

3rd ACM/IEEE International Conference on Distributed Smart Cameras (ICDSC 2009)

30 August - 2 September 2009



Programme at a glance

Sunday, August 30, 2009

08:00 - 09:00 Registration, PhD forum posters up on boards
09:00 - 11:00 **Tutorial:** Multiple cameras in smart rooms: analysis strategies
11:00 - 11:20 **Break**
11:20 - 12:20 **Tutorial:** Multimodal human-centered vision systems (part I)
12:20 - 13:30 **Lunch**
13:30 - 14:30 **Tutorial:** Multimodal human-centered vision systems (part II)
14:30 - 16:30 **Tutorial:** Multi-camera and distributed video surveillance
16:30 - 16:50 **Break**
16:50 - 18:30 PhD Forum

Monday, August 31, 2009

08:00 - 09:00 Registration, posters up on boards
09:00 - 09:10 **Welcome**
09:10 - 10:00 **Keynote:** Urban Surveillance Networks: a challenge for video analytics technologies
10:00 - 10:20 **Break**
10:20 - 12:00 Oral Session Mon AM: *Smart Environments and 3D Scene Analysis*
12:00 - 13:30 **Lunch**
13:30 - 14:40 Posters: *Surveillance & Tracking, Camera Networks, Distributed & Collab. Signal Proc.*
14:40 - 16:00 Oral Session Mon PM: *Surveillance and Tracking*
16:00 - 16:20 **Break**
16:20 - 18:00 Challenge Session
18:30 - 21:00 **Welcome Reception at Villa Olmo**

Tuesday, September 1, 2009

08:00 - 09:00 Registration, posters up on boards
09:00 - 10:00 **Keynote:** Multi-sensor coordination and control
10:00 - 10:20 **Break**
10:20 - 12:00 Oral Session Tue AM: *Architectures and Protocols for Camera Networks*
12:00 - 13:30 **Lunch**
13:30 - 15:00 Posters: *Surveillance & Tracking, Camera Network Topology, Embedded Smart Cameras*
15:00 - 16:00 **ICDSC Panel**
16:00 - 16:20 **Break**
16:20 - 18:00 Special Session: *Activity Monitoring by Multi-Camera Systems*
18:00 - 23:00 **Banquet: boat trip on Lake Como & dinner at "Il Vapore" in Torno**

Wednesday, September 2, 2009

08:00 - 09:00 Registration
09:00 - 10:00 **Keynote:** PANOPTIC: An Omnidirectional Multi-Aperture Visual Sensor
10:00 - 10:20 **Break**
10:20 - 12:00 Oral Session Wed AM: *Camera Network Topology*
12:00 - 13:30 **Lunch**
13:30 - 15:10 Special Session: *Embedded Techniques for Smart Cameras*
15:10 - 15:30 **Break**
15:30 - 16:30 Special Session: *Advances in Coding for Distributed Camera Networks*
16:30 - 17:30 Special Session: *Collaborative Signal Processing for Distributed Systems*

Welcome!

We are most delighted to welcome you to join us at the third ACM/IEEE International Conference on Distributed Smart Cameras (ICDSC 2009).

After the successful meetings in Vienna (2007) and Stanford (2008), the ICDSC 2009 is taking place in Como, Italy on August 30th - September, 2nd 2009. The conference offers insight into the potentials and challenges of distributed vision networks and presentation of design methodologies employed by leading research groups working in these areas are also the objectives of the conference. We are pleased to announce that ICDSC 2009 will feature, in addition to a **PhD forum**, a **Challenge** and a **Panel**, the following tutorials and keynote talks:

Tutorials

- Multiple cameras in smart rooms: analysis strategies
- Multimodal human-centered vision systems
- Multi-camera and distributed video surveillance

Keynotes

- Urban Surveillance Networks: a challenge for video analytics technologies
- Multi-sensor coordination and control
- PANOPTIC: An omnidirectional multi-aperture visual sensor

The ICDSC 2009 technical programme also includes the following sessions:

Special sessions

- Activity Monitoring by Multi-Camera Systems
- Embedded Techniques for Smart Cameras
- Advances in Coding for Distributed Camera Networks
- Collaborative Signal Processing for Distributed Systems

Regular Sessions

- Architectures and Protocols for Camera Networks
- Smart Environments and 3D Scene Analysis
- Surveillance and Tracking
- Embedded Smart Cameras
- Camera Networks
- Distributed and Collaborative Signal Processing
- Camera Network Topology

Many thanks go to the organizing committee members and the technical program committee whose valuable support made this exciting programme possible. We hope you will find this technical programme an enriching experience. We also invite you to attend the Welcome Reception that will take place at Villa Olmo and the Banquet that will feature a boat trip on Lake Como followed by a dinner with regional specialities at "Il Vapore" in Torno. We look forward to the opportunity of meeting you also at these social events and we hope you will enjoy them.

