- Activities & Collaborations of Divisions –

Division of Computational Informatics:

Computational Media Group

Faculty members:

Prof. Yuichi Ohta (Leader / vice president)

Assoc. Prof. Yoshinari Kameda

Assoc. Prof. Itaru Kitahara

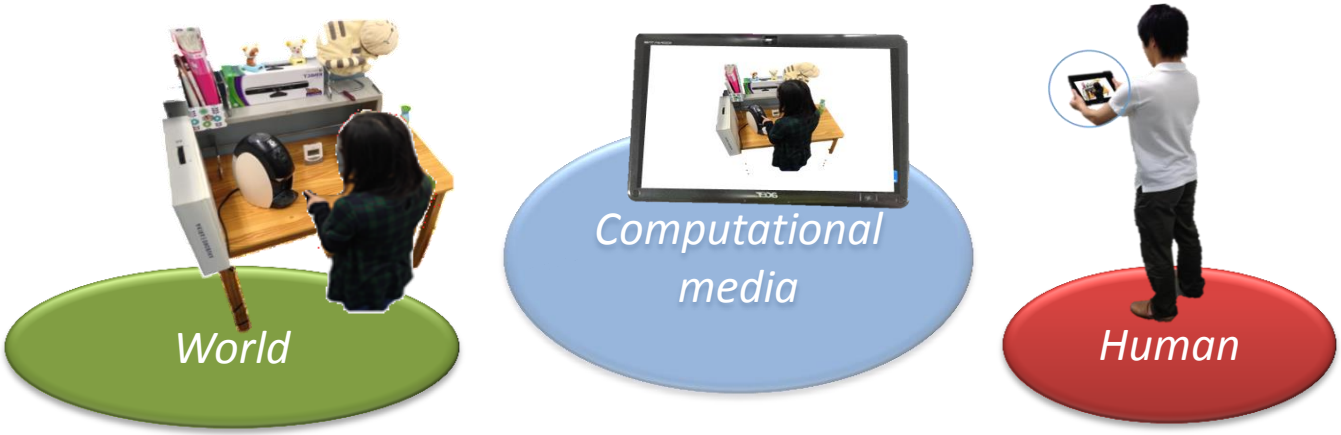
2014/02/19, **External Review**

Computational Media Group

- Founded in July 2004.
  - To investigate novel methods at the frontier of computational sciences
- Targeting **Computational media**
  - a key technology to unite human beings and vast data / high performance computation world
- Members
  - 3 faculty members (running CVIM laboratory)
  - About 15-20 graduate students
  - About 4-8 undergraduates

What is Computational Media?

- Definition of “Computational Media”
  - the fusion of technologies on sensing, visualization, computing, and computer network
- Purpose of “Computational Media”
  - to augment the human sensing abilities by fully utilizing the capability of computational resources



