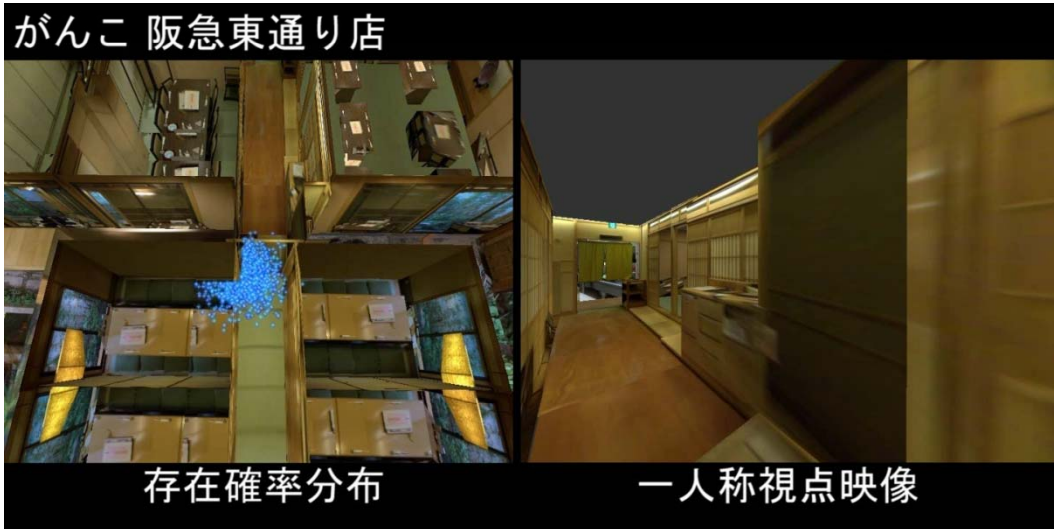
Service Cooperation and Co-creative Intelligence Cycles Based on Mixed-Reality Technology

Takeshi Kurata, Masakatsu Kourogi, Tomoya Ishikawa,
Jungwoo Hyun and Anjin Park

Center for Service Research, AIST



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Point-Of-Sales (POS)

- Real-virtual correspondences of products with POS systems
  - Facilitate modeling and designing the flow of the products by not strongly relying on tacit knowledge.
  - Brought about drastic changes in retail, chain restaurant, logistics, etc.
- On the analogy…
- One of the next key issues for service innovation

→ How to Make better correspondence between customers/employees/service processes and the computerized data

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What is MR (Mixed Reality)?

- Comprehensive technical field that addresses not only virtualization of real-world entities such as human, object, and environment, but also information presentation.
- Considering the following consistency according to its necessity;

Consistency of real-world entities and virtual entities in terms of

- Geometrical aspect
- Optical aspect
- Temporal aspect
- **Semantic aspect**

- Promising technology for next service innovation!?

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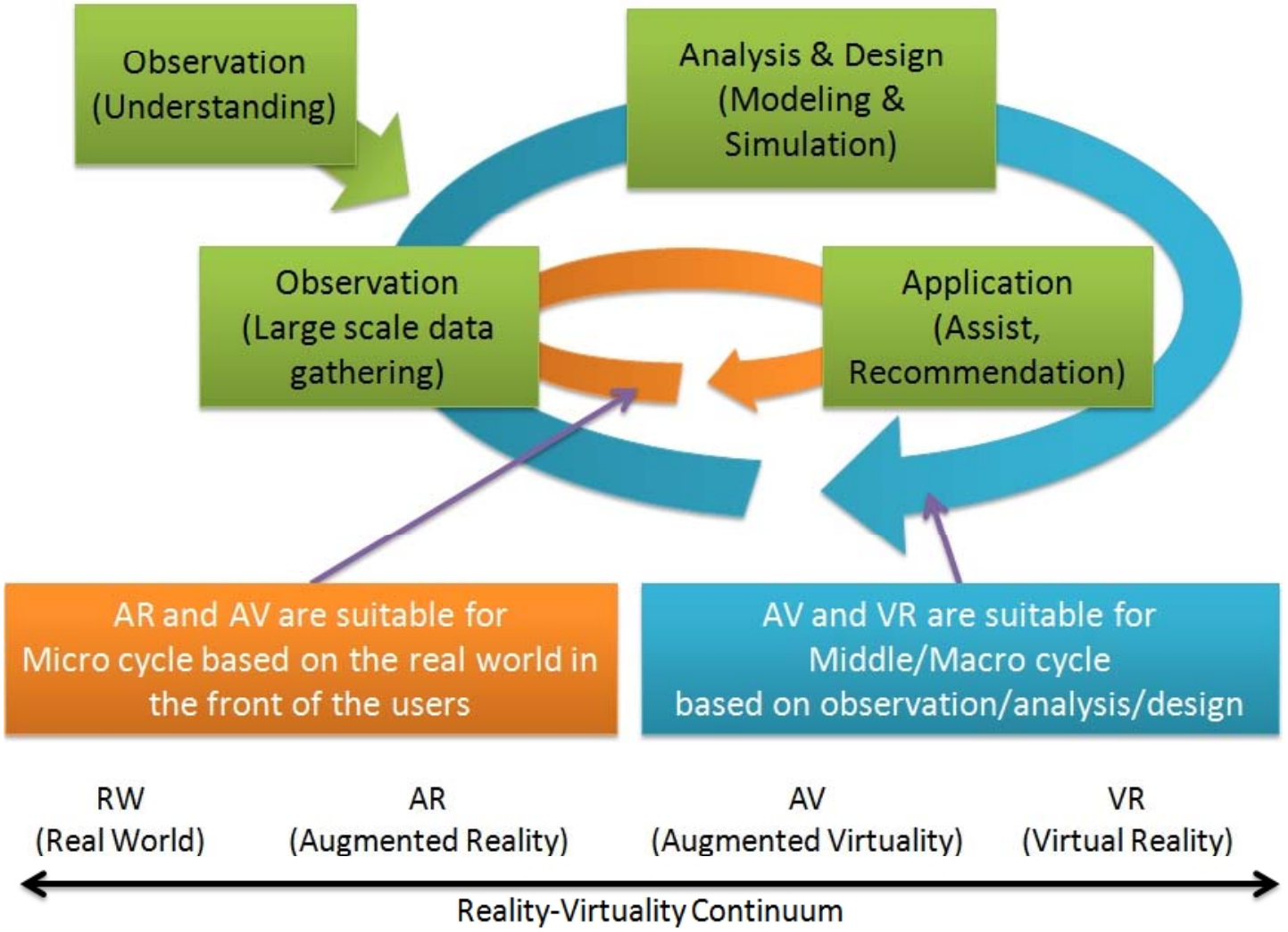
Continuum of MR along with Co-Creative Service-Design Cycle



