Research Activities, Results, Collaborations and Plan

Computational Media Group
Division of Computational Informatics
Center for Computational Sciences
University of Tsukuba
2007.10.30

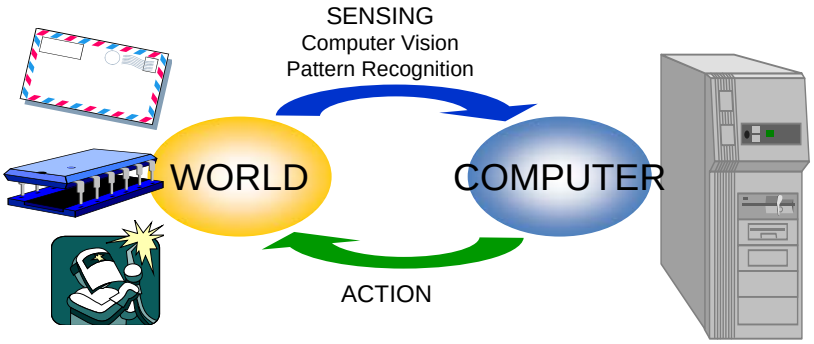
Division of Computational Informatics

- Newly founded in 2004.7.
  - To investigate novel methods at the frontier of computational sciences
- Guiding principle for research activities
  - To try to establish a new framework of computational sciences whose target is the human society and its environment
  - Real-World Computational Informatics
- Two groups in the division
  - Computational Intelligence Group
  - Computational Media Group

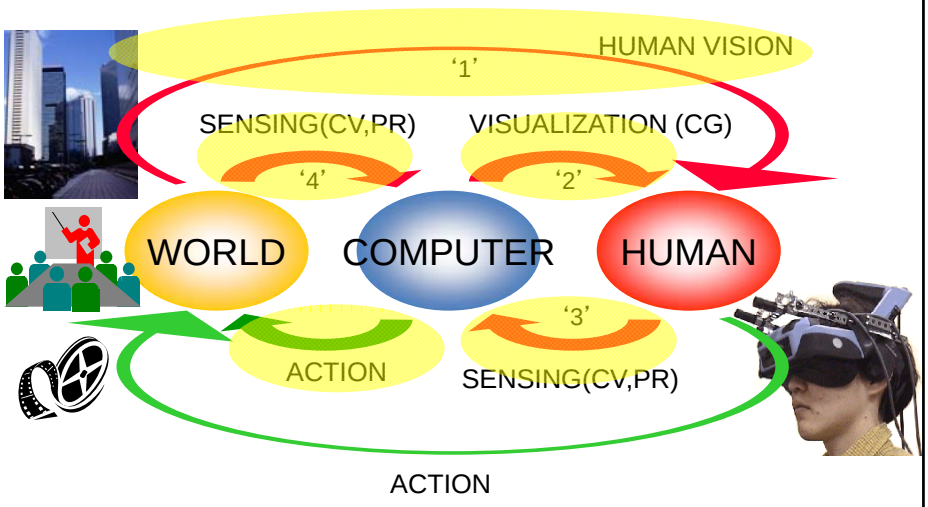
Computational Media Group

- What is “computational media?”
  - “Computational media” will be the fusion of technologies on sensing, visualization, grid computing, and computer network.
  - The purpose of “computational media” is to augment the human sensing abilities by fully utilizing the capability of computational resources.
- Computational Media Group
  - 3 faculties
    - Y. Ohta (professor), Y. Kameda (associated prof.), I. Kitahara (assistant prof.)
  - 15 graduate students, 8 undergraduate students
  - Researches on cutting-edge technologies and development of application-oriented systems are conducted in parallel.

Sensing as Robot Technology



Sensing as Media Technology



Robot vs. Medium

- The robot technology creates machines that can substitute humans by simulating human behavior.
  - The term robot is a symbol of the technology for substituting humans.
- A medium offers environment that gets humans to learn, think, and come up with ideas.
  - The term medium is a symbol of the technology for cooperating with humans.