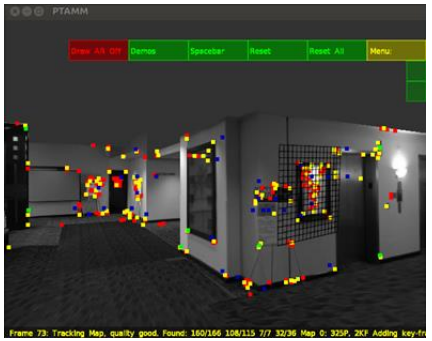
Real-World Computational Informatics

Our research framework

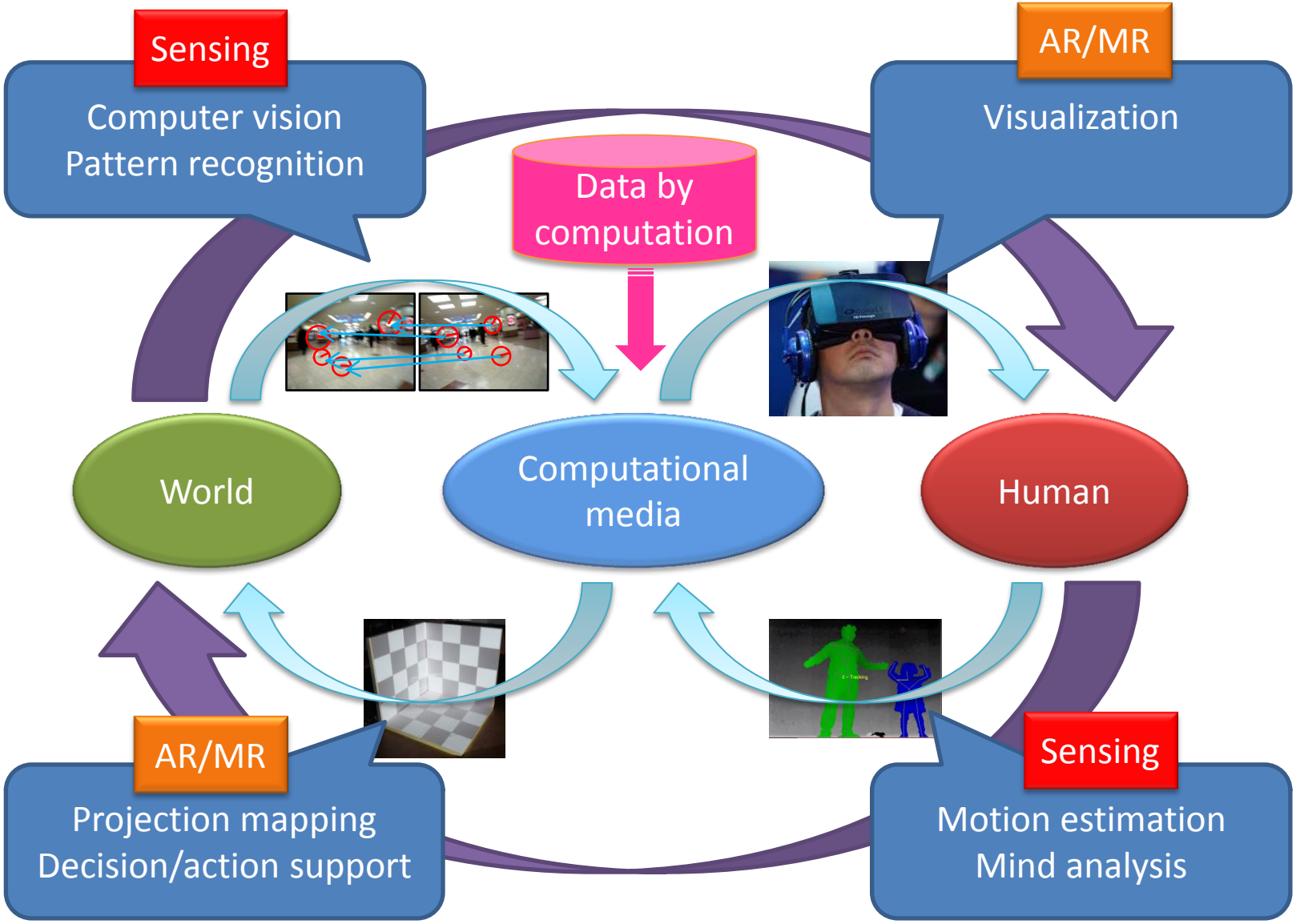
- Sensors and data from real world on-line
- Instant reaction (for good CHI)

- **Visual Information**

  - **Cameras and videos as sensor and input data**
  - **Mobile display and HMD for feedback**
  - **AR and MR as total CHI method**



Between human and the world



Scope of Research activities

- Technology challenges
  - Mixed and Augmented Reality
  - Massive sensing and data
  - Sensor collaboration (including sensors on human)
  - Communication promotion