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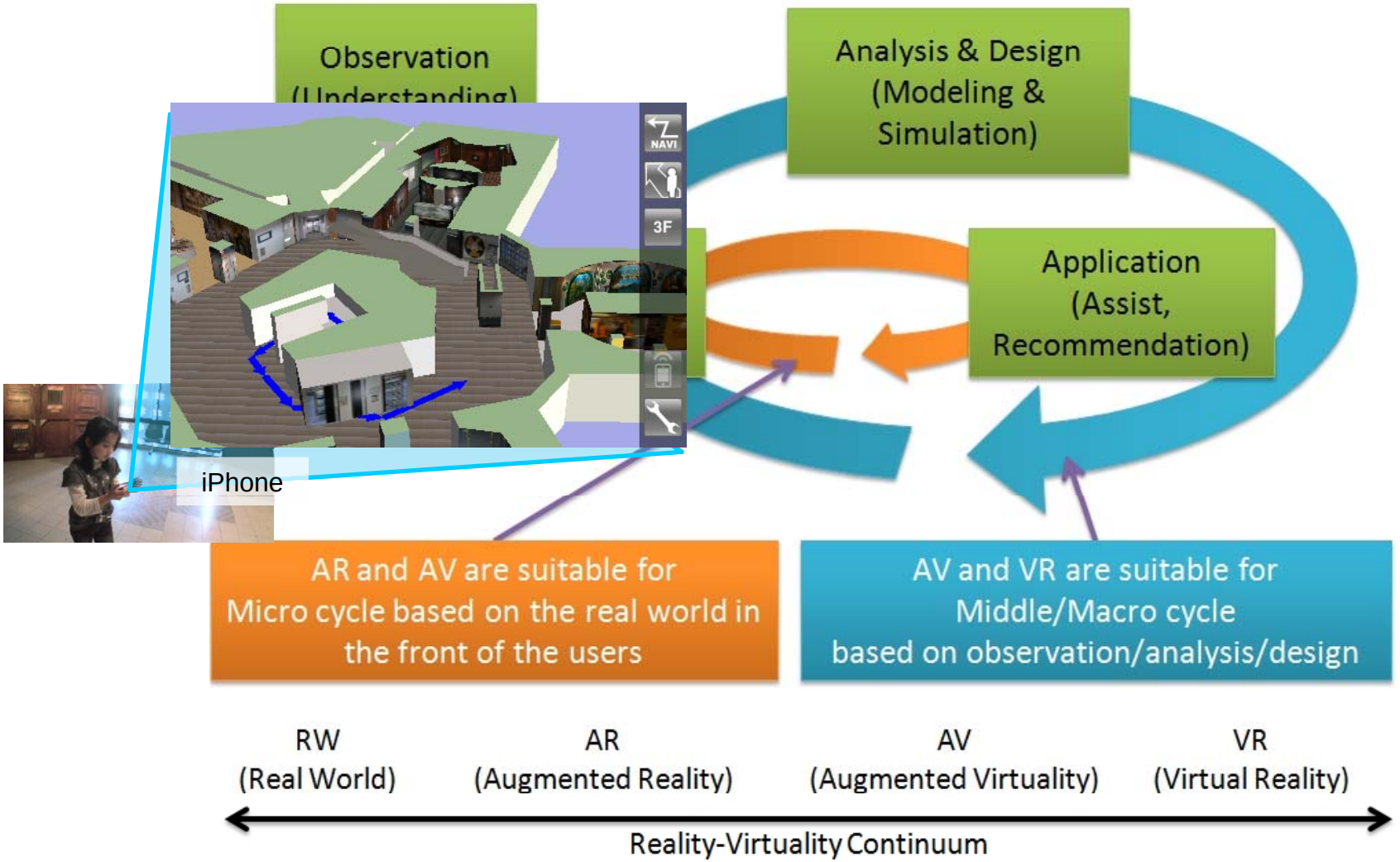

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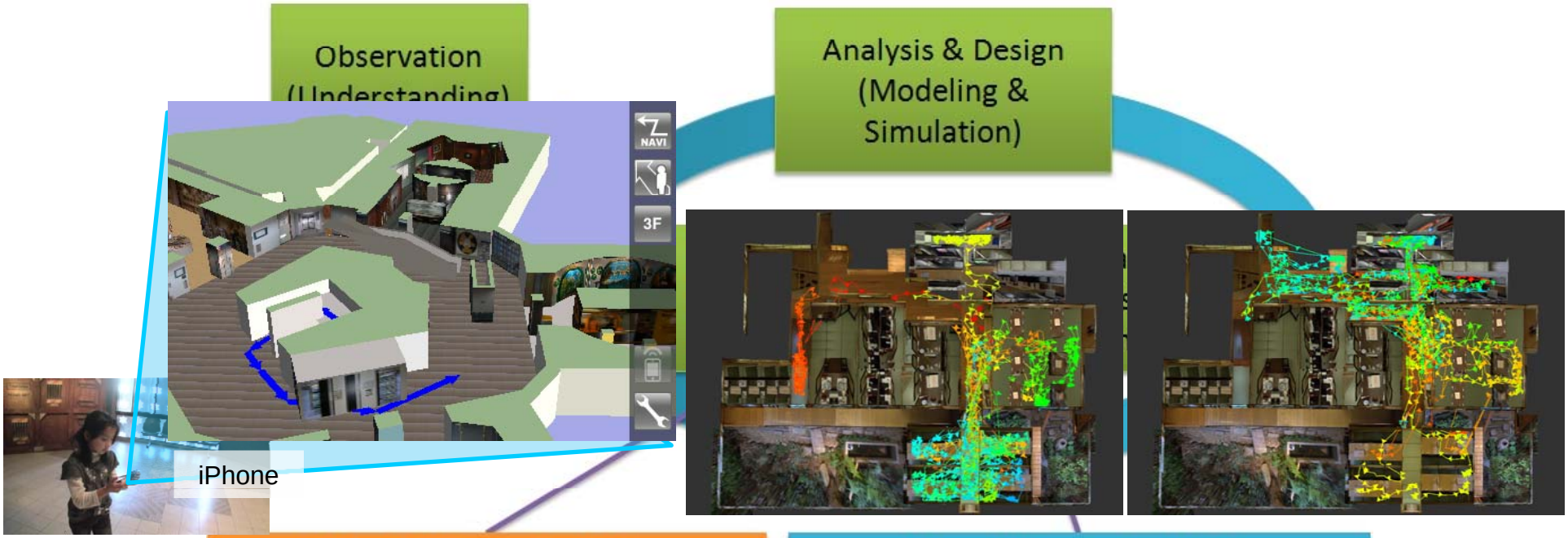

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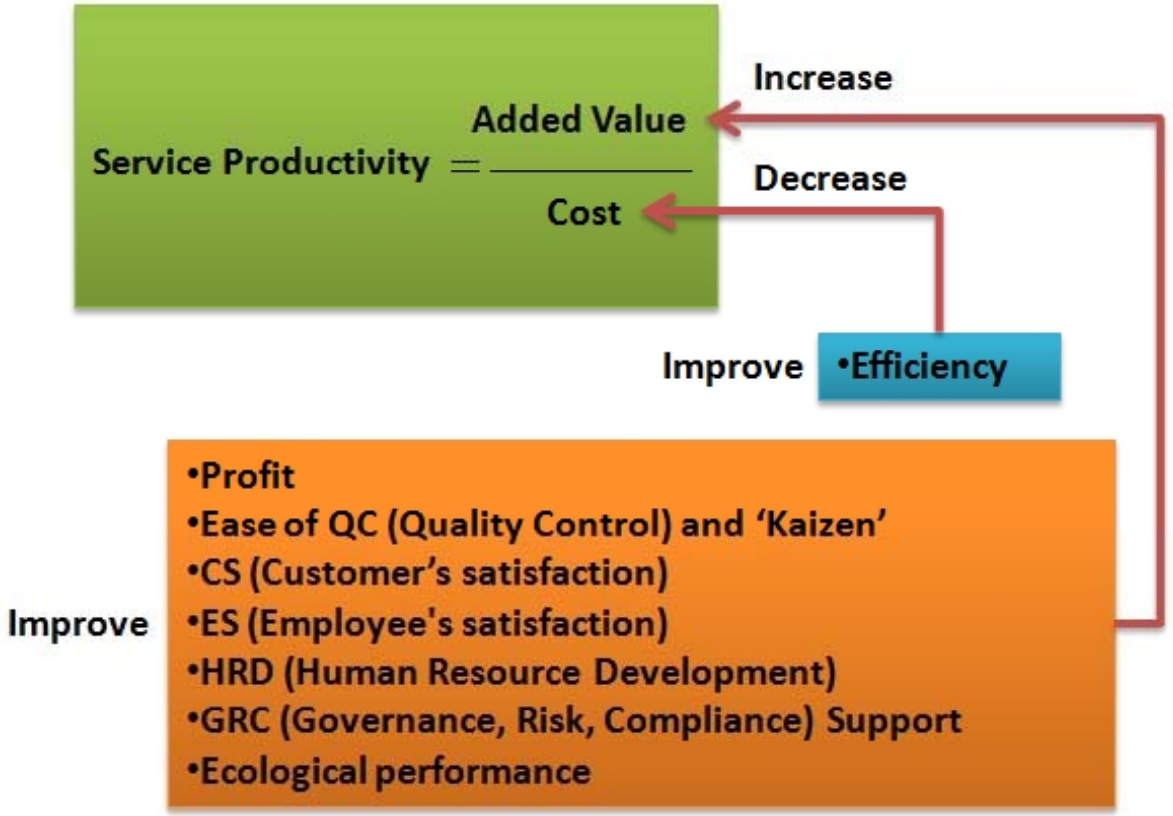
Service Productivity



To improve service productivity…

- Increase the added values.
- Decrease the cost.

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Service Improvement and Innovation by MR?

