



Realistic 3D Simulation of Multiple Human Recognition over Perception Sensor Network

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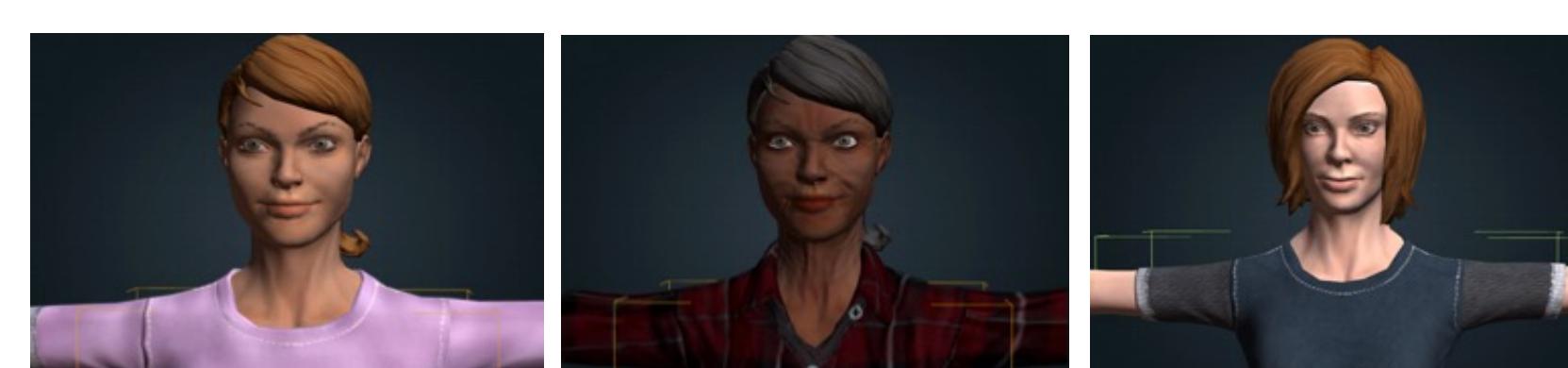
INTRODUCTION

- We introduce a simulation approach for emulating a real-world human recognition system called a **Perception Sensor Network (PSN)**.
- PSN** is simultaneously **tracking global human locations** and corresponding **face identifications** among the sensors.
- This work aims to **simulate a PSN system** that recognizes multiple human targets over a relatively large indoor environment.

METHOD

Create Multiple Humans

- Avatar's appearances are customize (fuse)



- Captured motions can be add to the avatar (blender)