We would like to take this opportunity to acknowledge the sponsorship of ACM and IEEE. We would also like to recognize and acknowledge the generous contributions to this year's conference by our sponsors Philips, IBBT, Project Automation, KeeSquare and LabTechnology. The support of the administrative and technical staff from Politecnico di Milano and Queen Mary University of London is hereby acknowledged.

We hope you will have four fruitful and inspiring days in Como and look forward to hearing about the new results and collaborations that follow.

*Andrea Cavallaro
Stefano Tubaro
ICDSC 2009 General Chairs*

Detailed Programme

Sunday, August 30, 2009

08:00 - 09:00 Registration, PhD forum posters up on boards

09:00 - 11:00 **Tutorial**

Multiple cameras in smart rooms: analysis strategies

Prof. Josep R. Casas, *Technical University of Catalonia*

Abstract: Smart rooms are a paradigm of ambient intelligence and pervasive computing, providing an interesting combination of analysis from sensors, response through actuators and modeling of the situation for the development of consistent strategies in a particular "service" provided by the room. Technically speaking, a smart room is just an advanced computer interface, equipped with sensors and actuators. The tutorial starts from these concepts in order to justify the need of multiple cameras in a smart room for the unobtrusive analysis of the scene. After a brief discussion on the camera setup, framing and spatial coverage, the tutorial focuses on several visual analysis strategies and algorithms which may provide valid scene descriptions for the computer interface to work properly. A review on different fusion approaches for visual analysis in the context of a smart room introduces the description of the low level visual analysis tasks of person location and tracking, person identification, articulated body tracking and head-pose estimation. Higher level analysis requirements allow providing an insight into the more semantically meaningful analysis tasks of detection of focus of attention, gesture recognition or activity and event classification. Finally, the concept of smart room "service" is revisited for the closing of the tutorial, so that the set of visual analysis strategies described before are shown as integrated in a service environment.



11:00 - 11:20 Break

11:20 - 12:20 **Tutorial** (*Multimodal human-centered vision systems Part I*)

Multimodal human-centered vision systems

Prof. Nicu Sebe¹ and Prof. Hamid Aghajan²,
¹University of Trento, ²Stanford University

Abstract: In this tutorial, we take a holistic approach to the human-centered visionsystems problem. We aim to identify the opportunities in addressing novel applications, and the potentials for fruitful future research directions in this area. In particular, we introduce key concepts, discuss technical approaches and open issues in three areas: (1) multimodal interaction: visual (body, gaze, gesture) and audio (emotion) analysis; (2) smart environments; (3) distributed and collaborative fusion of visual information. The tutorial sets forth application design examples in which a user-centric methodology is adopted across the different stages from feature and pose estimation in early vision to user behavior modeling in high-level reasoning. The role of query for user's feedback will be discussed with examples in smart home applications. The course will motivate the use of multiple sensors in the environment as well as contextual information for effective data and decision fusion, and will focus on the user interaction techniques formulated from the perspective of key human factors such as adaptation to user preferences and behavior models. Several applications based on the notion of user-centric design will be introduced and discussed.



12:20 - 13:30 Lunch

13:30 - 14:30 **Tutorial** (*Multimodal human-centered vision systems - Part II*)

Multi-camera and distributed video surveillance

Prof. Rita Cucchiara, *University of Modena and Reggio Emilia*



Abstract: This tutorial addresses algorithms and techniques of computer vision and pattern recognition for multi-camera and distributed video surveillance. When multiple (heterogeneous) cameras are connected in a forest of sensors, standard techniques used in single- fixed camera surveillance are not sufficient anymore. Different approaches should be taken into account depending on the camera layout (e.g., with overlapped or not overlapped field of view), the camera motion (e.g., fixed or PTZ cameras), the network capability and the availability of computational resource in the smart camera for early processing. The tutorial aims at presenting a short survey of the research activities in this area, mainly focusing on people surveillance; models and algorithms for object segmentation and tracking in multi-camera environments will be presented in details with several demos from ImageLab of Modena. Techniques for people detection in cluttered environment will be presented. Finally, recent advances in trajectory analysis for people behaviour classification in distributed cameras systems will be discussed. Benchmark videos with ground truth and tutorial material will be available for the tutorial attendees.