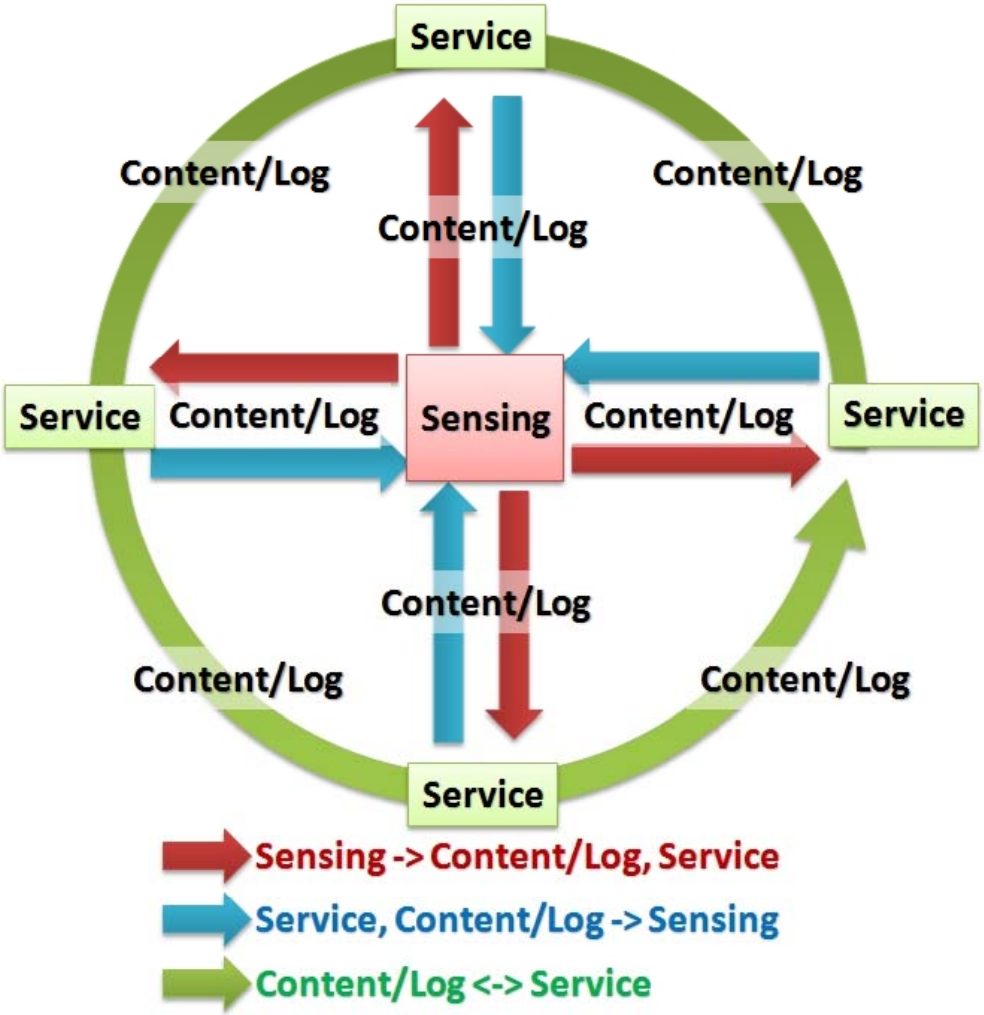
From tacit knowledge to Data-driven (Engineering) approaches?		**Definitely, Yes**
Service Productivity	Added Value?	**Yes, but more**
	Cost/Efficiency?	**In general, No…**

To make MR widespread

Establish an efficient framework for service cooperation and intelligence cycle in which

Real-world sensing contributes the efficiency of service operation, content gathering and authoring.

Digital content and service operation log improve the performance of real-world sensing.



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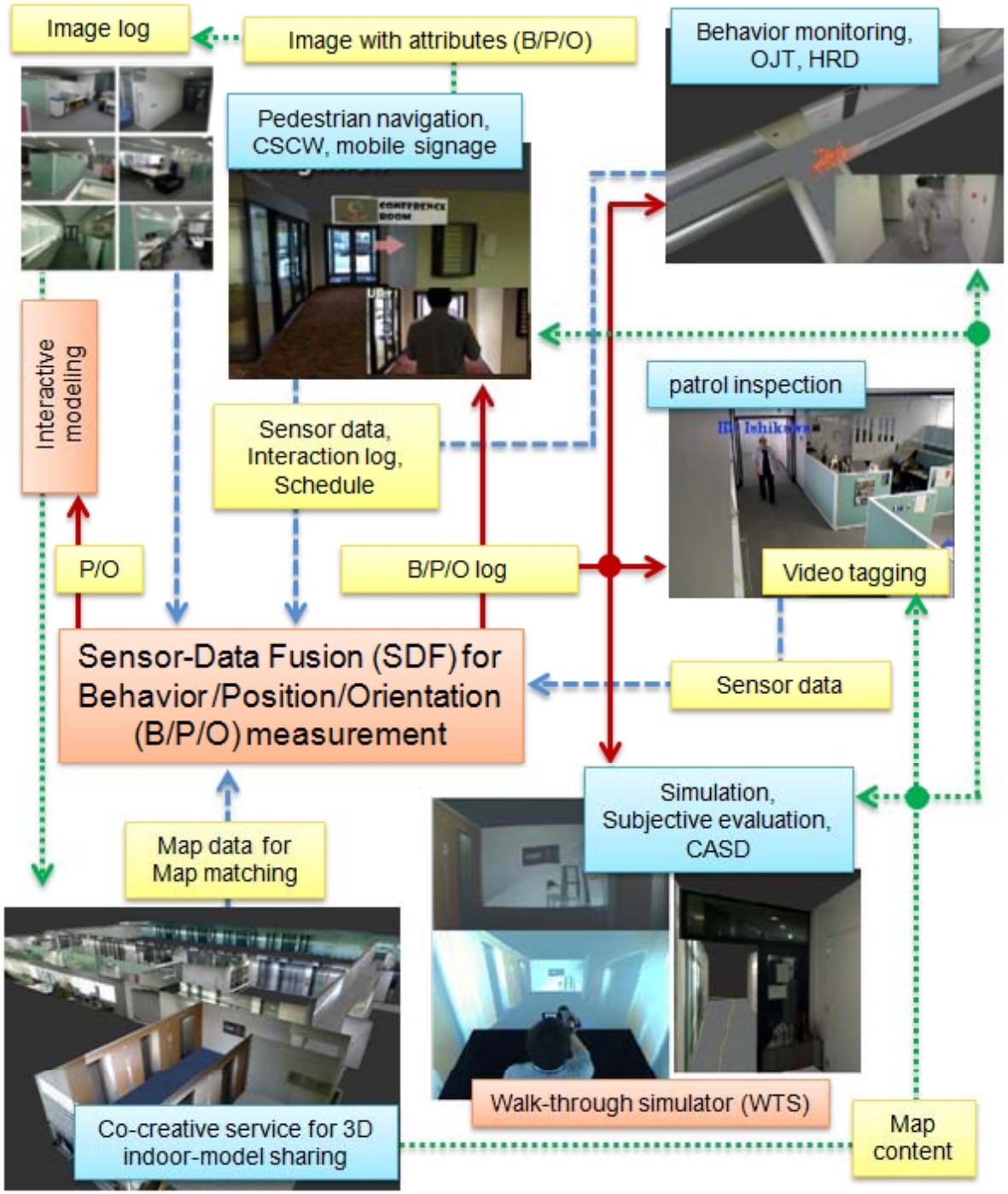
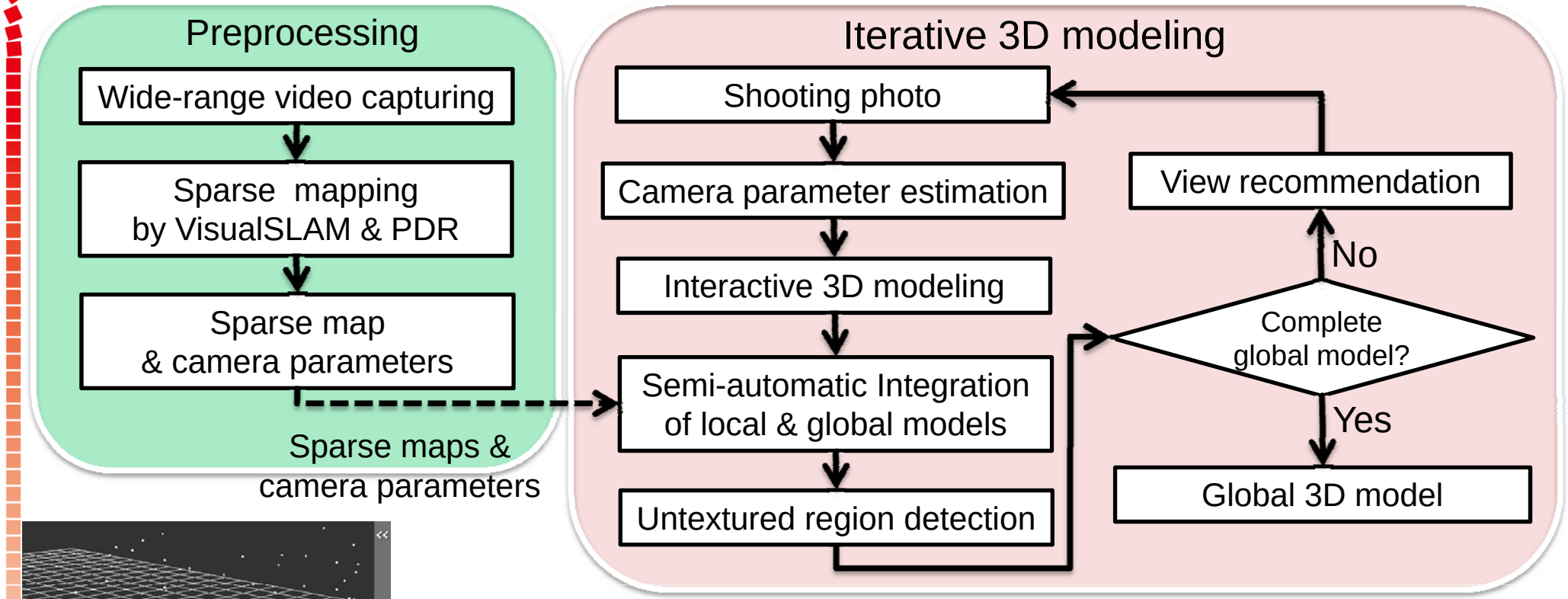
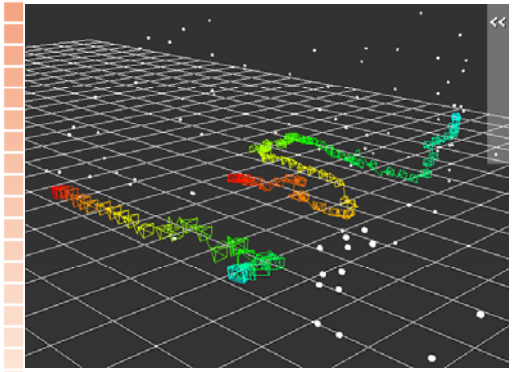
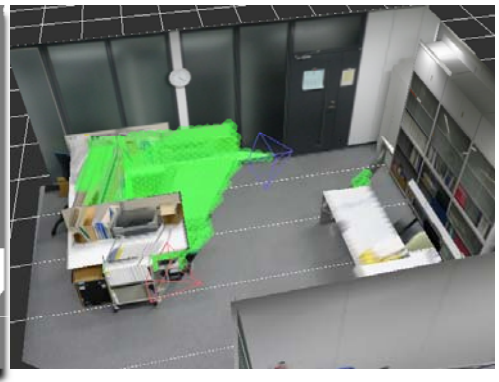
Example of Service cooperation and co-creative intelligence cycle based on MR

