

Document for IEC TC100 PT100-10, AGS

Overview of NPs Proposal on XR Systems

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* XR is a term which unifies augmented reality (AR), virtual reality (VR), mixed reality (MR), and so on.

1. Introduction

XR technology including AR, VR, MR is widely noticed not only for video game software, but also for business tools. It works in combination with hardware, software, and network as a system. Standards for XR systems are now necessary.

Standard Candidates for XR Systems:

1. System models include servers and terminals as TS
2. Specification and evaluation method for XR systems as IS
3. System interfaces between servers and terminals as IS
4. Energy efficiency evaluation method as IS
5. Input methods and user interface
6. Network security and requirements
7. System interfaces to external conventional servers
8. System interfaces between sensors and controllers
- ⋮

Details will be presented at IDW'17

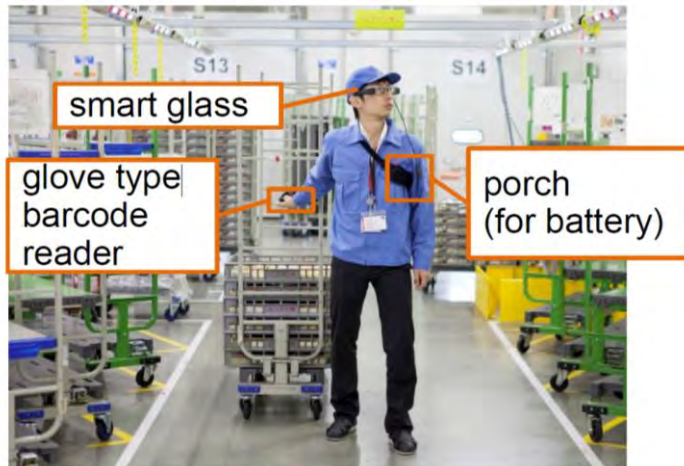
Today's Discussion

Details for some items will be presented at IDW'17 or SID'18

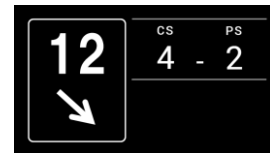
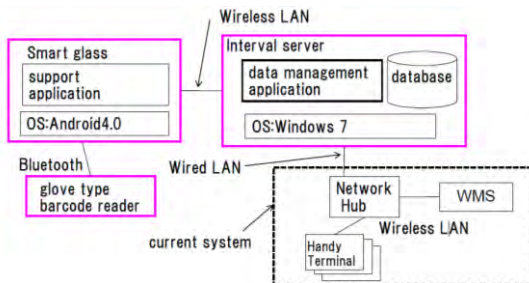
2. Background (1) AR System Examples

In last several years, work support systems using AR or VR wearable eye glasses, tablets, smart phones have been developed.

AR Assortment Work Support System in Logistics



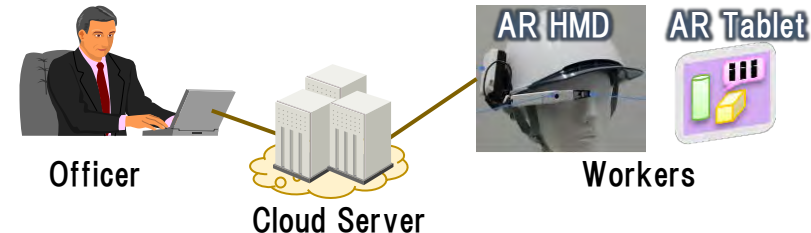
AR Inspection Work Support System



[Image on smart glass]
(Black is transparent)

Schematic Diagram of the System

Reference: "An Applied Method for Wearable Device with Assortment Work in Logistics", IDW 2015 (International Display Workshops)



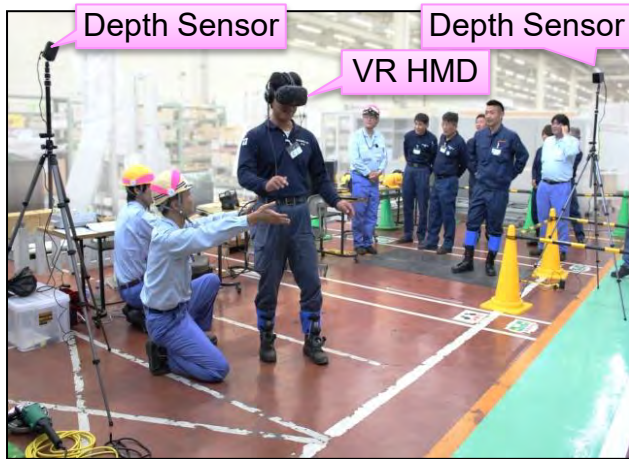
Schematic Diagram of the System

Reference: Press Release from Hitachi, LTD.,
<http://www.hitachi.co.jp/New/cnews/month/2015/09/0902b.html>

3. Background (2) VR Systems Examples

In last several years, work support systems using AR or VR wearable eye glasses, tablets, smart phones have been developed.