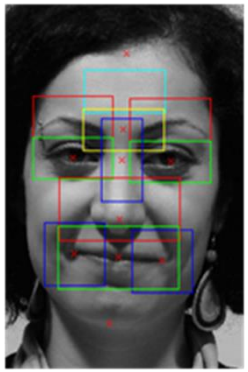
- Applications
  - Live 3D free-viewpoint video on Sport
  - Driver support via visual augmentation
  - Pedestrian under embedded cameras

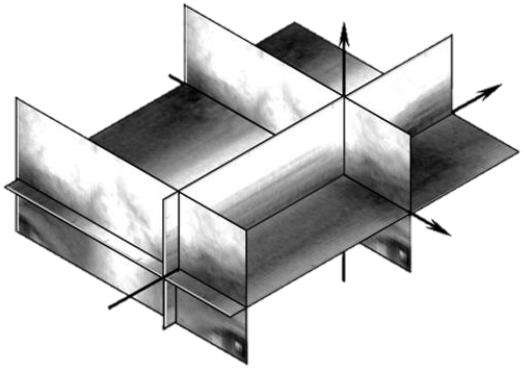
Teasing on selected topics

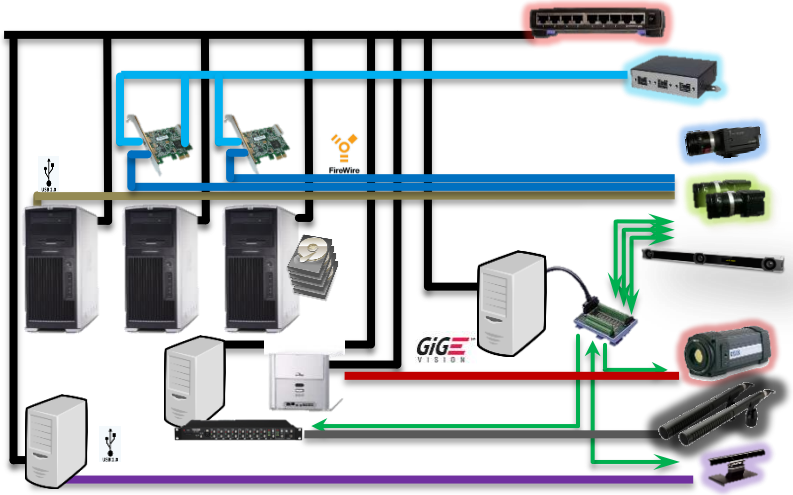
- We have 6 research teams
- Select one or two from each team
- (1) (2) (3) (4) (5) (6)

(1) Massive sensing and sensor fusion for human mind analysis

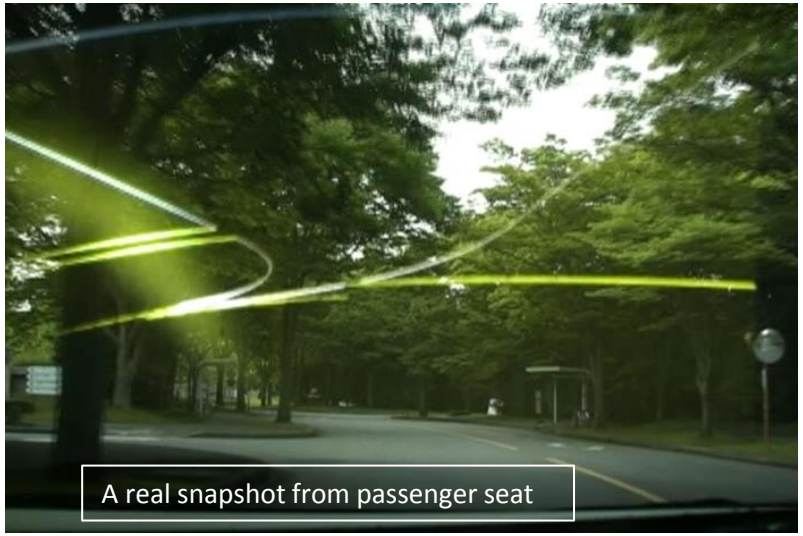
- Towards Emotion Sensing Support System
  - Micro-Expression detection and analysis
  - Sensor-fusion capture system in high accuracy in time (millisecond) and space (under millimeter)