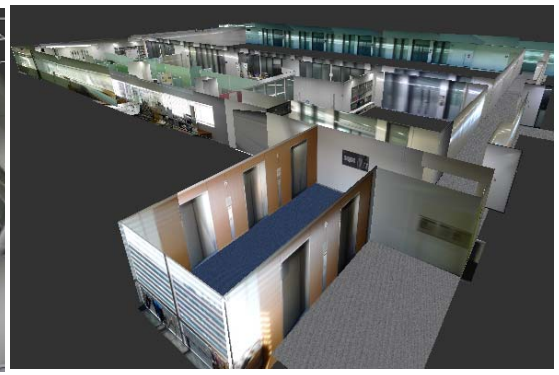


Overview of 3D Indoor Modeler









T. Ishikawa, K. Thangamani, M. Kourogi, A. P. Gee, W. Mayol, K. Jung, and T. Kurata, "In-Situ 3D Indoor Modeler with a Camera and Self-Contained Sensors", In Proc. HCII2009, LNCS 5622, pp. 454-464, 2009.

Pedestrian Tracking System

Sensor module

Barometer | Magnetometer | Accelerometers / gyro-sensors | RFID reader

Active RFID tag

Surveillance camera

ID

Atmospheric pressure

Magnetic vector

Acceleration / angular velocity

ID
RSSI

Video

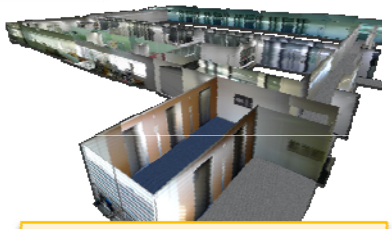
Walking velocity

Pedestrian dead-reckoning

Trajectory matching/ Velocity estimation

Velocity vector /
Relative altitude /
Action type

RF-based positioning



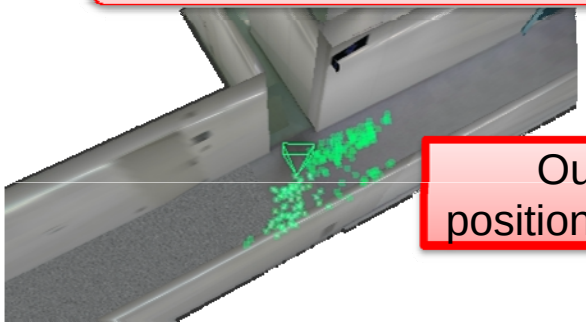
Absolute position

Sensor/Data fusion (Particle filter)

Trajectory

3D model

3D environment model

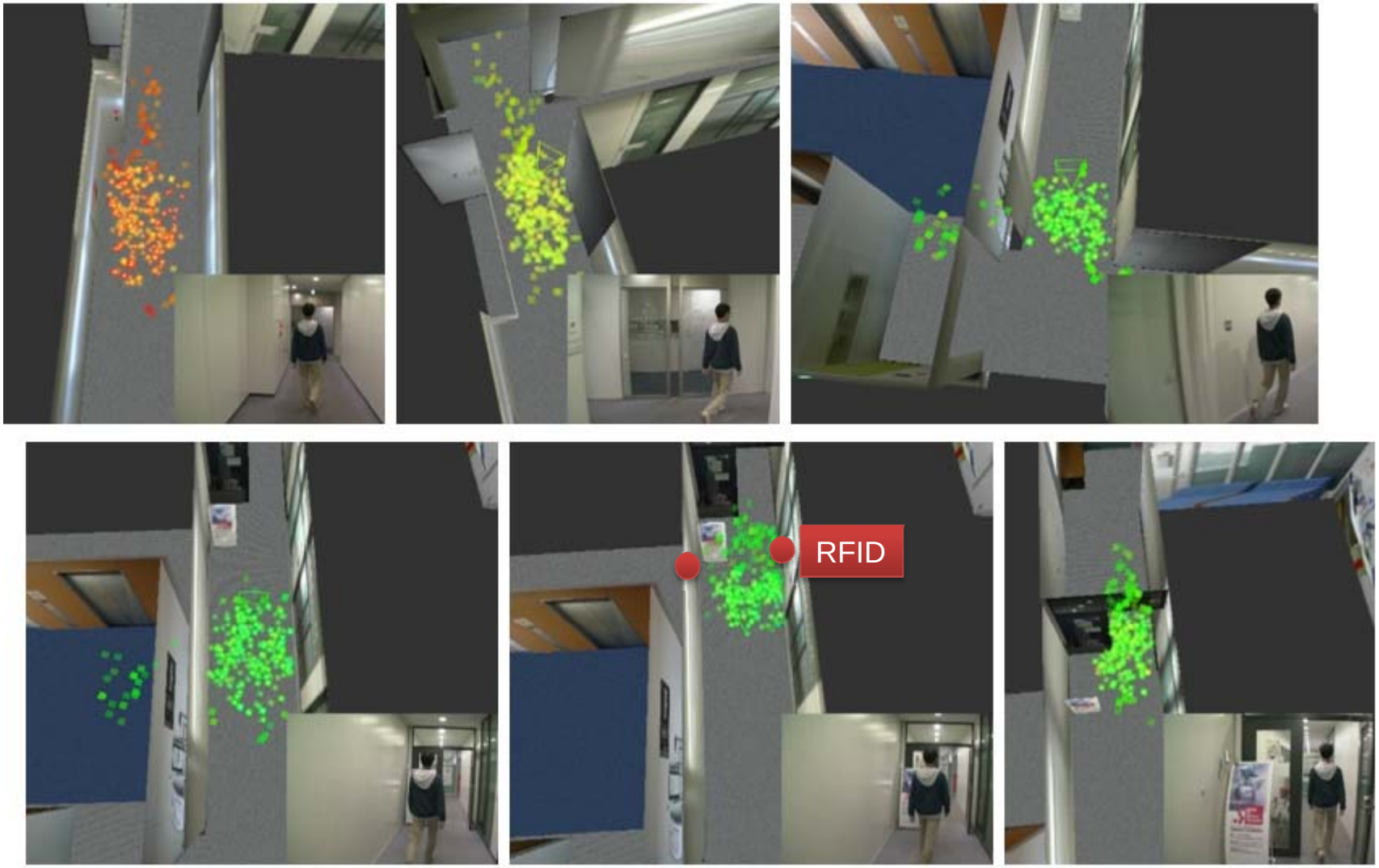


Position / Orientation

Output of position/orientation

T. Ishikawa, M. Kourogi, T. Okuma, and T. Kurata, “Economic and Synergistic Pedestrian Tracking System for Indoor Environments”, In Proc. SoCPaR2009, pp.522-527, 2009.