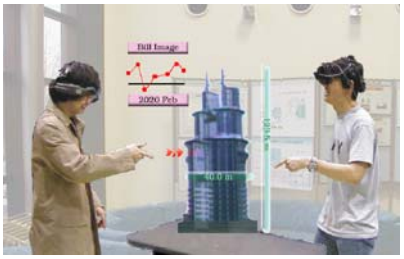
Research Activities
in Computational Media Group

Cutting-Edge Technologies
- Mixed Reality
- Massive Sensing
- Video Surveillance

Application-Oriented Systems
- Live 3D Video in Soccer Stadium (3D-TV)
- Visual Augmentation for Drivers (NaviView)
- Visual Augmentation for Pedestrians (See-Through Vision)

Mixed Reality

Mixed Reality is a fusion of sensing and visualizing technologies.
It seamlessly merges the visual data obtained from the real world and the visualized data in the computer.

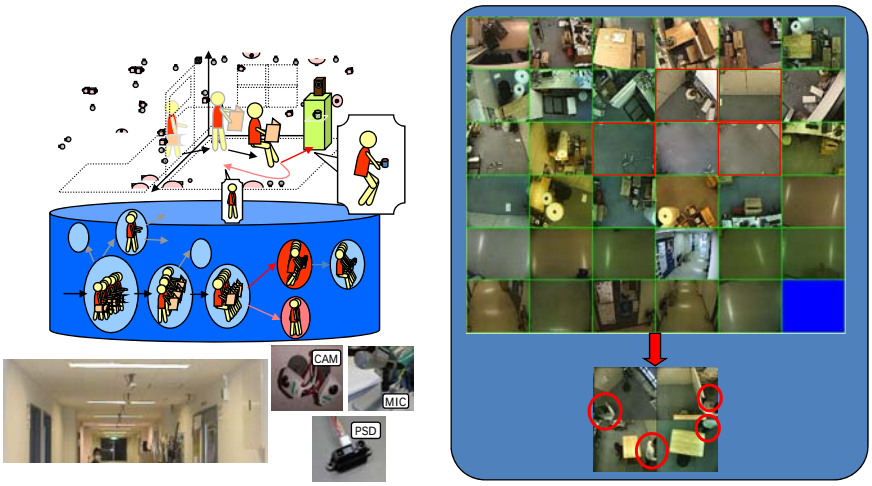


Remote face-to-face collaboration

HMD can be diminished by MR technology

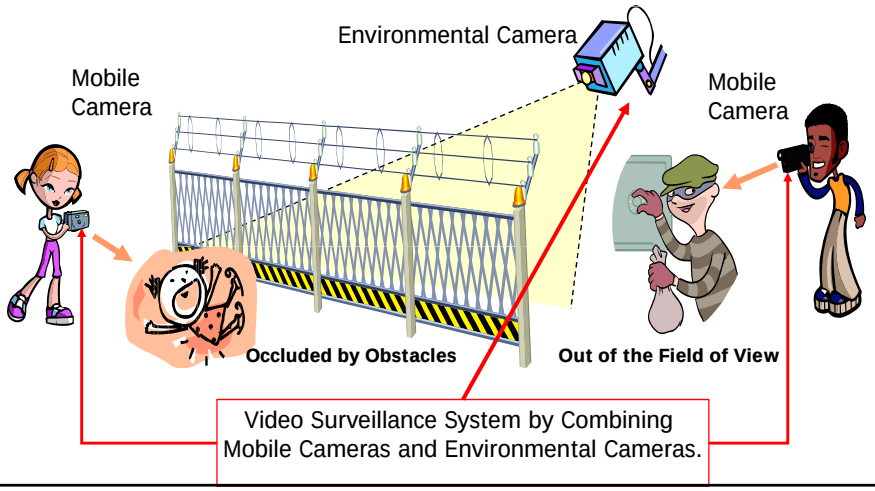
Massive Sensing

Sensing and understanding of human behaviors with a massive number of sensors (cameras, microphones, etc.).

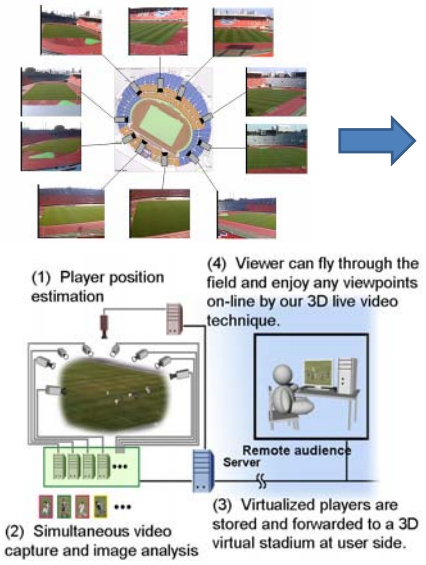


Video Surveillance

An advanced video surveillance system by combining mobile and fixed cameras.