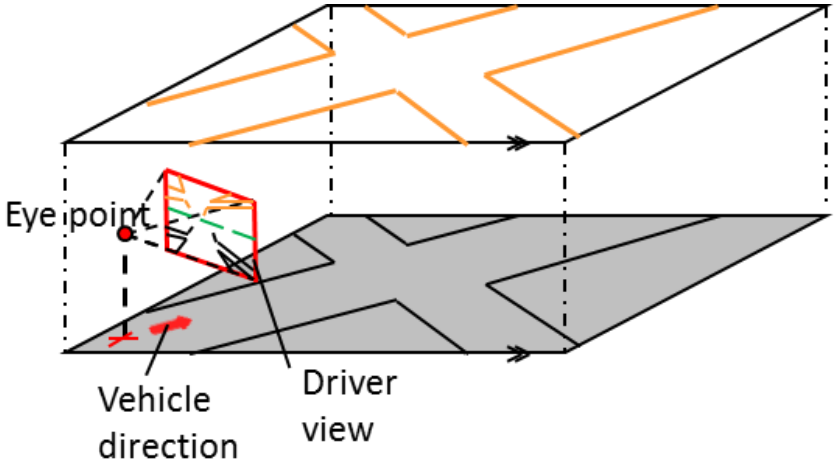


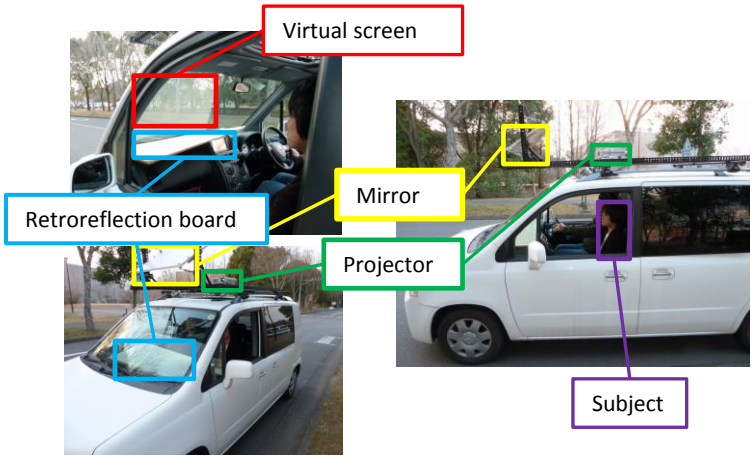




(2) Driver support by Augmented Reality technology



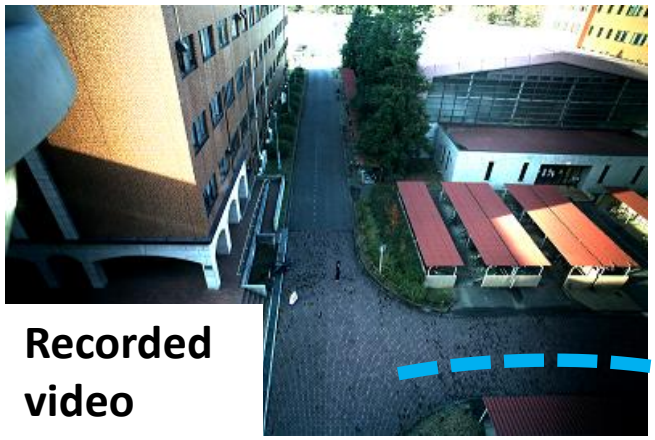




"Windshield Display"