Error Correction Using Map Matching and RFID Tags



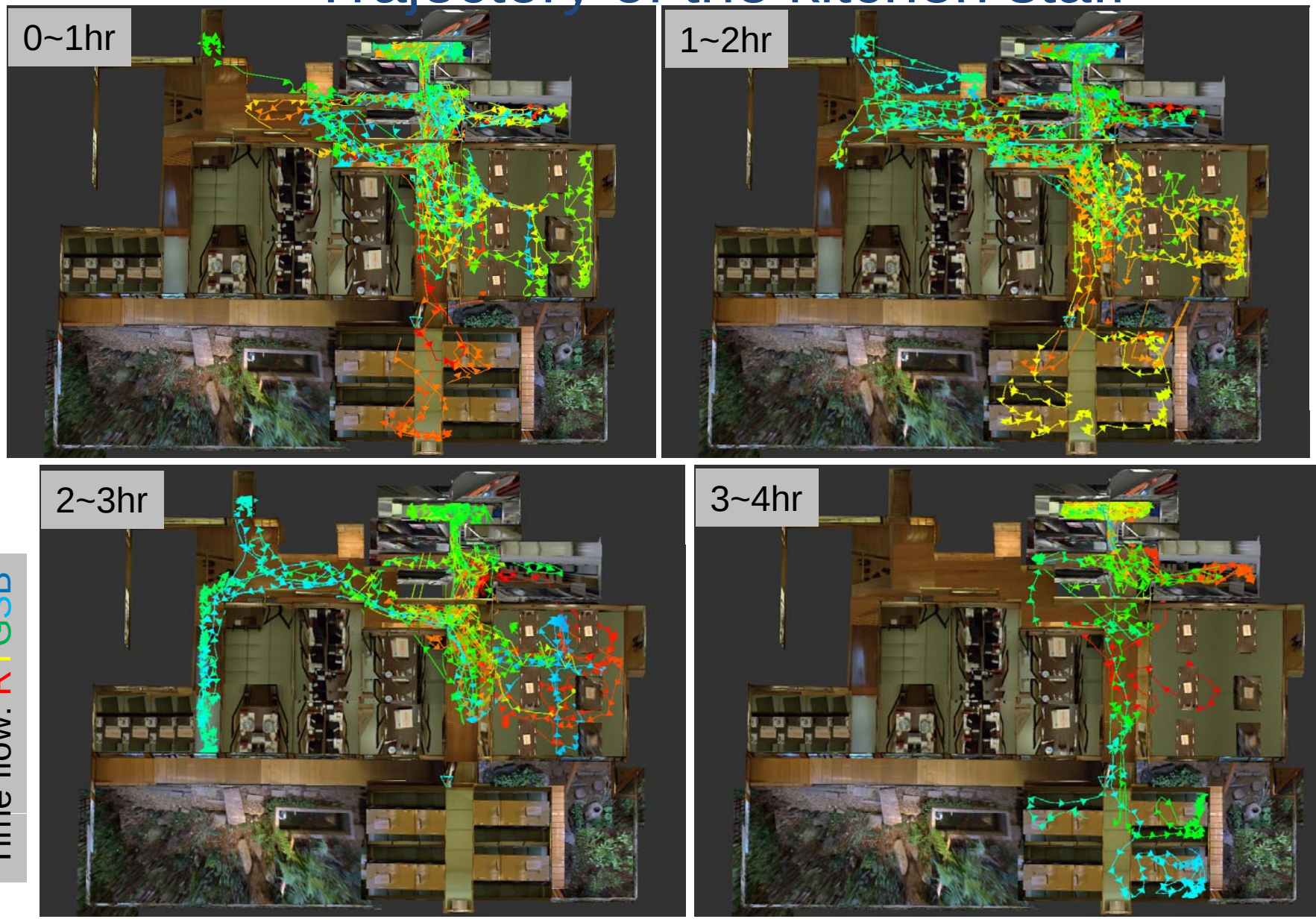
Behavior Measurement of workers at Japanese Restaurant (Ganko)

Chief hostess (Okami)

Kitchen staff (Ohakobi)

Surveillance camera
Active RFID tag
Eco sensor

Mieruka (Visualization): Trajectory of the kitchen staff



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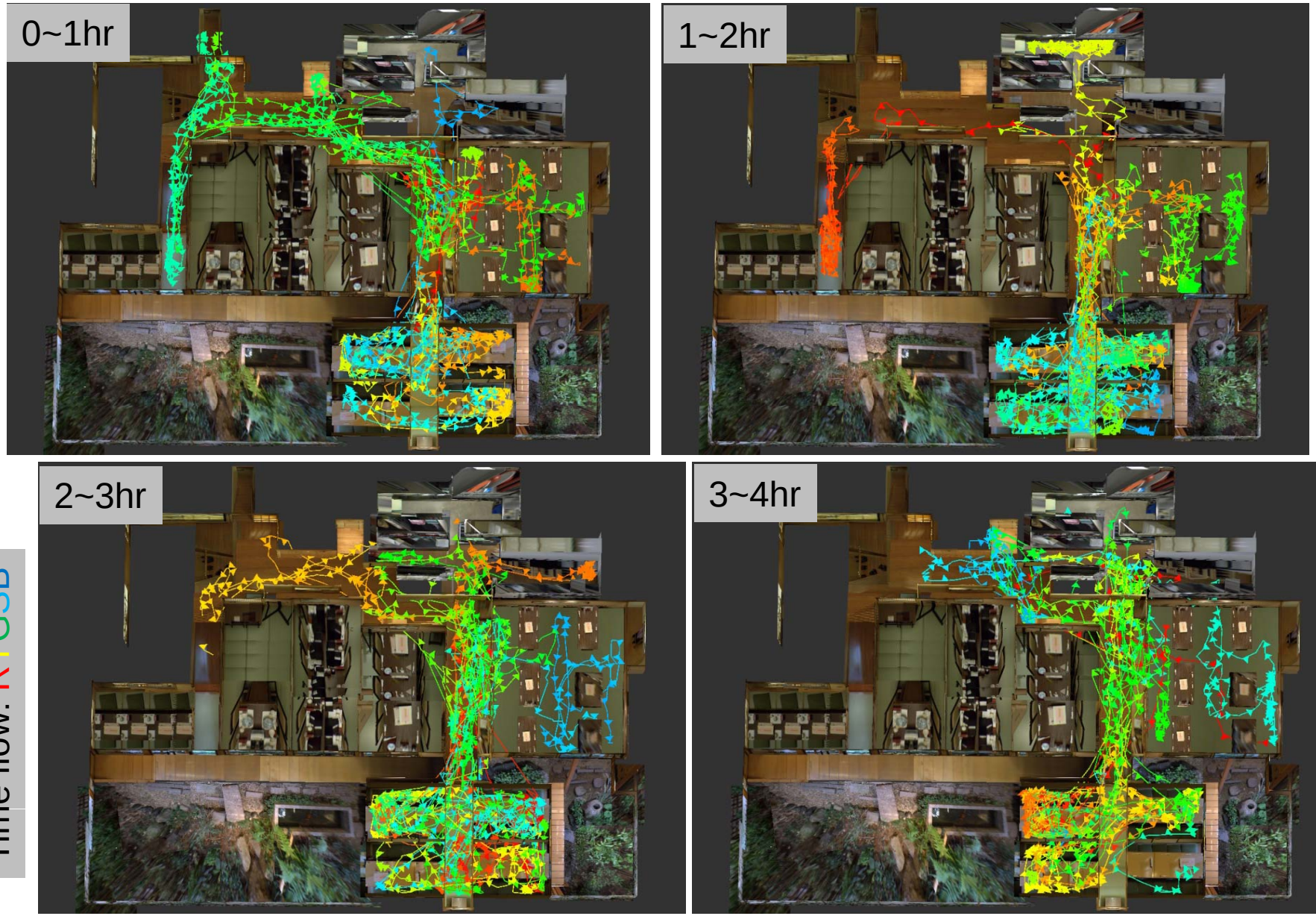
Trajectory of the chief hostess