VR High-place Work Training System



Position of worker is detected by depth sensors

Reference: Homepage of Meidensha Corporation
http://www.meidensha.co.jp/products/plant/prod_01/prod_01_01/index.html#ancFree01

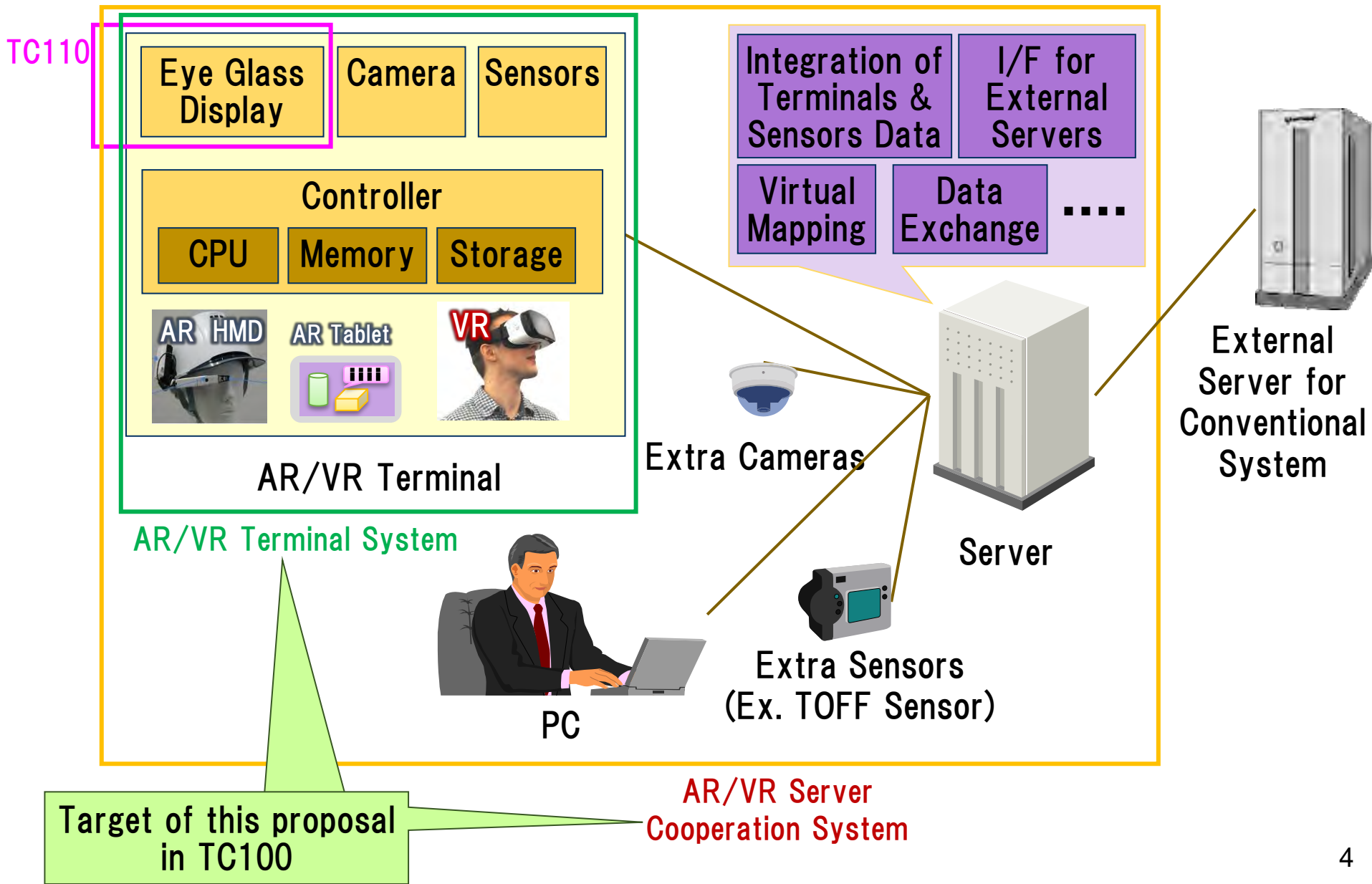
VR Construction Work Simulation System



Predicting Difficulties in Construction Work Place

Reference: Homepage of Hifumikitamichi Corporation
<http://www.hifukita.co.jp/company/index2.html#media>
(Japanese article only)