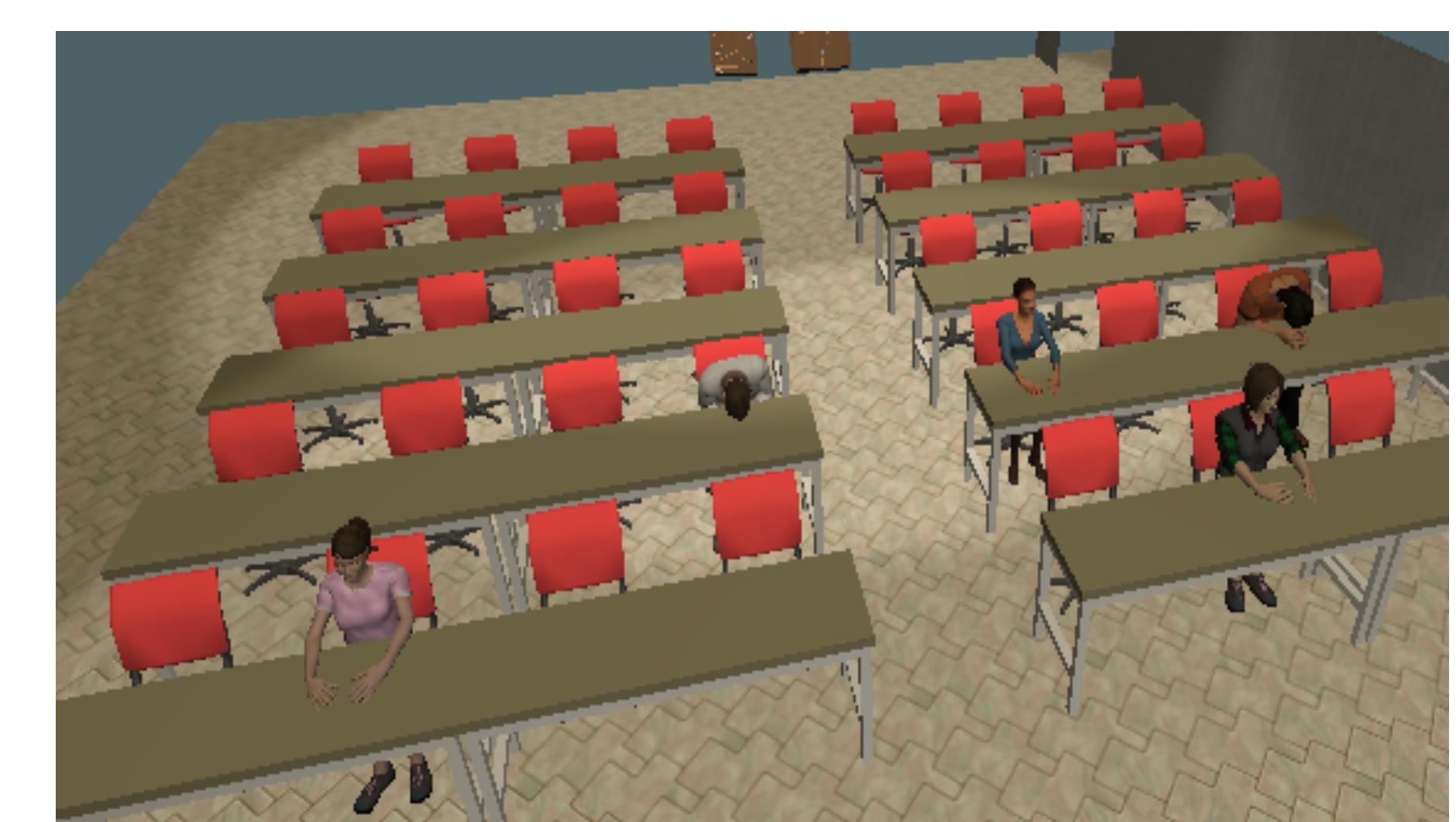
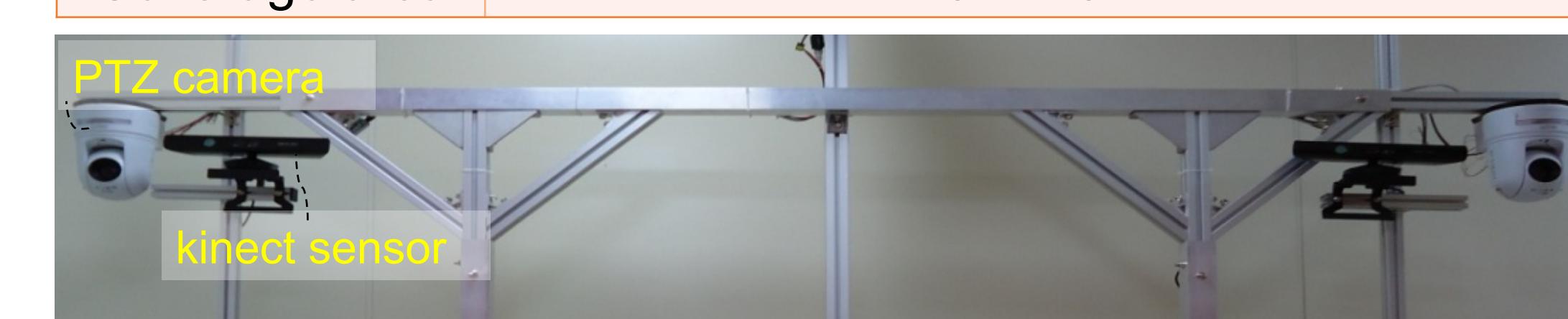


