitted papers. The review process has been facilitated by the Conference Management Toolkit, a free service provided by Microsoft Research (`http://msrcmt.research.microsoft.com/cmt`). We would also like to thank the Chairs of the ECCV 2006 Conference in Graz, Austria, for their support and help. Finally, we would like to thank our corporate sponsor, Delphi Corporation, for generous support of the workshop.

May 2006
Graz, Austria

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HCI 2006 Chairs

Organization

HCI 2006 (Workshop on Human–Computer Interaction) was held in conjunction with ECCV 2006 (European Conference on Computer Vision), on 13 May 2006, in Graz, Austria.

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