4. Target of This Proposal



5. First 3 Document Candidates and Purpose

First 3 Document Candidates to be discussed:

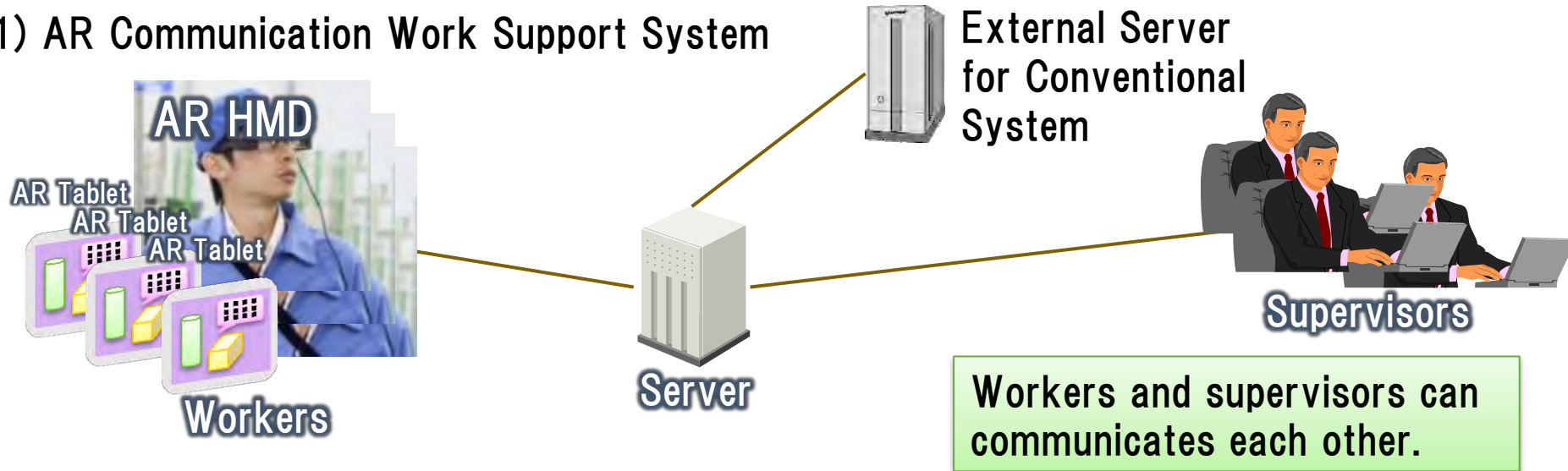
1. System models include servers and terminals as TS
2. Specification and evaluation method for XR systems as IS
3. System interfaces between servers and terminals as IS

Purpose:

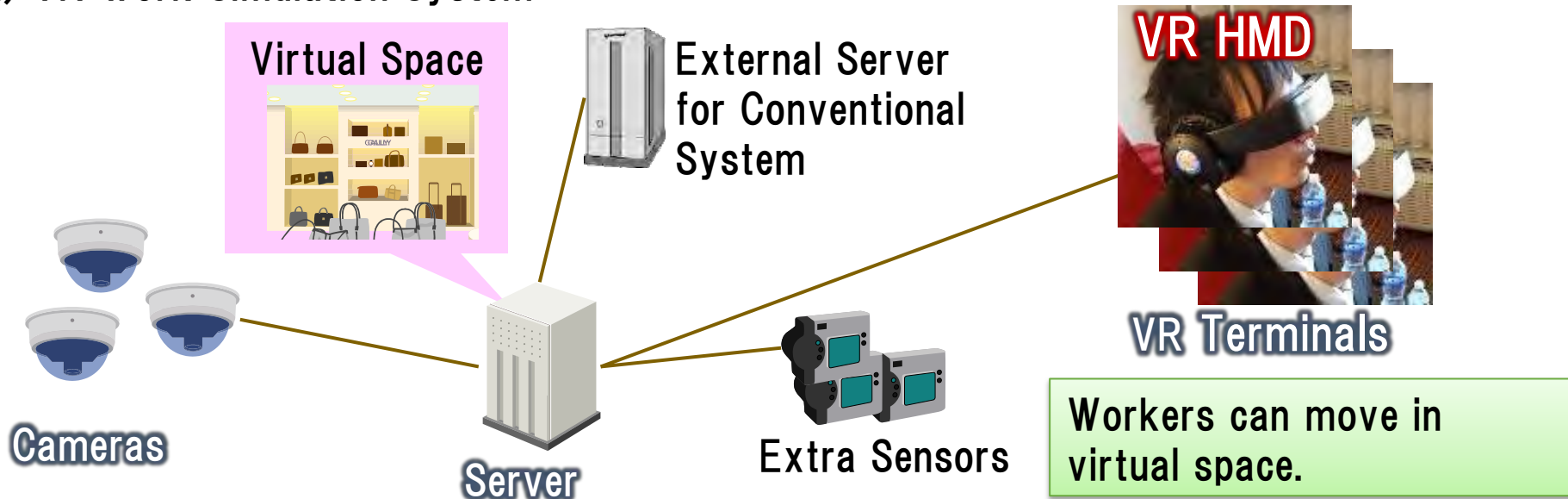
1. To share the image of whole system
2. To evaluate and compare the specification of XR systems
3. To make sure the interoperability between servers and terminals

6. Supposed Target Systems Architecture Examples

(1) AR Communication Work Support System



(2) VR Work Simulation System



7. XR Specification and Evaluation Method

Major Items	Minor Items	AR	VR
Delay Response	Time delay between sensing and displaying in a terminal.	✓	✓
	Time delay between servers and terminals.	✓	✓
Space Perception and Tracking	Tracking miss characteristic by long distance moving.	✓	✓
	Tracking miss characteristic by turn around.	✓	✓
	Space perception characteristic degradation by moving.	✓	✓
	Space perception characteristic dependency on luminance	✓	✓
Marker Recognition	Marker recognition characteristic dependency on distance and marker size.	✓	✓
	Marker recognition characteristic dependency on angular of marker.	✓	✓
	Marker recognition characteristic dependency on view field.	✓	✓
	Marker recognition characteristic dependency on luminance	✓	✓

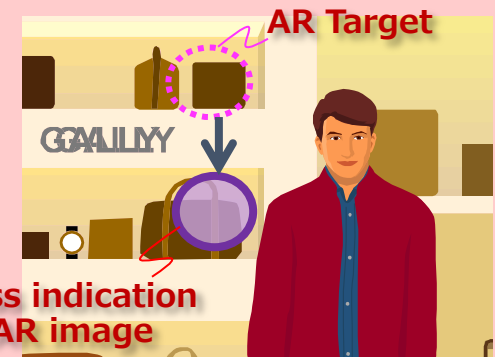
8. What is Delay Response in a Terminal

Time delay between sensing and displaying in a terminal.

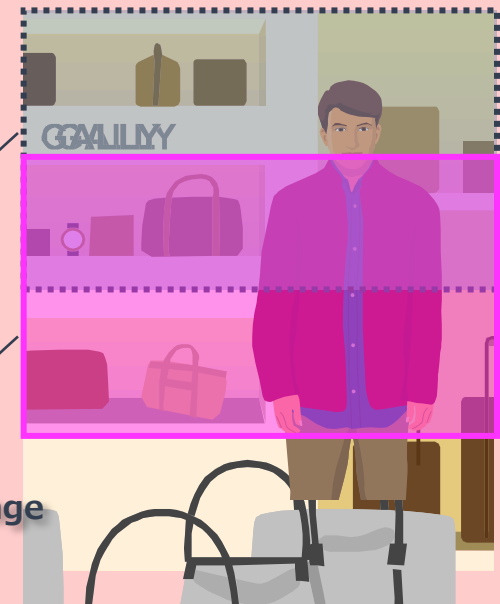


Related Parameters:

- Kinds of glasses model
- AR engine which enable to perceive space around user.
- Display conditions. Ex. definition, frame rate, and so on.