Set up the simulation environment

Platform : blender, morse

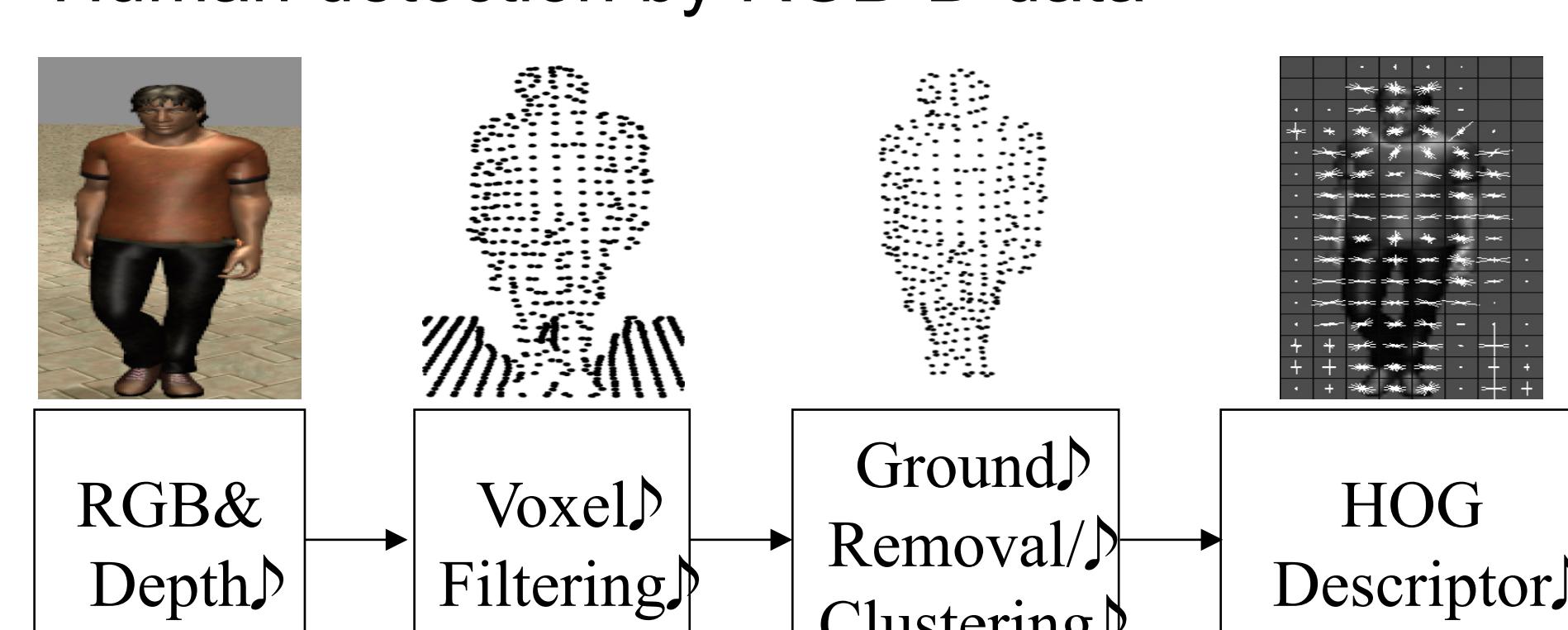
- Sensor emulation(morse)

Parameters	Setting Values
Kinect Camera Matrix	$\begin{bmatrix} f_x & 0 & c_x \\ 0 & f_y & c_y \\ 0 & 0 & 1 \end{bmatrix} = \begin{bmatrix} 525.0 & 0 & 320 \\ 0 & 525.0 & 240 \\ 0 & 0 & 1 \end{bmatrix}$
Clipping range	Near : 0.5m / Far : 5m
Coverage area	5m x 5m