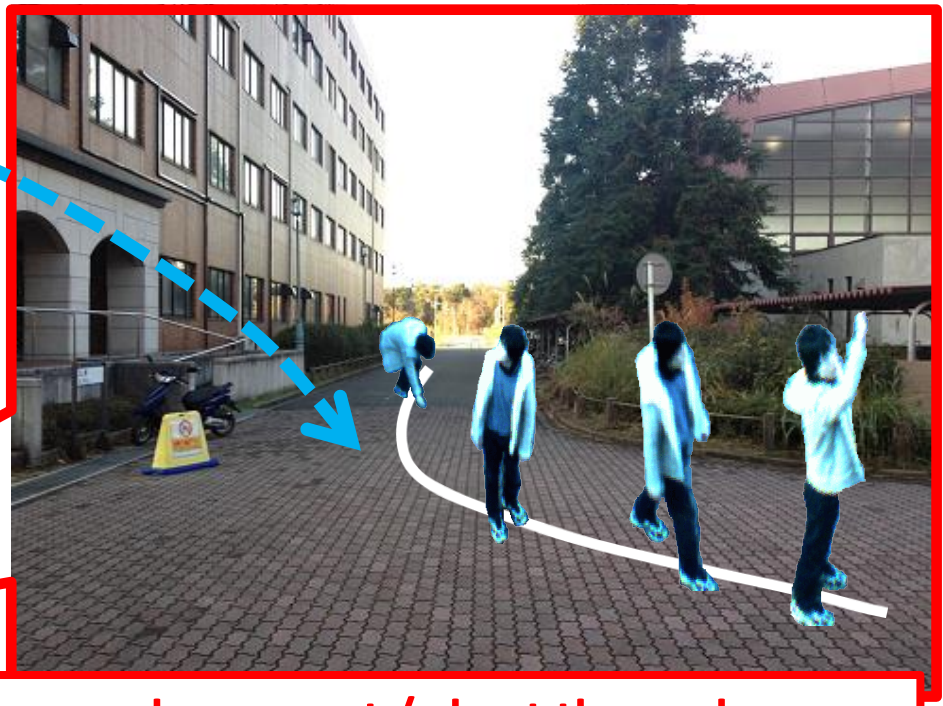
Test route in our campus (open road)

(3) Compact video expression of moving objects at outdoor scene



Recorded video

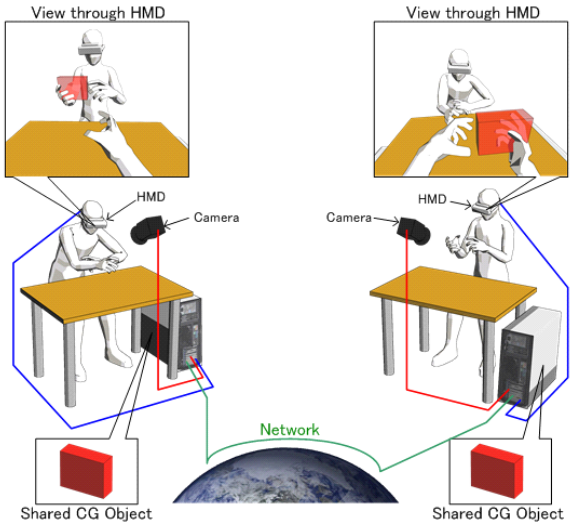
- Drawing trajectory and direction
- Replaying object's action simultaneously