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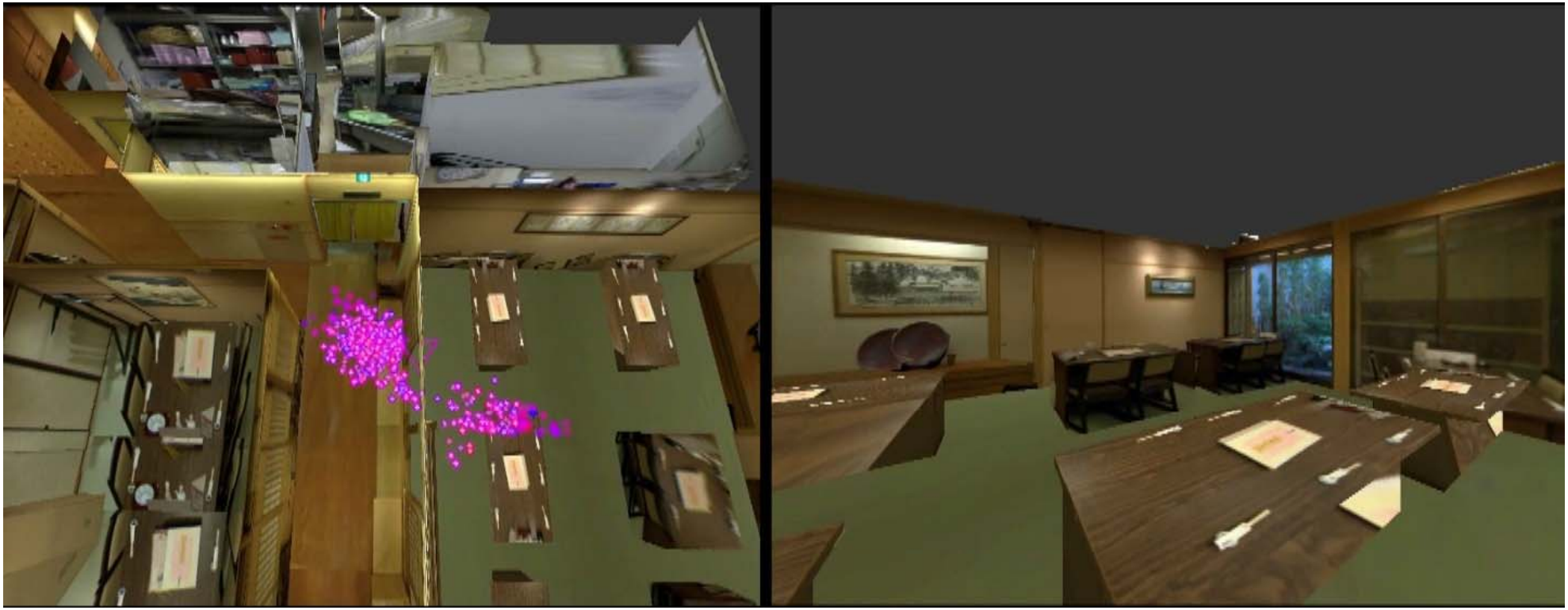
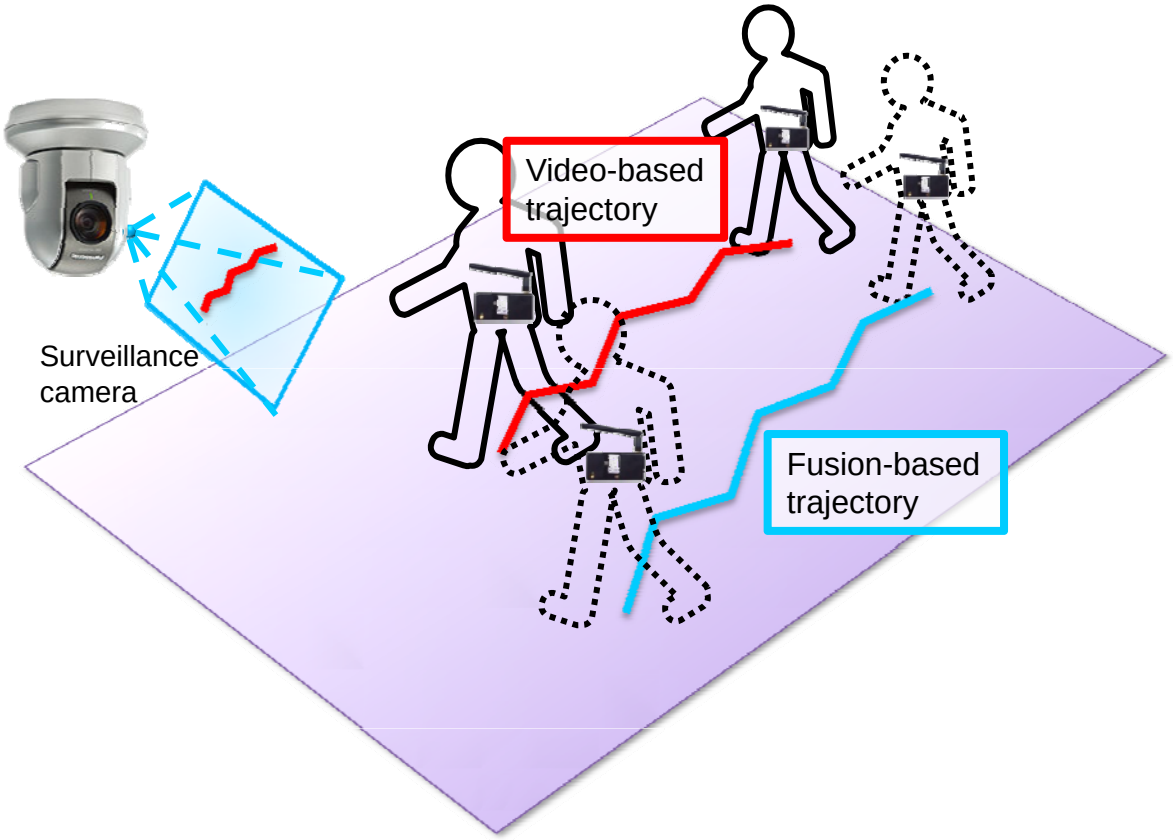
HRD (Human Resource Development) and Business Ethnography