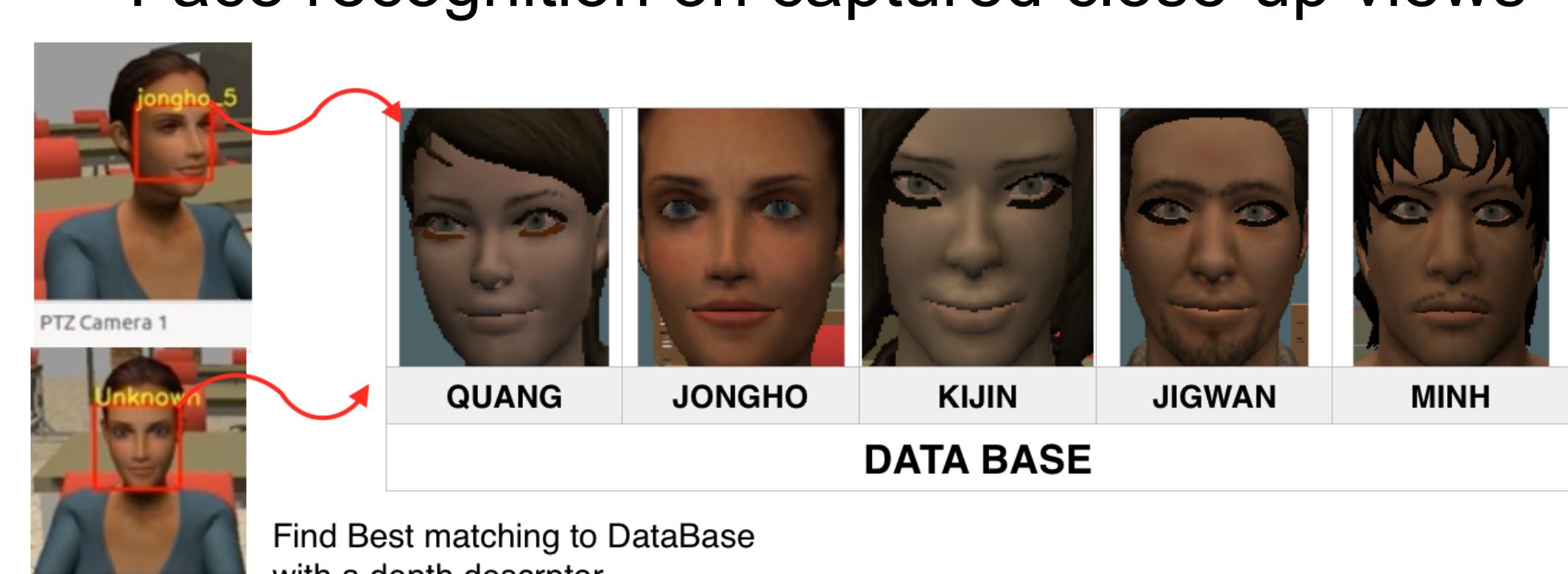


Detect humans and recognize their faces