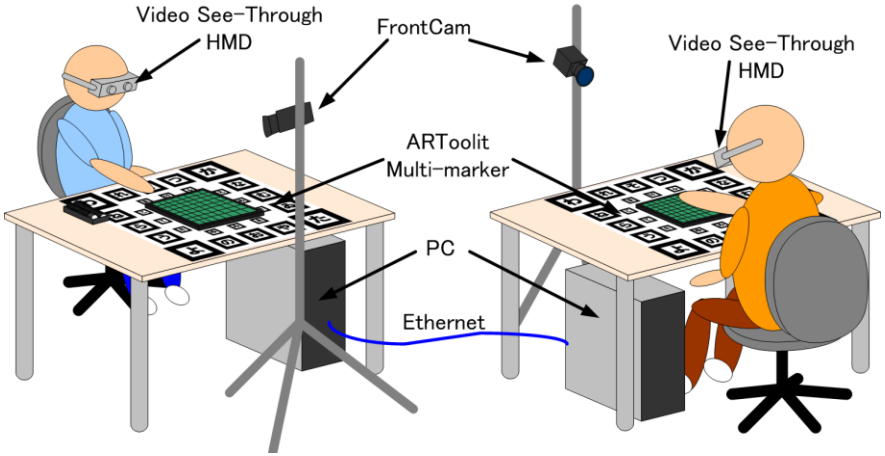
Viewer

How much compact / short the replay could be ?

(4) Shared mixed-reality

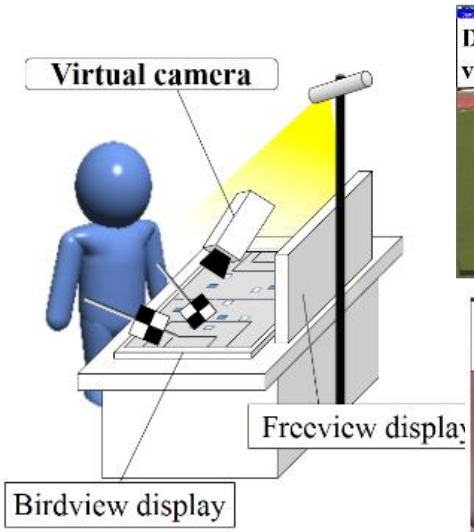


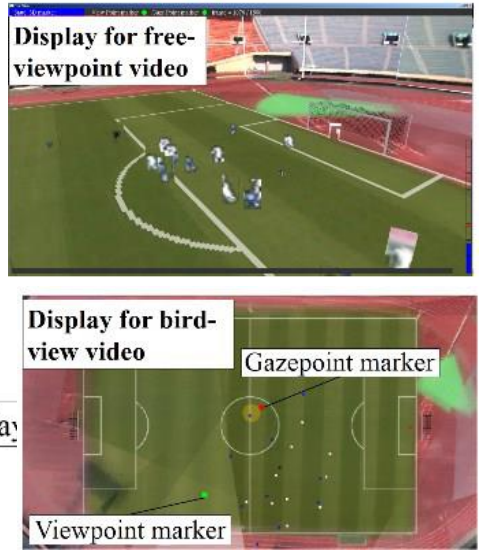
- Collaboration with remote site
- Sharing “same” tabletop workspace
- Augmenting collaborator’s image