16:30 - 16:50 **Break**

16:50 - 18:30 **PhD Forum**

Probabilistic Surveillance with Multiple Active Cameras

Eric Sommerlade and Ian Reid.
University of Oxford

Calibrating and Using the Global Network of Outdoor Webcams

Nathan Jacobs and Robert Pless.
Washington University in St. Louis

Hierarchical Feature Scheme for Object Recognition in Visual Sensor Networks

Vildana Sulic, Janez Pers, Matej Kristan and Stanislav Kovacic.
University of Ljubljana

Competing Agents for Distributed Object-Tracking in Smart Camera Networks

Uwe Jaenen, Joerg Haehner and Christian Mueller-Schloer.
Leibniz Universität Hannover

Flexible Clustering in Smart Camera Networks

Bernhard Dieber¹ and Bernhard Rinner².
¹*Austrian Institute of Technology,* ²*Klagenfurt University*

Multiple Camera Management Using Wide Base-line Matching

Ruan Lakemond, Clinton Fookes and Sridha Sridharan.
Queensland University of Technology

Keypoints-based Background Model and Foreground Pedestrians Extraction for Future Smart Cameras

Omar Hamdoun and Fabien Moutarde.
Mines ParisTech

Non Supervised Learning of Human Activities in Visual Sensor Networks

Rodrigo Cilla, Miguel A. Patricio, Antonio Berlanga and Jose M. Molina.
Universidad Carlos III de Madrid

A Distributed Architecture for Object Tracking Across Intelligent Vision Sensor Network With Constrained Resources

Joshua Goshorn.
University of California, San Diego

Dempster-Shafer Based Camera Contribution Evaluation for Task Assignment in Vision Networks

Marleen Morbee¹, Linda Tessens¹, Wilfried Philips¹ and Hamid Aghajan².
¹*TELIN - IPI - IBBT, Ghent University,* ²*Stanford University*

Monday, August 31, 2009

08:00 - 09:00 Registration, posters up on boards

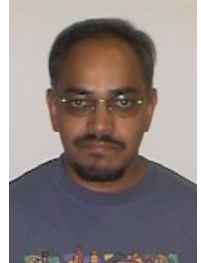
09:00 - 09:10 **Welcome**

09:10 - 10:00 **Keynote**

Urban Surveillance Networks: a challenge for video analytics technologies

Dr. Arun Hampapur, *IBM*

Abstract: The most visible and pervasive cameras networks today are evolving in metropolitan cities. In these networks cameras cover 100's of square miles of densely populated urban areas. These cameras networks have evolved from a heterogeneous technology base, starting from analog camera and encoders to IP cameras and fiber optic networks. While the challenges of building large scale networked surveillance system are enormous, they dwarf the challenge of making sense out of the 1000's of video feeds that are being captured and stored. The challenge using automatic video analysis and pattern recognition technologies in surveillance video is made many orders of magnitude more complex by the high activity levels that occur within the field of view of urban surveillance cameras. In this talk, we will describe the real world implementation of one of the most advanced video analytics system applied to urban surveillance. The talk will begin by providing the background of a complex urban surveillance network and discuss the various use cases for analytics in surveillance networks. The second part of the talk highlights the various technical challenges involved in video analytics in urban environments. The talk will conclude with demonstrations of customer implementations video analytics technology and discuss key areas of research needed in computer vision, video indexing and data management to take urban surveillance networks to the next level.



10:00 - 10:20 Break

10:20 - 12:00 Oral Session Mon AM: *Smart Environments and 3D Scene Analysis*
chair: *B. Bhanu*

Detecting Interleaved Sequences and Groups in Camera Streams for Human Behavior Sensing

Athanasios Babis, Jia Fang and Andreas Savvides.
Yale University

Multiple-View Object Recognition in Band-Limited Distributed Camera Networks

Allen Yang, Subhransu Maji, C. Mario Christoudias, Trevor Darrell, Jitendra Malik and Shankar Sastry.
University of California, Berkeley

View-Invariant Full-Body Gesture Recognition via Multilinear Analysis of Voxel Data

Bo Peng, Gang Qian and Stjepan Rajko.
Arizona State University

PEM-ID: Identifying People by Gait-Matching using Cameras and Wearable Accelerometers

Thiago Teixeira, Deokwoo Jung, Gershon Dublon and Andreas Savvides.
Yale University

A Distributed Camera System for Multi-Resolution Surveillance

Nicola Bellotto¹, Eric Sommerlade², Ben Benfold¹, Charles Bibby¹, Ian Reid¹, Daniel Roth², Charles Fernandez³, Luc Van Gool² and Jordi Gonzalez³.