Bird's eye view to show
the probabilistic distribution of
the chief hostess

First person view
for virtually reliving her movement

Trajectory matching/ PDR parameter modification/ Video tagging



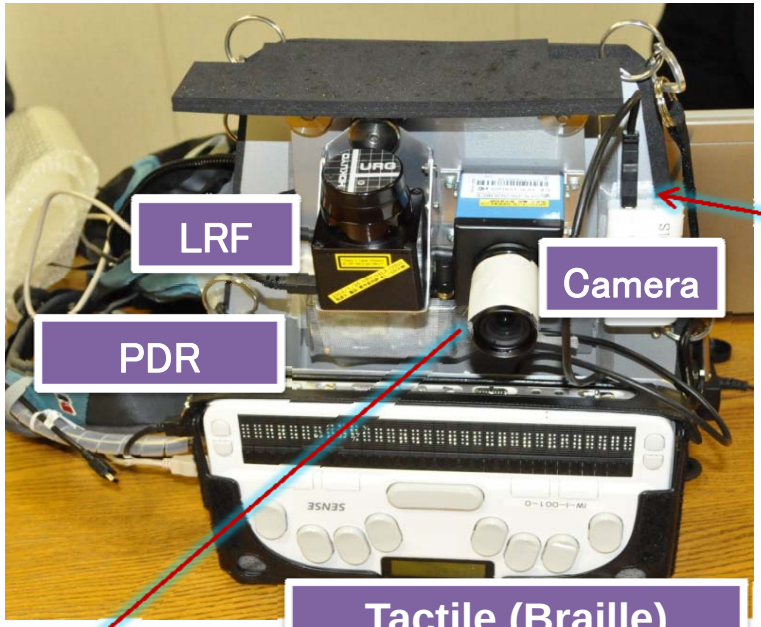
Patrol inspection service

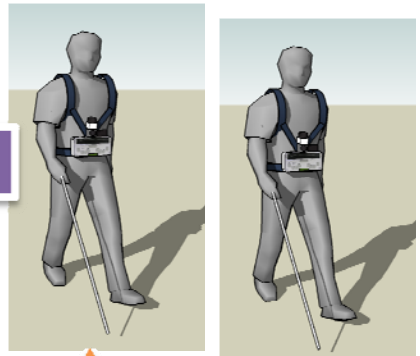
Indoor Navigation/ Remote Collaboration

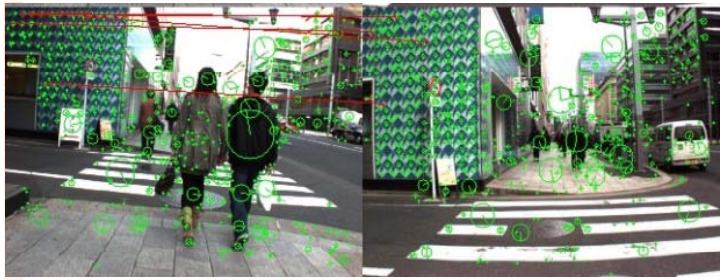
Science Museum Service

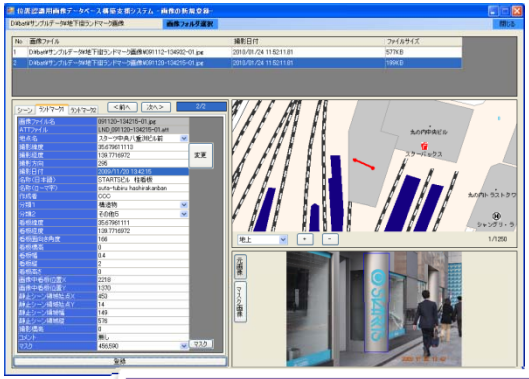
Maintenance Service

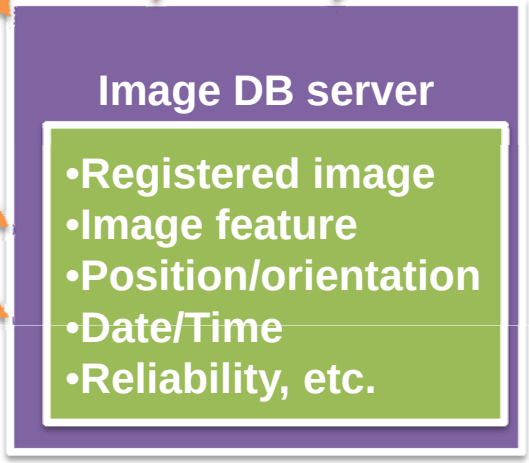
Pedestrian navigation system for visually-impaired persons











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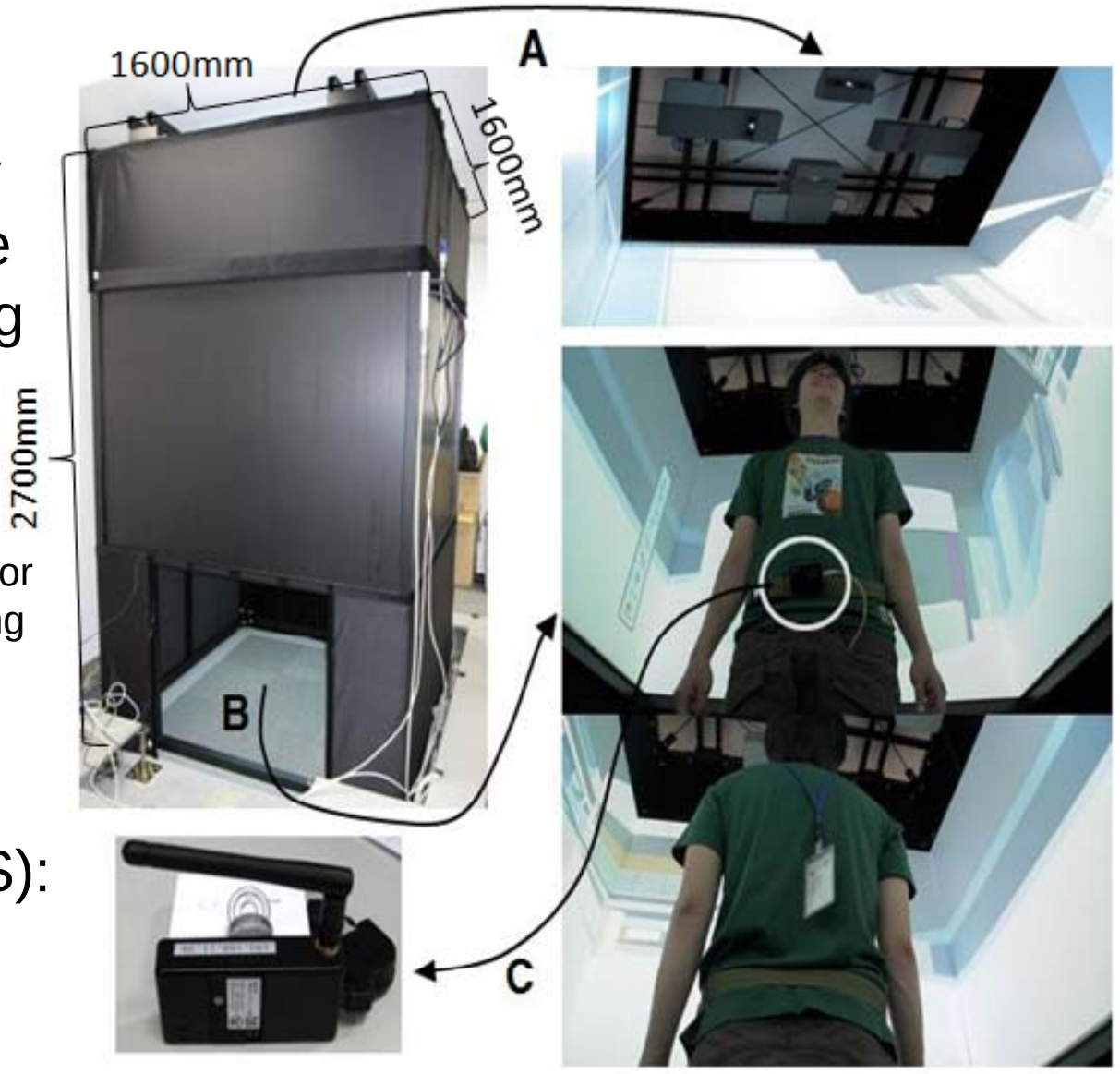
Walk-Through Simulator (WTS)

- Repetition of locomotion by walking and relatively simple work is one of the most frequently occurring situations in daily lives and services.
  - The subject moves to some destination while holding a map or a handheld device, and by having a conversation with employees, etc.,
- Omni-directional Walk-Through Simulator (WTS): Reproduce such situations in the lab.



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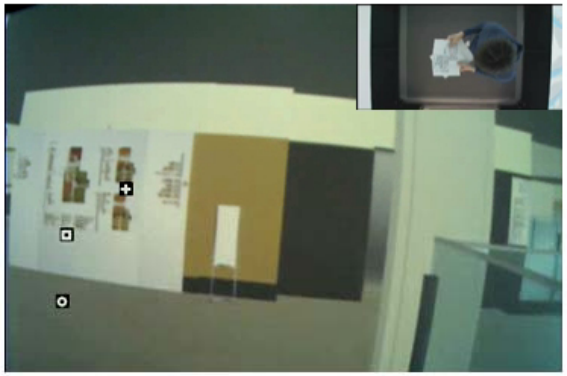
Features of WTS

- Preservation of sense of absolute orientation (prevention of VR sickness)
- Hands-free control by footfall, and body rotation
- Verbal/Non-verbal communication with others by photo-realistic avatars
- convenience of duplication by compact and ease mechanism