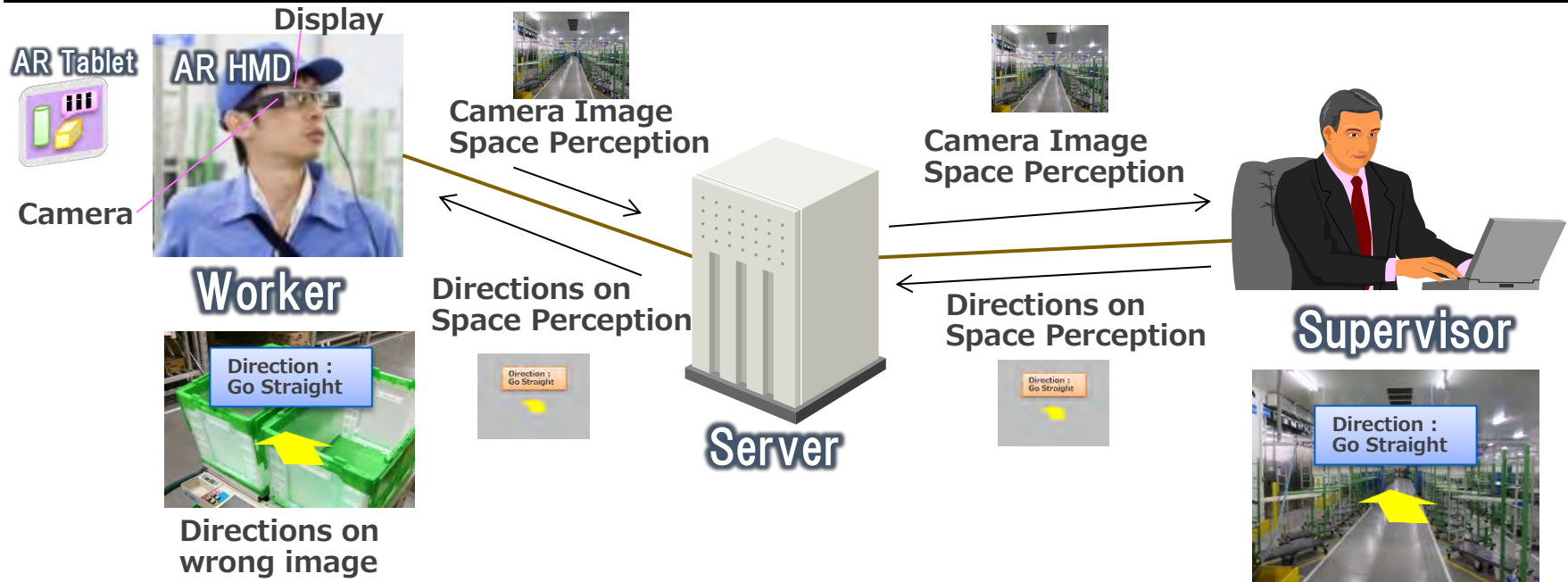
Ideal VR image
based on users
head position