¹University of Oxford, ²ETH Zurich, ³Computer Vision Centre, Bellaterra, Spain

12:00 - 13:30 Lunch

Surveillance and Tracking

Continuously Evolvable Bayesian Nets for Human Action Analysis in Video

Nirmalaya Ghosh, Bir Bhanu and Giovanni Denina.

University of California at Riverside

Autonomous Real-time Surveillance System with Distributed IP Cameras

Kofi Appiah¹, Andrew Hunter¹, Jonathan Owens¹, Philip Aiken² and Katrina Lewis².

¹*University of Lincoln, SecuraCorp*²

A Random Projections Model for Object Tracking under Variable Pose and Multi-Camera Views

Grigorios Tsagakatakis and Andreas Savakis.

Rochester Institute of Technology

Dependable Integrated Surveillance Systems for the Physical Security of Metro Railways

Francesco Flammini¹, Concetta Pragliola¹, Giovanni Bocchetti¹ and Alfio Pappalardo².

¹*Ansaldo STS Italy*, ²*CeRICT - Centro Regionale Information Communication Technology S.c.r.l.*

Covariance Descriptors on Moving Regions for Human Detection in Very Complex Outdoor Scenes

Giovanni Galdi, Andrea Prati and Rita Cucchiara.

Univ. of Modena and Reggio Emilia

An Efficient System for Vehicle Tracking in Multi-Camera Networks

Michael Dixon, Nathan Jacobs and Robert Pless.

Washington University

Online Video Synthesis for Removing Occluding Objects Using Multiple Uncalibrated Cameras via Plane Sweep Algorithm

Takahide Hosokawa, Songkran Jarusirisawad and Hideo Saito.

Keio University

Surveillance of Robots using Multiple Colour or Depth Cameras with Distributed Processing

Markus Fischer and Dominik Henrich.

Universität Bayreuth

Person Tracking in Camera Networks Using Graph-Based Bayesian Inference

Florian van de Camp¹, Keni Bernardin² and Rainer Stiefelhagen^{1,2}.

¹*Fraunhofer IITB*, ²*Universität Karlsruhe*

Camera Networks

A 3D Object Model for Wireless Camera Networks with Network Constraints

Fanyu Kong and Jindong Tan.

Michigan Technological University

A Distributed Camera Network Architecture Supporting Video Adaptation

Razib Iqbal, Saurabh Ratti and Shervin Shirmohammadi.

University of Ottawa

A Pervasive Smart Camera Network Architecture applied for Multi-Camera Object Classification

Wolfgang Schriebl, Thomas Winkler, Andreas Starzacher and Bernhard Rinner.

Klagenfurt University

Distributed and Collaborative Signal Processing

Super-resolution Based on Blind Deconvolution using Similarity of Power Spectra

Toshihisa Tanaka¹, Ryo Miyamoto² and Rachel Mabanag Chong¹

¹*Tokyo University of Agriculture and Technology*, ²*Nara Advanced Institute of Science and Technology*

Improved View Interpolation for Side Information in Multiview Distributed Video Coding

Shinya Shimizu, Yoshihide Tonomura, Hideaki Kimata and Yoshimitsu Ohtani.

Nippon Telegraph and Telephone Corporation

Performance Evaluation of Two State of the art DVC Codecs

N. Anantrasirichai¹, D. Agrafiotis¹, M. Oualet², F. Dufaux² and T. Ebrahimi².

¹*University of Bristol, Ecole Polytechnique Fédérale de Lausanne*²

Conditioning Multimodal Information for smart environments

David Looney¹, Tomasz M. Rutkowski², Alla Heidenreich³, Dagmar Beyer³, Naveed Rehman¹ and Danilo Mandic¹.

¹*Imperial College London, ²RIKEN Brain Science Institute, ³Siemens AG*

14:40 - 16:00 Oral Session Mon PM: *Surveillance and Tracking*
chair: *M. Shah*

Target Detection and Counting using a Progressive Certainty Map in Distributed Visual Sensor Networks

Mahmut Karakaya and Hairong Qi.

University of Tennessee

Metric Learning for Semi-Supervised Clustering of Region Covariance Descriptors

Ravishankar Sivalingam, Vassilios Morellas, Daniel Boley and Nikolaos Papanikolopoulos.