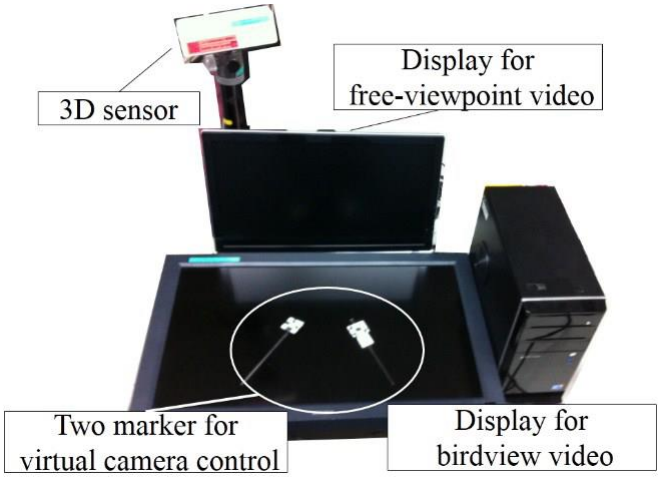


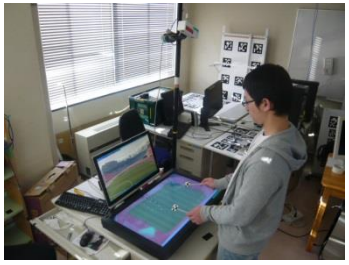
(5) Free viewpoint video browsing

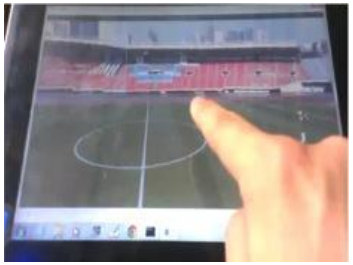
- Move the virtual camera as you wish





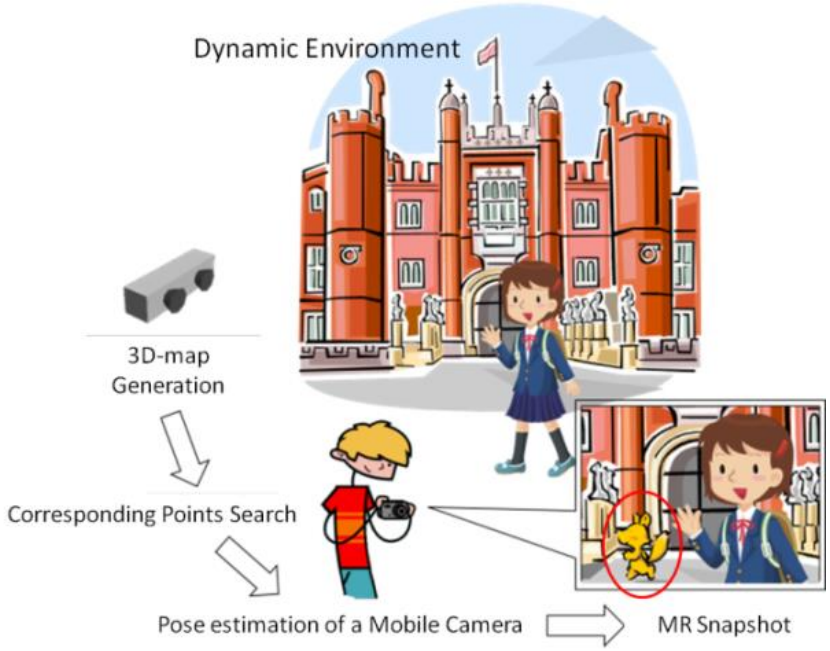


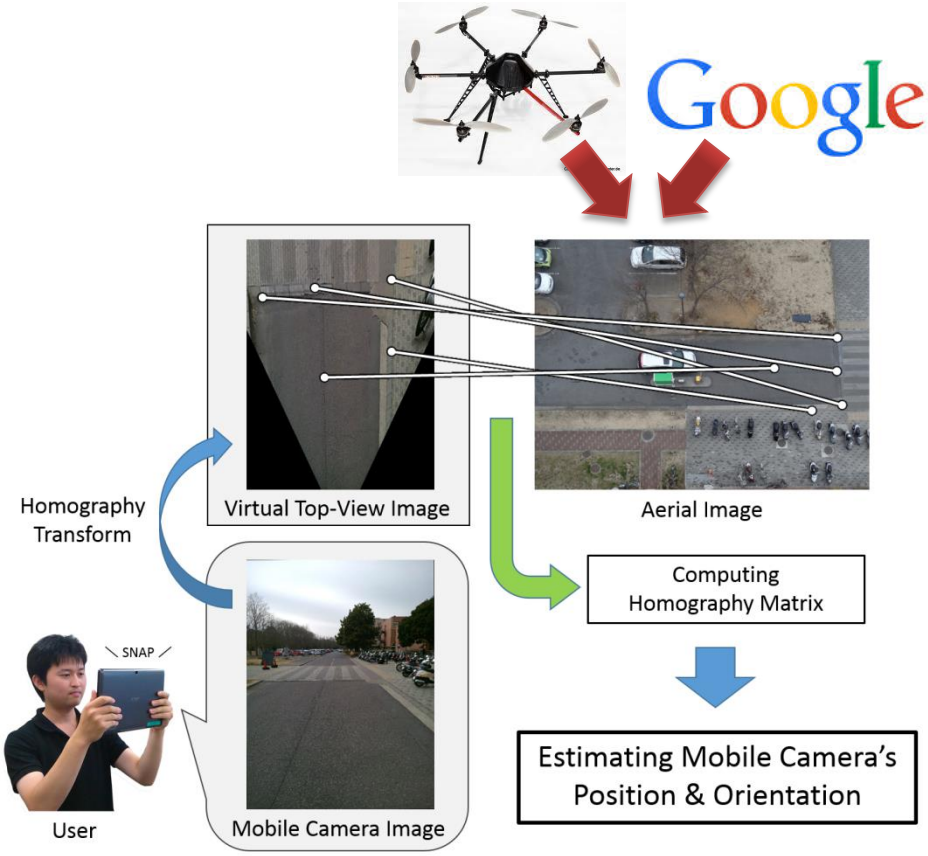




(6) Mobile camera localization using environmental cameras

- Localize the camera by querying image features
- Database/environmental cameras covers whole scene





Research Funds

- “HD Quality Improvement of Free Viewpoint Video Browsing by Human Billboard for Large-Scale Space,” by Grant-in-Aid for Scientific Research (B), Japan Society for the Promotion of Science, 2013-2016.
- “Spatio-Temporal Analysis and Mixed-Reality-Based Visualization of Video Images of Environmental Cameras toward Safe and Efficient Viewing,“ by Grant-in-Aid for Scientific Research (B), Japan Society for the Promotion of Science, 2011-2014.
- “Information Compression for Displaying Immersive Perception by Boundary Search of a Feeling of Strangeness in Mixed Reality Space”, by Grand-in-Aid for Houga (new researches), Japan Society for the Promotion of Science, 2011-2014.
- “An Observer Oriented Free-Viewpoint Video Generation,“ by Grand-in-Aid for Young Scientists (A), Japan Society for the Promotion of Science, 2009-2011.
- “A Development of Walking-Out Support System Development of Visually Impaired Person in Indoor and Outdoor Daily Scene by Sensor Integration of Imaging and GPS,” grant of MHLW, 2009.