Delayed VR image

9. What is Delay between Servers and Terminals (1)

Example : Delay Response between AR terminal and PC



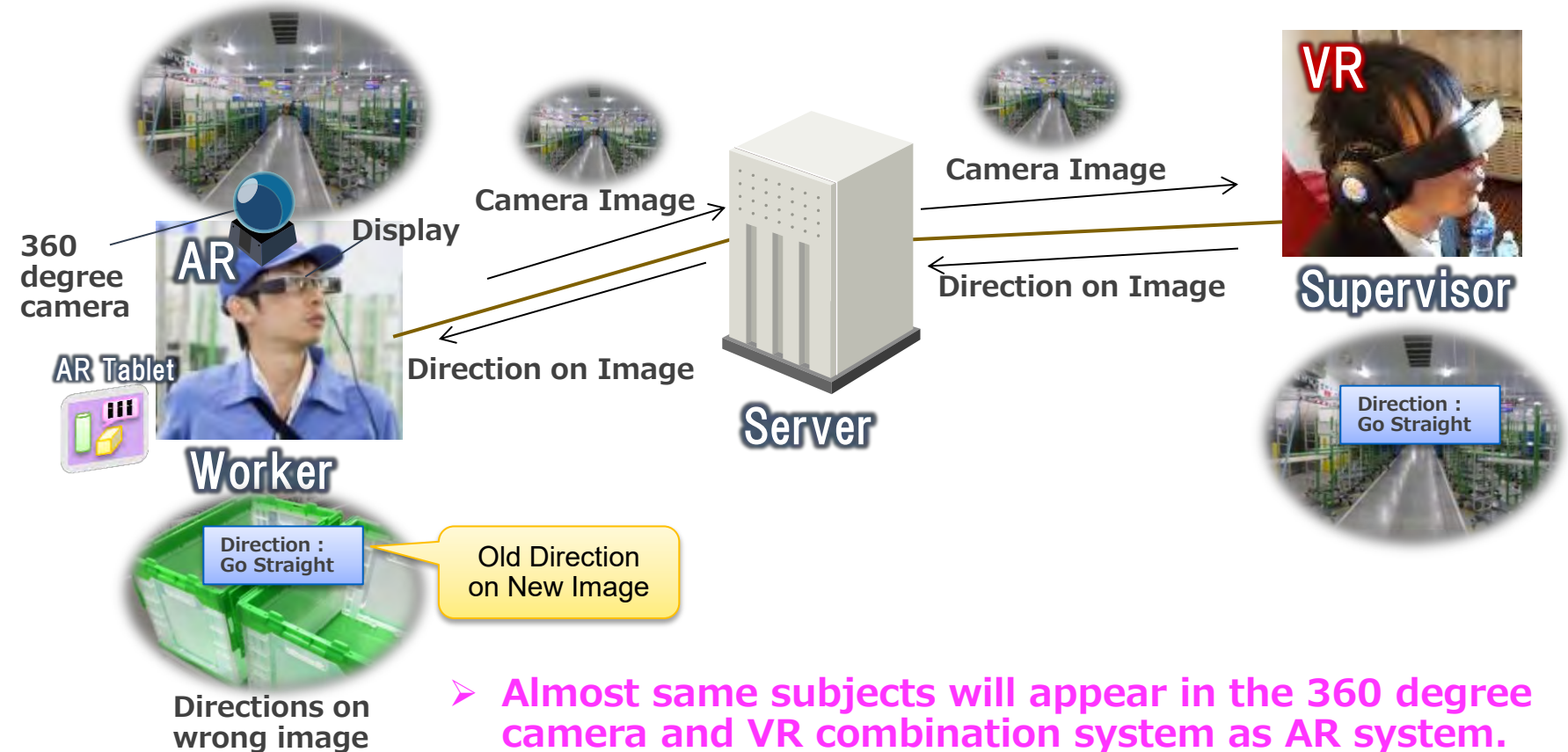
- If the time delay is large, the worker cannot receive accurate directions. In some cases, it cause dangerous situation for workers.
- It also suggests the necessity of communication data standardization.

Related Parameters:

- Kinds of glasses model
- AR engine which enable to perceive space around user.
- Communication Protocol and data semantic
- Display conditions. Ex. definition, frame rate, and so on.

10. What is Delay between Servers and Terminals (2)

Example : Delay Response between camera and VR terminal

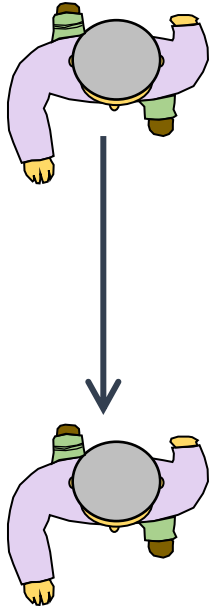


Related Parameters :

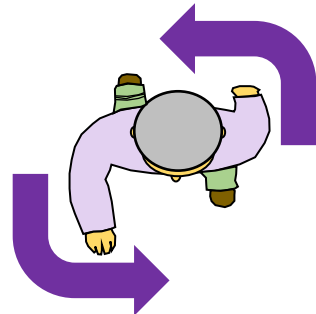
- Kinds of glasses model AR and VR
- Communication Protocol and data semantic
- Display conditions. Ex. definition, frame rate, and so on.