University of Minnesota, Twin Cities

Efficient Approximate Foreground Detection for Low-Resource Devices

Linda Tessens¹, Marleen Morbee¹, Richard Kleihorst², Hamid Aghajan³ and Wilfried Philips¹.

¹*Ghent University, ²VITO NV, ³Stanford University*

Bayesian Formulation of Image Patch Matching Using Cross-correlation

Hakan Ardo and Kalle Åström.

Lund University

16:00 - 16:20 Break

16:20 - 18:00 Challenge Session
chairs: *H. Aghajan and C. De Vleeschouwer*

Introduction (10 mins)

Multi-camera track-before-detect

Murtaza Taj and Andrea Cavallaro.

Queen Mary University of London

Sport Players Detection and Tracking With a Mixed Network of Planar and Omnidirectional Cameras

Alexandre Alahi¹, Yannick Boursier¹, Laurent Jacques² and Pierre Vandergheynst¹.

Ecole ¹Polytechnique Fédérale de Lausanne, ²Université catholique de Louvain

Detection and Recognition of Sports(wo)men from Multiple Views

Damien Delannay, Nicolas Danhier and Christophe De Vleeschouwer.

Université catholique de Louvain

Template Matching Based Tracking of Players in Indoor Team Sports

Emad Monier, Per Wilhelm and Ulrich Rückert.

University of Paderborn

Summary of the challenge (10 mins)

18:30 - 21:00 **Welcome Reception at Villa Olmo**



Tuesday, September 1, 2009

08:00 - 09:00 Registration, posters up on boards

09:00 - 10:00 **Keynote**

Multi-sensor coordination and control

Prof. Mohan Kankanhalli, *National University of Singapore*

Abstract: There has been an increasing research interest in a number of multi-sensor applications like surveillance, video ethnography, tele-presence, assisted living, life blogging etc. Unfortunately, in many of these applications, the multiple sensors operate separately in isolation and only the central processing unit fuses the data obtained from the various sensors to accomplish its task. However, if we can coordinate and control these sensors, the system tasks can be achieved more efficiently with a higher accuracy. To demonstrate this, we will discuss one control and coordination strategy from a multimedia observation system perspective. This cooperative approach combines the salient features of cooperation and competition with an aim to optimize the overall cooperation among sensors to achieve best results at the system level. We will show the use of a model predictive control based forward state estimation method for counter-acting various delays faced in such multi-sensor environments. We will then briefly present a design methodology for building systems which can explicitly take performance into account. This can aid in optimal selection and placement of multimedia sensors. Finally, we will introduce novel open problems in the area of multi-sensor coordination and control. One such problem is the "best-view" selection in the emerging area of cyber-physical systems that involve sensing, communication, control, and interaction with physical environments. Real-time selection of best viewpoints in a cyber-physical environment is very useful in many applications such as in conferencing systems, surveillance systems and interactive TV. To address this problem, we introduce a new image-based measure, Viewpoint Saliency, for evaluating view qualities of captured cyber-physical environments. And then, based on the new measure, we develop a feedback control based method for generating the best view through guided control of cameras.



10:00 - 10:20 Break

10:20 - 12:00 Oral Session Tue AM: *Architectures and Protocols for Camera Networks*
chair: B. Rinner

VideoWeb: Design of a Wireless Camera Network for Real-time Monitoring of Activities

Hoang Nguyen, Bir Bhanu, Ankit Patel and Ramiro Diaz.

University of California, Riverside

PTZ Camera Network Reconfiguration

Claudio Piciarelli, Christian Micheloni and Gian Luca Foresti.

University of Udine

Planning Ahead for PTZ Camera Assignment and Handoff

Faisal Qureshi¹ and Demetri Terzopoulos².

¹*University of Ontario Institute of Technology*, ²*University of California, Los Angeles*

Localization of Distributed Wireless Cameras

Nadeem Anjum and Andrea Cavallaro.

Queen Mary University of London

Distributed Calibration of Camera Sensor Networks

Ehsan Elhamifar and Rene Vidal.