- Human detection by RGB-D data



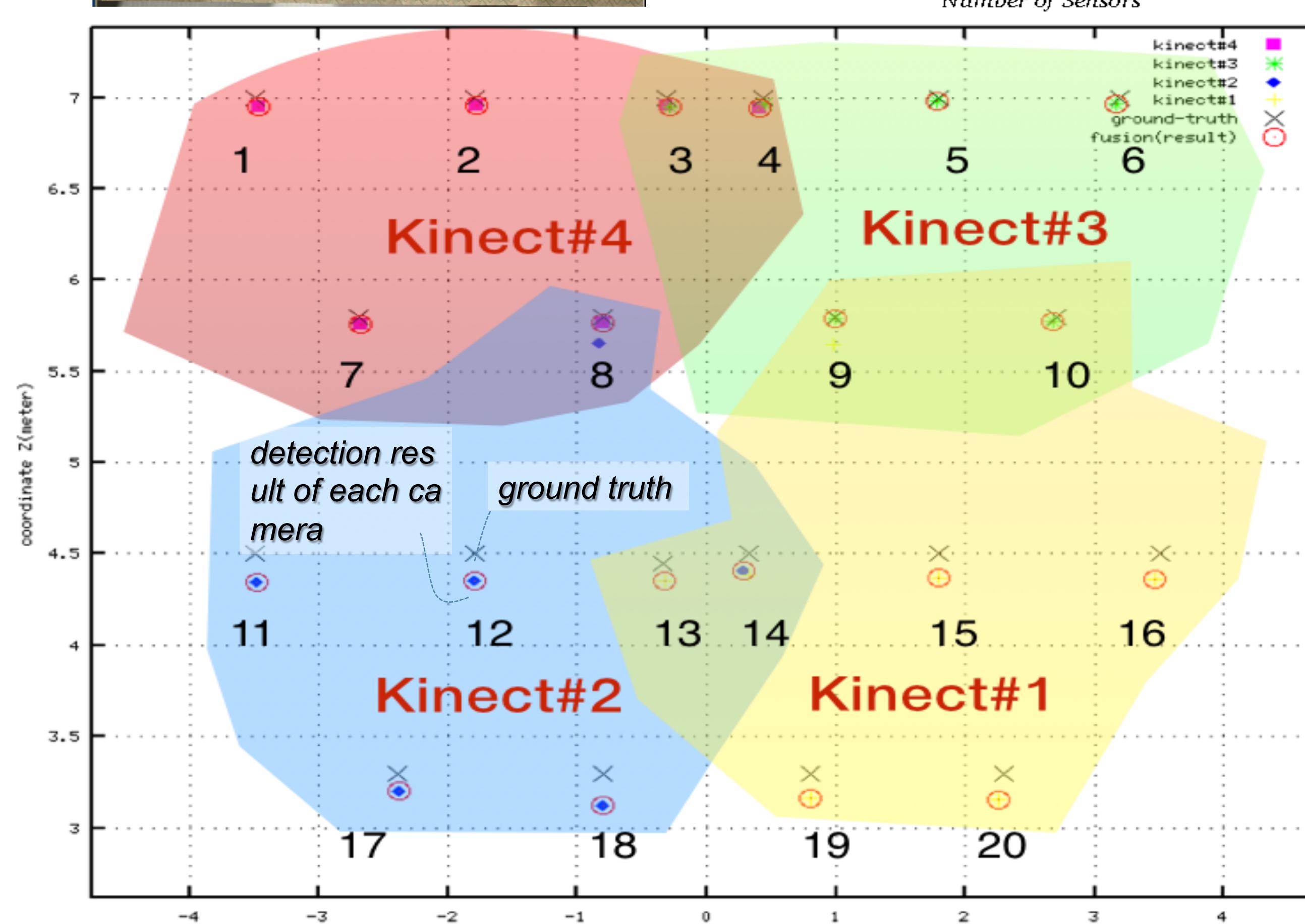
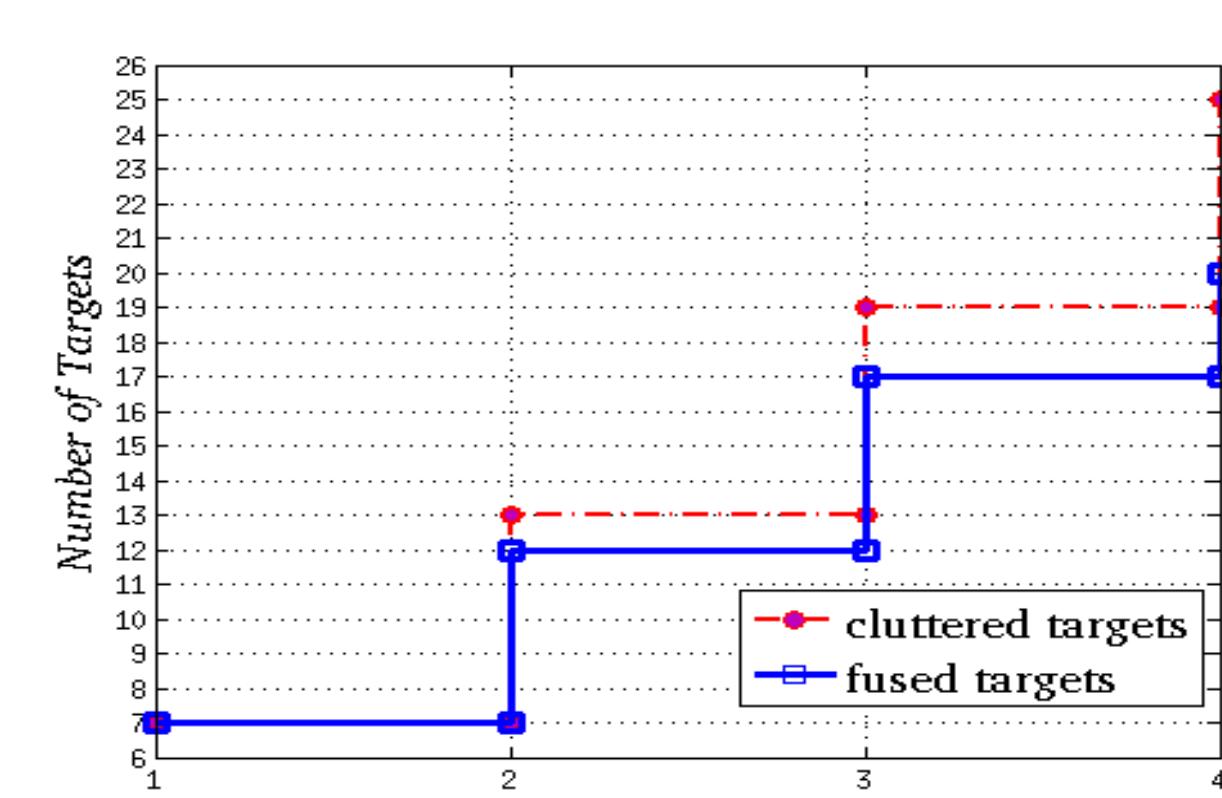