11. What is Space Perception and Tracking Specification

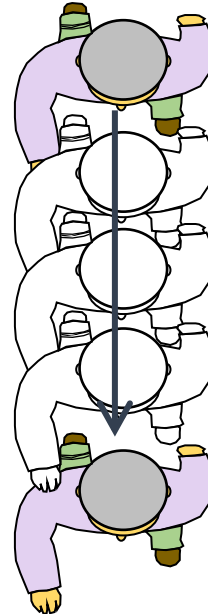
Tracking ability for moving distance, turning around, or moving speed



Tracking ability depending on long distance moving



Tracking ability depending on turning around



Tracking ability depending on moving speed



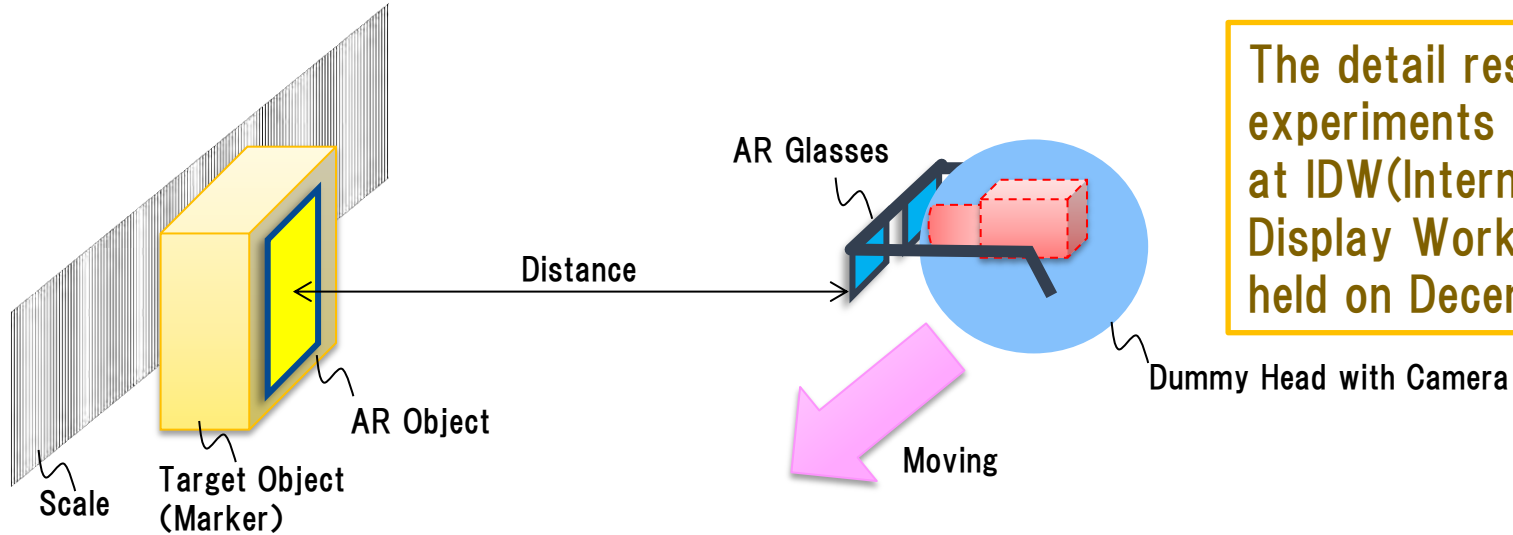
Tracking ability depending on luminance

Related Parameters :

- Kinds of glasses model AR and VR
- Space perception engine
- Moving distance, turning speed, and moving speed
- Luminance
- Display conditions. Ex. definition, frame rate, and so on

12. Experimental Result Examples of Delay Specification

Purpose: To evaluate time delay between sensing and displaying in a terminal.



The detail results and experiments will be shown at IDW(International Display Workshop) 2017 held on December.

Results:

Conditions		Delay time Result	
Distance	Moving Speed	System A (AR Glasses of A company with C company AR software engine)	System B (AR Glasses of B company included AR Engine)
1 m	10 cm/s	6 frame	Less than 1frame
	20 cm/s	6 frame	1frame
	30 cm/s	7 frame	1frame
2 m	10 cm/s	6 frame	Less than 1frame
	20 cm/s	6 frame	1frame
	30 cm/s	8 frame	2frame
3 m	10 cm/s	8 frame	Less than 1frame
	20 cm/s	8 frame	1frame
	30 cm/s	8 frame	2frame

Delay characteristic dependency on systems is significant.



It's helpful for users to regulate evaluation method and to show specification.

* 1 frame = 33.3 ms

3 new documents are proposed to be discussed.

- 1. System models include servers and terminals as TS.**
- 2. Specification and evaluation method for XR systems as IS.**
- 3. System interfaces between servers and terminals as IS.**

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