Johns Hopkins University

12:00 - 13:30 Lunch

Surveillance and Tracking

Recognizing Activities from Context and Arm Pose using Finite State Machines

Thiago Teixeira, Deokwoo Jung, Gershon Dublon and Andreas Savvides.
Yale University

Tracking in Sparse Multi-Camera Setups using Stereo Vision

Gwenn Englebienne, Tim van Oosterhout and Ben Kröse.
University of Amsterdam

Surprisal-aware Scheduling of PTZ Cameras

Henry Detmold, Anton van den Hengel, Anthony Dick, Christopher Madden,
 Alex Cichowski and Rhys Hill.
University of Adelaide

3D Localization of Projected Objects for Surveillance

Sunghoon Jung, Dowon Jang and Minhwan Kim.
Pusan National University

Semantic Browsing of Video Surveillance Databases through Online Generic Indexing

Denis Marraud, Benjamin Cepas and Liver Reithler.
EADS Innovation Works

Face Tracking and Recognition by using Omnidirectional Sensor Network

Yuzuko Utsumi and Yoshio Iwai.
Osaka University

Resolution Mosaic-based Smart Camera for Video Surveillance

Mohammed Abdel-Megeed Salem¹, Kristian Klaus², Frank Winkler² and Beate Meffert².
¹*Ain Shams University*, ²*Humboldt-Universitaet zu Berlin*

Color Brightness Transfer Function Evaluation for Non overlapping Multi Camera Tracking

Tiziana D'Orazio, Pier Luigi Mazzeo and Paolo Spagnolo.
Institute of Intelligent Systems for Automation, Italy

Camera Network Topology

Unsupervised Camera Network Structure Estimation Based on Activity

Pierre Clarot¹, Erhan Ermis², Pierre-Marc Jodoin¹ and Saligrama Venkatesh².
¹*Université de Sherbrooke*, ²*Boston University*

A Framework for Determining Overlap in Large Scale Networks

Anton van den Hengel, Henry Detmold, Christopher Madden, Anthony Dick, Alex Cichowski
 and Rhys Hill.
University of Adelaide

Efficient Topology Calibration and Object Tracking with Distributed Pan Tilt Cameras

Norimichi Ukita, Kunihiro Terashita and Masatsugu Kidode.
Nara Institute of Science and Technology

Joint Spatial-temporal Alignment of Networked Cameras

Chia-Yeh Lee¹, Tsuhan Chen¹, Ming-Yu Shih² and Shiao-Shian Yu².
¹*Cornell University*, ²*Industrial Technology Research Institute, Taiwan*

Embedded Smart Cameras

Adaptive Power Control for Solar Harvesting Multimodal Wireless Smart Camera

Michele Magno¹, Davide Brunelli¹, Lothar Thiele² and Luca Benini¹.
¹*Università di Bologna*, ²*Swiss Federal Institute of Technology Zurich*

Abnormal Motion Detection in a Real-time Smart Camera System

Mona Akbarniai Tehrani¹, Richard Kleihorst², Peter Meijer² and Lambert Spaanenburg¹.
¹*Lund Technical University*, ²*NXP Research*

Resource-efficient Acceleration of 2-Dimensional Fast Fourier Transform Computations on FPGAs

Hojin Kee¹, Shuvra S. Bhattacharyya¹, Newton Petersen² and Jacob Kornerup².
¹*University of Maryland*, ²*National Instruments Corp.*

Tuesday, September 1, 2009

15:00 - 16:00 ICDSC Panel

16:00 - 16:20 Break

16:20 - 18:00 Special Session: *Activity Monitoring by Multi-Camera Systems*
chair: T. D'Orazio

Distributed and Lightweight Multi-Camera Human Activity Classification

Gaurav Srivastava, Hidekazu Iwaki, Johnny Park and Avinash C. Kak.
Purdue University

Detection of Composite Events Spanning Multiple Camera Views with Wireless Embedded Smart Cameras

Youlu Wang, Senem Velipasalar and Mauricio Casares.
University of Nebraska-Lincoln

Human Interaction Analysis Based on Walking Pattern Transitions

Hitoshi Habe, Kazuhisa Honda and Masatsugu Kidode.
Nara Institute of Science and Technology

Multi-Camera Tracking on a Graph Using Markov Chain Monte Carlo

Honggab Kim, Justin Romberg and Wayne Wolf.
Georgia Institute of Technology

Automatic Camera Selection for Activity Monitoring in a Multi-camera System for Tennis

Philip Kelly, Ciarán Ó Conaire, Chanyul Kim and Noel O'Connor.
Dublin City University

Banquet

18:00 - 23:00 Boat trip on Lake Como followed by a dinner with regional specialities at "Il Vapore" in Torno



08:00 - 09:00 Registration

09:00 - 10:00 **Keynote**

PANOPTIC: An Omnidirectional Multi-Aperture Visual Sensor

Prof. Pierre Vanderghenst, *Swiss Federal Institute of Technology*

Abstract: A 2007 digital photography market study by IDC recently showed two interesting trends. First, global digital camera shipments have grown by about 15 percent in 2007, doubling the previous forecast of 7.5 percent and reversing a trend of declining growth seen over the past four years. Moreover, the imaging sensor market is booming mostly under the influence of camera phone sales. This all proves that imaging devices have become an integral part of our daily lives. But with high resolution sensors becoming cheaper (Nokia's current offering includes a 5 mega pixels camera phone) what future advances in imaging sensor technology could possibly help keep up the innovation pace?