Live 3D Video in Soccer Stadium (3D-TV)



Multiple audiences can arbitrarily select their viewing positions of sports events.
Our technology enables live transfer of 3D-TV via network.

Visual Augmentation for Drivers (NaviView)

Application of Mixed Reality in ITS.
Drivers can see the blind spots by an augmenting visual support utilizing the videos obtained by road surveillance cameras.

Visual Augmentation for Pedestrians
(See-Through Vision)

Citizens can effectively utilize the video data obtained by many surveillance cameras in town. A pedestrian can see-through a blind area occluded by a building simply by holding up his PDA toward the blind area.

Research Funds
of Computational Media Group

- 3D-TV: 49,140,000 yen (2002-2004)
  Grant-in-Aid for Scientific Research (A), Japan Society for the Promotion of Science
- 3D-TV: 56,843,800 yen (2004-2006)
  Strategic Information and Communication R&D Promotion Programme, Ministry of Internal Affairs and Communications
- NaviView: 39,087,100 yen (2004-2006)
  Special Coordination Funds for Promoting Science and Technology, Japan Science and Technology Agency
- See-Through Vision: 45,630,000 yen (2006-2009)
  Grant-in-Aid for Scientific Research (A), Japan Society for the Promotion of Science
- Sensing Web: 40,000,000 yen (2007-2009)
  Special Coordination Funds for Promoting Science and Technology, Japan Science and Technology Agency
- Massive Sensing: 28,210,000 yen (2004-2006) by Kameda
  Grant-in-Aid for Young Scientists (A), Japan Society for the Promotion of Science
- Video Surveillance: 29,640,000 yen (2006-2008) by Kitahara
  Grant-in-Aid for Young Scientists (A), Japan Society for the Promotion of Science

Publications (2004～2007)
from Computational Media Group

- Journal Papers
  - 6 (in English)
  - 16 (in Japanese)
- International Conference Papers
  - 55 (in English)
- Other Papers
  - 60 (in Japanese)

Awards (2004-2007)
received by Computational Media Group

- Microsoft Innovation Award (IT Division), Innovation Japan 2007 (2007.9.13)
- Image Electronics Technology Award 2006, The Institute of Image Electronics Engineers of Japan (2007.6.23)
- IPSJ Fellow, Information Processing Society of Japan (2007.3.6)
- IEICE Fellow, The Institute of Electronics, Information and Communication Engineers (2004.9.9)
- FIT 2004 Paper Award, Forum on Information Technology (2004.9.7)
- IAPR Fellow, International Association for Pattern Recognition (2004.8.25)

Awards received by students

- Dean Award (K. Tateno), Graduate School of Systems and Information Engineering, University of Tsukuba (2007.3)
- President Award (M. Takemura), University of Tsukuba (2006.3)
- Dean Award (T. Nishizaki), Graduate School of Science and Engineering, University of Tsukuba (2006.3)
- Young Researcher Award (M. Takemura), Forum on Information Technology (2005.9)
- Dean Award (M. Ozeki), Graduate School of Systems and Information Engineering, University of Tsukuba (2005.3)

Collaborations

- Computational Informatics Seminar
  - Purpose
    - To share the awareness of problems
  - Members
    - Faculties of Computational Informatics Division
    - Researchers from other departments
    - Researchers from AIST
- Sensing Grid Planning Group
  - Purpose
    - To launch a new project of the Grant-in-Aid for Scientific Research on Priority Areas
  - Members
    - Computational Media Group & Grid Computing Group from CCS
    - Groups from Kyoto University, Osaka University, etc.
  - Current Status
    - A new project “Sensing Web” has started from 2007.9 supported by the Special Coordination Funds for Promoting Science and Technology.

Future Plan

- Researches on elemental state-of-the-art technologies
  - Acquisition/analysis/recognition of massive visual data
  - Computer vision for recovery of 3D from 2D
  - Real-time sensing of human behavior
  - Computer graphics for visualizing data
- Researches on Mixed Reality as the technology fusion of elemental ones
- To create a new framework of Computational Science
  - “Real-World Computational Informatics” whose target is the human society and its environment.
  - “Initiative for Real-World Computational Informatics” has been selected as one of the strategic initiative project of the university.
    - Divisions of Computational Informatics, High Performance Computing Systems, and Global Environment from CCS