- “See-through Vision : Visual Augmentation for Pedestrians by Using Surveillance Cameras,“ by Grand-in-Aid for Scientific Research (A), Japan Society for the Promotion of Science, 2006-2009.
- “A Video Surveillance Method by Using Environmental and Mobile Cameras with Considering Privacy Issue,” by Grand-in-Aid for Young Scientists (A), Japan Society for the Promotion of Science, 2006-2009.

Collaborations

Collaborations with Industry

- NEC
- Hitachi
- Yahoo Japan

Collaborations with Intl Organization

- University of Arizona
- Otto von Guericke University Magdeburg

Outreach activities

- Innovation Japan (2008,2009,2010,2011)

Future Plan

- Extend our researches to promote and analyze other division's research outcomes
- Realize computational media at people's hand

Technical challenges:
(1) Spatio-temporal video analysis and its utilization for data navigation
(2) Advanced RGB-D data analysis and visualization
(3) Vehicle localization by road monitoring camera
(4) Visual Support for Drivers by Mixed Reality
(5) Novel Cubic Display with Diorama and Projection AR
(6) Realizing corroborative work environment where multiple remote-users can virtually share real objects
(7) Developing a facial expression enhancement of MR face to realize smoother video communication
(8) Higher resolution of video (e.g., 4K) with keeping real-time processing
(9) New content management system that enables video creators produce attractive movies in free-viewpoint video
(10) Pedestrian navigation by a camera of mobile device
(11) Data managing/mining method for visual information given by the massive number of users