We claim that integrating innovative imaging sensor designs and image processing technologies will enable radically new applications and will unleash the full potential of vision based systems. We propose and study a breakthrough visual sensor we call the panoptic camera. It is realized by layering CMOS sensors on the facets of an icosahedron-like surface: it is thus an array of micro-cameras, with a particular geometry. As an optical system, the panoptic camera has two distinguishing features. First it is an omnidirectional camera, in the sense that it is able to record light information coming from any direction around its centre. Second it is a polydyoptric system: each CMOS facet is a tiny camera with a distinct focal plane, hence the whole system is a multiple aperture camera. The layering is designed such that the field of view of each facet is overlapping with that of its neighbours. We will review why such an omnidirectional polydyoptric camera is ideal for certain inverse vision problems like ego-motion estimation or structure from motion. Moreover because of the overlapping fields of view of each aperture facet, the panoptic system is also a plenoptic camera: light rays coming from the same scene point will strike neighbouring sensors and carry information about the underlying plenoptic function that can be used to infer fine information about the scene itself, for example the depth map. We will derive, as an illustrative application, a correspondence-less algorithm for depth estimation that uses the unique properties of our system. Finally, we will highlight some of the future milestones we intend to reach with the next prototypes.

10:00 - 10:20 Break

10:20 - 12:00 Oral Session Wed AM: *Camera Network Topology*
chair: *F. Qureshi*

Optimal Sensor Placement for Surveillance of Large Spaces

S. Indu¹, Santanu Chaudhury², Nikhil R Mittal¹ and Asok Bhattacharyya¹.
¹Delhi College of Engineering, ²IIT Delhi

Efficient Camera Selection Strategy for Multiple Objects Association

Shung Han Cho¹, Sangjin Hong¹ and We-Duke Cho².
¹Stony Brook University, ²Ajou University

A Knowledge-based Camera Selection Approach for Object Tracking in Large Sensor Networks

Eduardo Monari and Kristian Kroschel.
Fraunhofer Institute for Information and Data Processing IITB

Robust Construction of the Camera Network Complex for Topology Recovery

Edgar Lobaton, Ram Vasudevan, Shankar Sastry and Ruzena Bajcsy.
University of California Berkeley

Redundancy Removal through Semantic Neighbor Selection in Visual Sensor Networks

Yang Bai and Hairong Qi.
The University of Tennessee

12:00 - 13:30 Lunch

13:30 - 15:10 *Special Session: Embedded Techniques for Smart Cameras*
chairs: R. Kleihorst and F. Berry

Implementation of Canny Edge Detection on the WiCa SmartCam Architecture

Bert Geelen^{1,3}, Francis Deboeverie^{2,3} and Peter Veelaert^{2,3}.

¹SSET, ²Interuniversity Microelectronics Center, ³University College Ghent, ³IBBT

Mapping Schemes of Image Recognition Tasks onto Highly Parallel SIMD/MIMD Processors

Shorin Kyo, Shohei Nomoto and Shin'ichiro Okazaki.

NEC Corporation

DSPcam: A Camera Sensor System for Surveillance Networks

Arvind Kandhalu, Anthony Rowe and Ragnathan (Raj) Rajkumar.

Carnegie Mellon University

An Efficient Background Estimation Algorithm for Embedded Smart Cameras

Vikas Reddy, Conrad Sanderson, Brian Lovell and Abbas Bigdeli.

NICTA, The University of Queensland

Face Detection System Design For Real Time High Resolution Smart Camera

Yasir Mohd Mustafah^{1,2}, Abbas Bigdeli¹, Amelia Wong Azman^{1,2} and Brian Lovell^{1,2}.

¹The University of Queensland, ²National ICT Australia

15:10 - 15:30 Break

15:30 - 16:30 *Special Session: Advances in Coding for Distributed Camera Networks*
chairs: C. Abhayaratne, M. Mrak and F. Dufaux

An extension of the AVC file format for Video Surveillance

James Annesley¹, Gero Båse², James Orwell¹ and Houari Sabirin³.