Taking an escalator



Seeing a signboard

Confirming destination with a map

Talking with a photorealistic avatar

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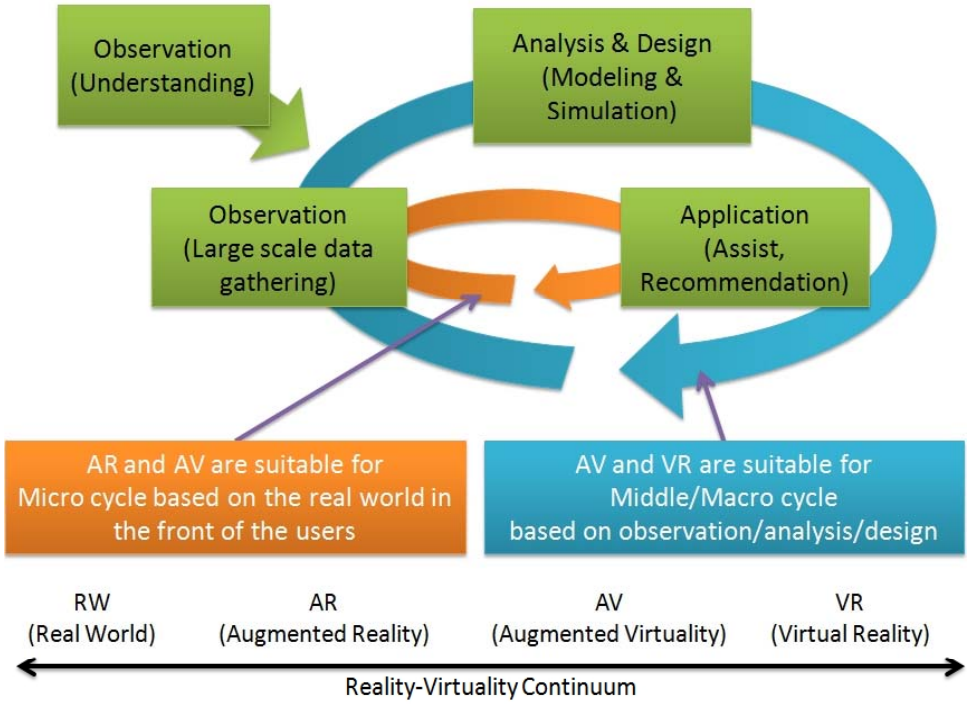
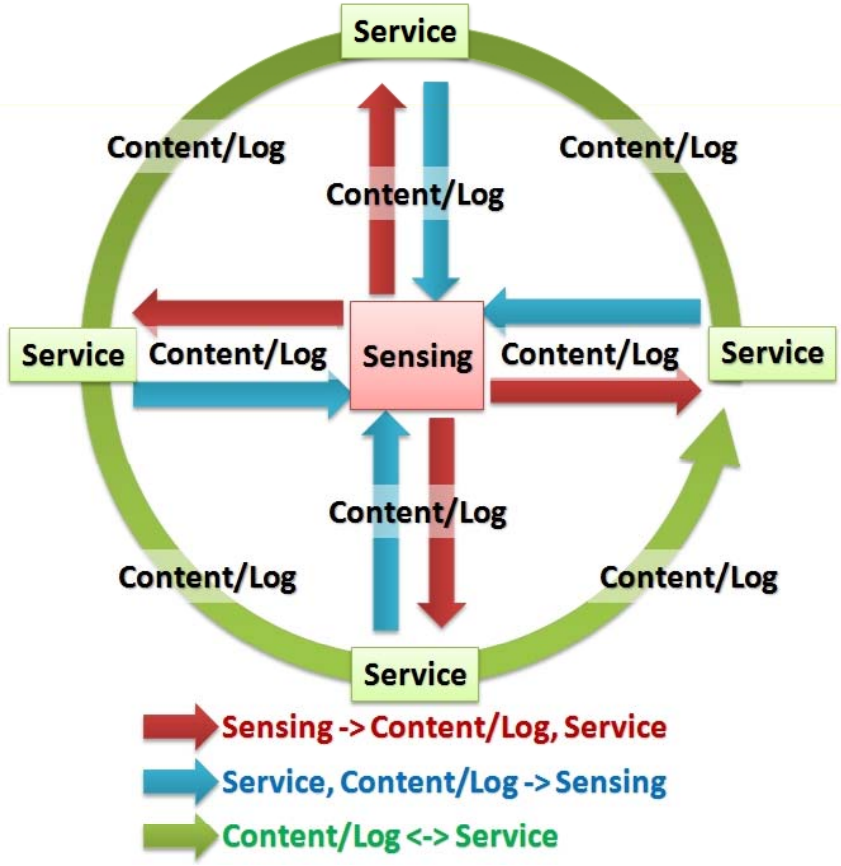
Conclusions





From tacit knowledge to Data-driven (Engineering) approaches?		**Definitely, Yes**
Service Productivity	Added Value?	**Yes, but more**
	Cost/Efficiency?	**In general, No**

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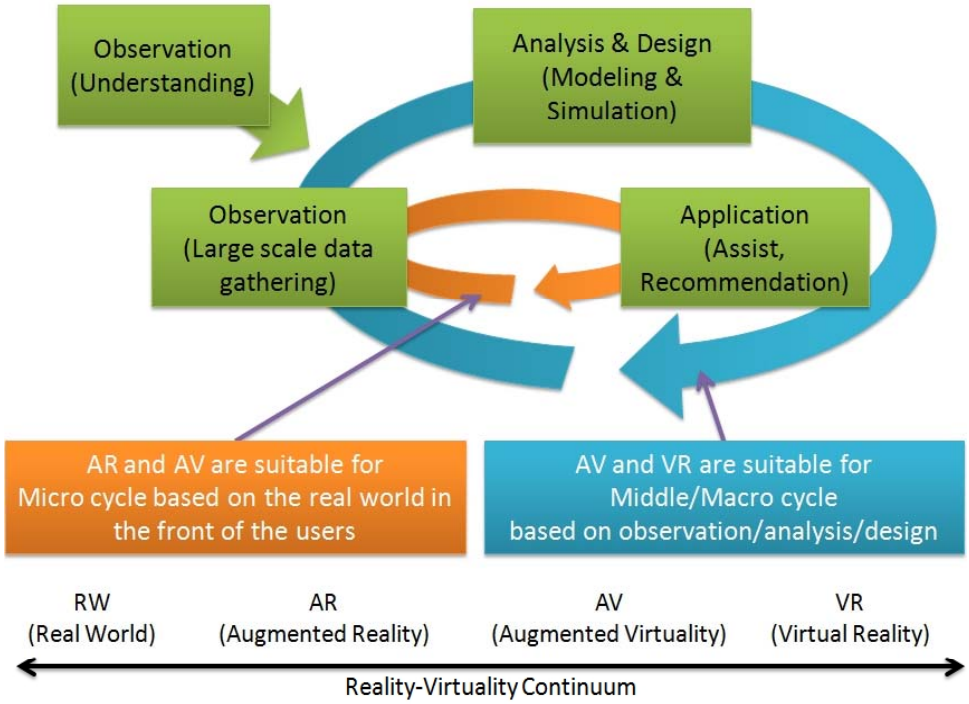
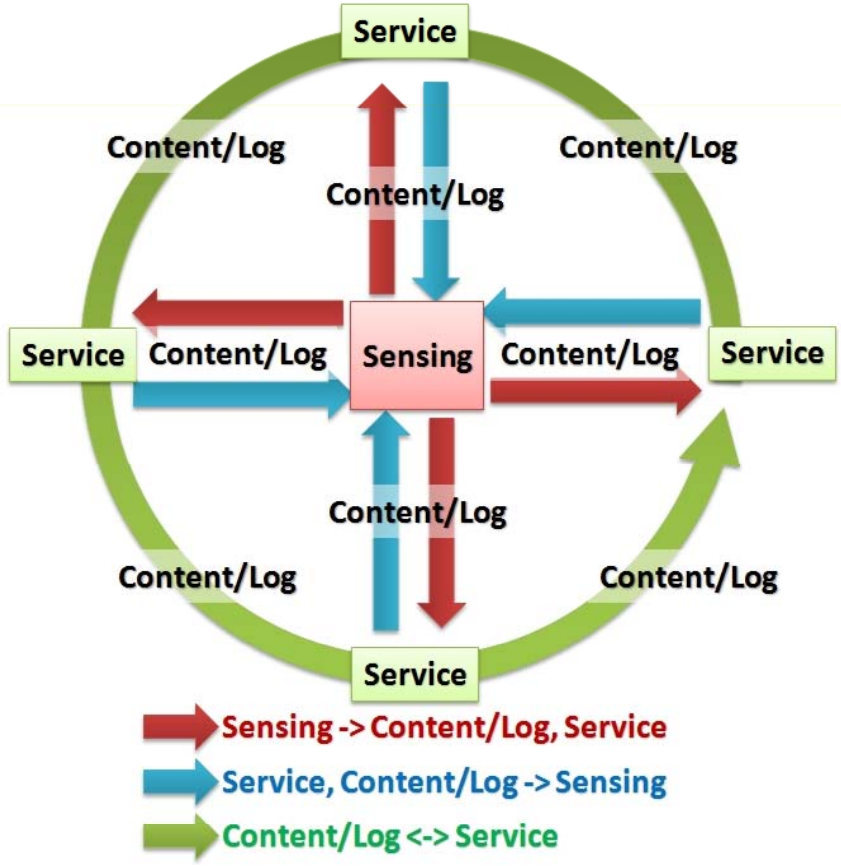
Conclusions





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Thank you.