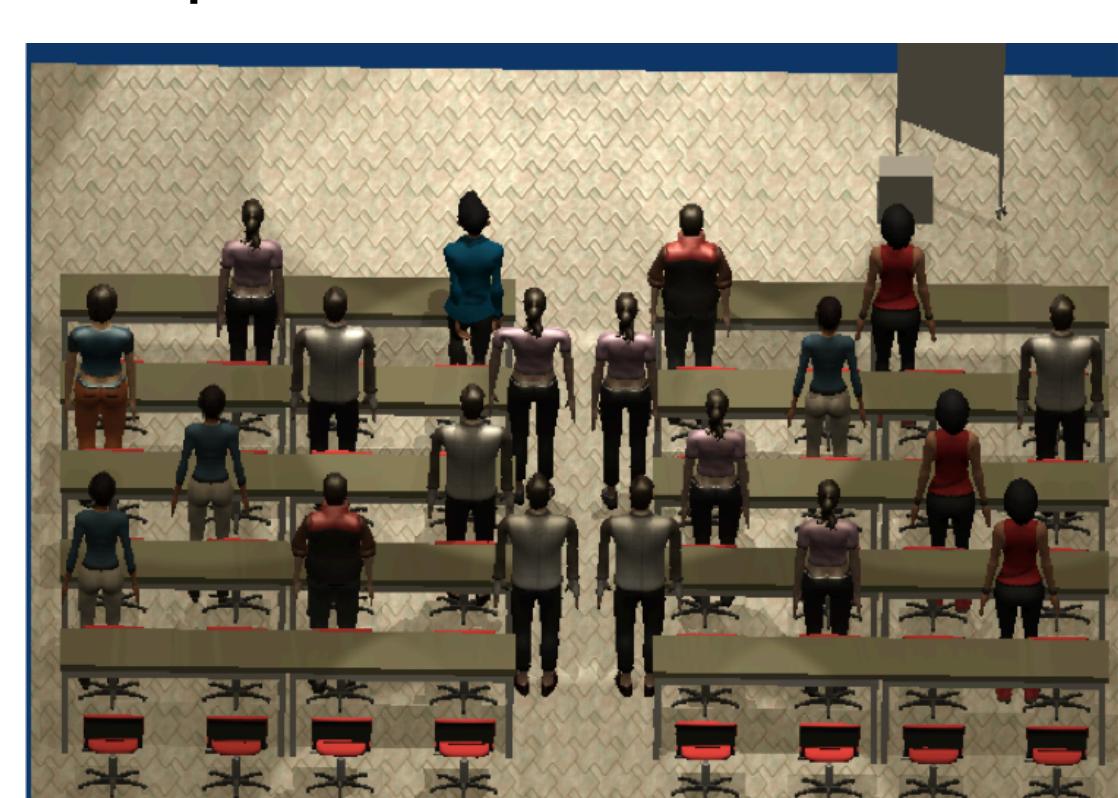
- Face recognition on captured close-up views