¹Kingston University, ²Siemens AG, ³Korea Advanced Institute of Science and Technology

Image Interpolation with Dense Disparity Estimation in MultiView Distributed Video Coding

Wided Miled, Thomas Maugey, Marco Cagnazzo and Béatrice Pesquet-Popescu.

Télécom ParisTech

Compressed Domain Aided Analysis of Traffic Surveillance Videos

Christian Kaes¹, Mathieu Brulin^{1,2}, Henri Nicolas¹ and Christophe Maillat^{1,2}.

¹University of Bordeaux I, ²ADACIS Sarl

16:30 - 17:30 *Special Session: Collaborative Signal Processing for Distributed Systems*
chair: D. Mandic

A Comparison of Techniques for Camera Selection and Handoff in a Video Network

Yiming Li and Bir Bhanu.

University of California at Riverside

A Multi Camera System for Soccer Player Performance Evaluation

Marco Leo¹, Tiziana D'Orazio¹ and Mohan Trivedi².

¹Institute of Intelligent Systems for Automation, Italy, ¹University of California San Diego

Joint Estimation of Offset Parameters and High-resolution Images via L1-norm Minimization Principle

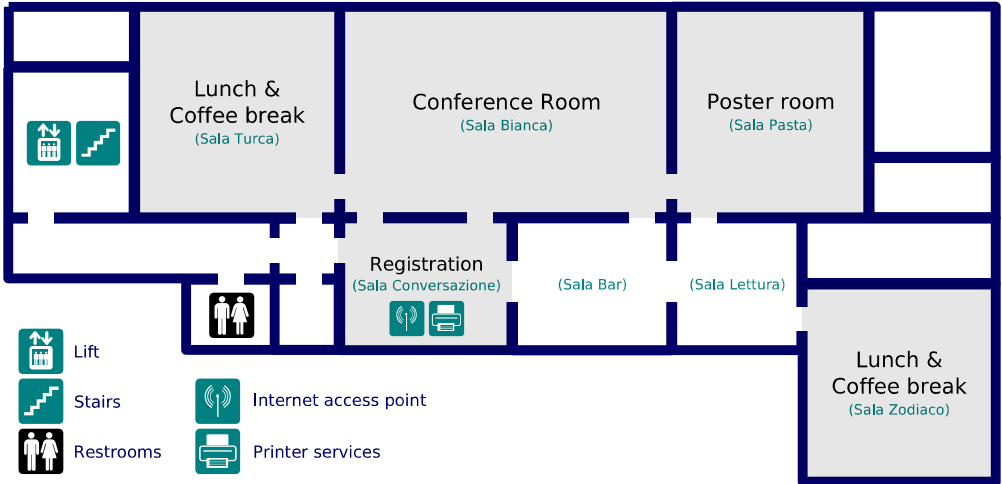
Akira Hirabayashi.

Yamaguchi University

Venue

Teatro Sociale (Piazza Giuseppe Verdi, Como)

Teatro Sociale 1st Floor



Contact Information

Teatro Sociale: +39 031 579814

Note: In case of need call/sms +39 328 1213538

Getting Around

The centre of Como is rather compact and can be covered easily on foot.

Buses

The local public transport network counts 10 urban (within city limits) lines and 'extra-urban' (crossing city limits) (C) lines connecting Como with most of its province centres. They are provided by SPTLinea.

Urban Lines

- Line 1: Chiasso FS - S.Fermo
- Line 3: Lora - Grandate
- Line 4: S.Giovanni FS - Camnago V.
- Line 5: S.Giovanni FS - Caviglio
- Line 6: Maslianico - Albate
- Line 7: Sagnino - Lora
- Line 8: S.Giovanni FS - Casnate
- Line 9: P.za Cavour - Cimitero
- Line 10: Albate - Navedano
- Line 11: P.Chiasso - Bassone
- Line 12: Camerlata-S.Fermo-Tavernola

Note: Urban bus tickets have to be bought before boarding the bus in news-stands or bars

Ferrovie Nord Milano also provides other bus lines connecting Como to Varese in substitution of the original railway line that was dismissed in the 1960s.

The funicolare (funicular) connects the centre of Como with Brunate, a small village (1800 inhabitants) on a mountain at 715 meters above sea level. The journey takes about 7 minutes and the view is worth the trip: it can also be the starting point for a stroll on the mountains.

Boats

The boats and aliscafi of Navigazione Lago di Como connect the town with most of the villages sitting on the shores of the lake, the former are slower and right for sightseeing, the latter are faster and make less stops.

Taxi

A taxi service is provided by the Comune di Como, local phone numbers are +39 031-2772, and +39 031-261515.

Sponsors



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