RESULTS

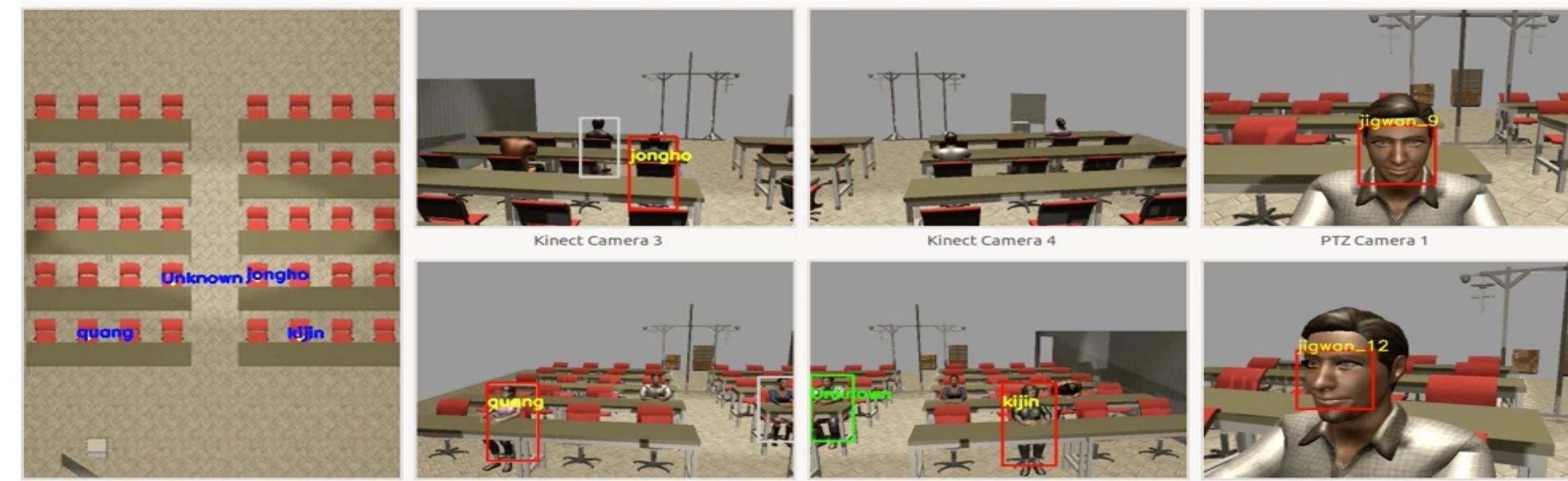
A. Multiple human detection

- Detect 20 human avatars on Kinect 1, 2, 3, 4.
- Merge duplicate detection result among sensors.
- Compare detection results with ground truth.



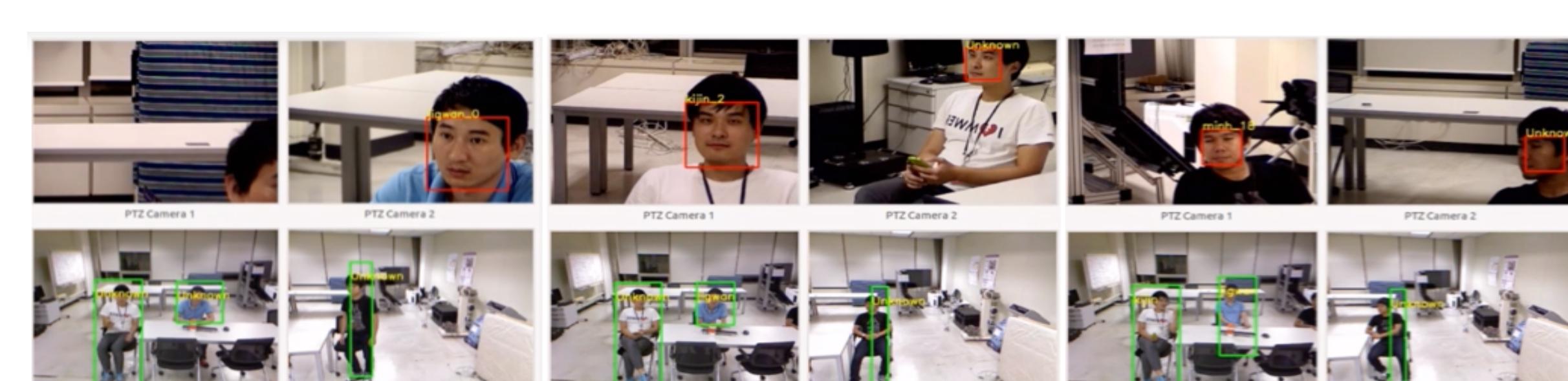
B. Experiment in the simulated environment

- PSN randomly selects the area around one of the detected humans and starts face recognition.
- Once PSN finds the face of the known person, it matches his/her ID to the detected person.



C. Experiment in the real environment

- We also developed an actual hardware system and confirmed the function of the proposed system.



CONCLUSIONS

- In this study, we have created a virtual environment that mimics the real world conditions.
- Proposed system can reliably detect multiple humans and assign their own identity by comparing recognized faces.
- This system can evaluate the various detection algorithms before applying them to the real situations.

ACKNOWLEDGMENT

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