



Immersive Live Experience

- A future prospect of live viewing -

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What is Immersive Live Experience (ILE)?

Limitation of conventional TV



Real things are full of experiences that conventional TV can't broadcast

- The real size of things
- View from left, right and behind



What we're aiming at by

Immersive Live Experience



Feel the real size



What we're aiming at by

Immersive Live Experience



See from behind



What we're aiming at by

Immersive Live Experience



Speed,
height,
sound,
temperature,

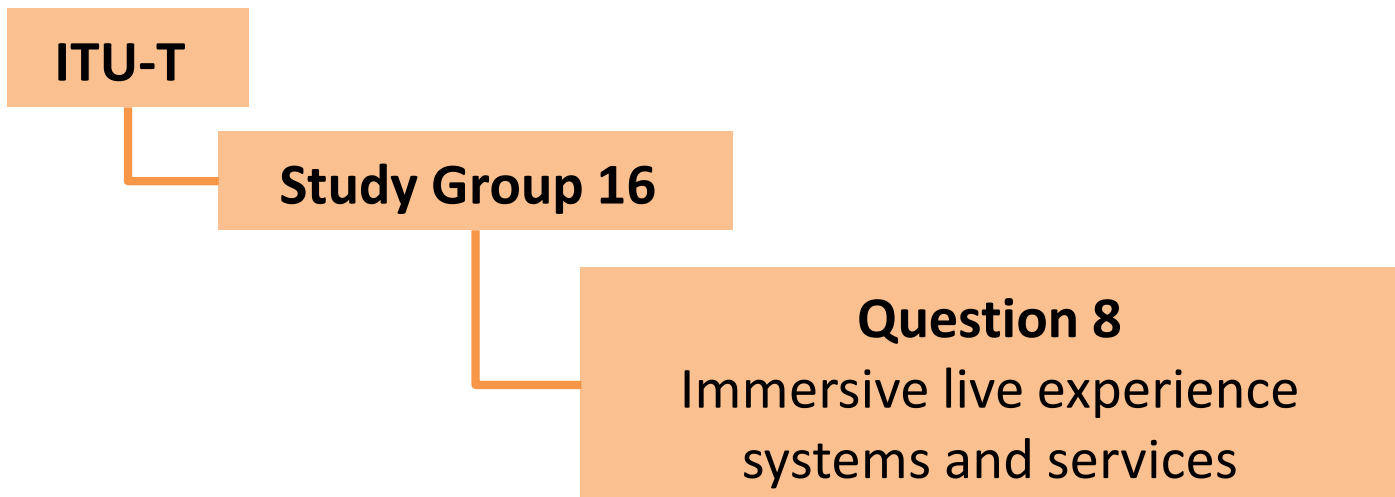
....,

Deliver
the entire
atmosphere!



ILE Standardization Activities

- Started from September 2016
 - Management
 - Rapporteur: Hideo IMANAKA (NTT)
 - Associate rapporteur: Hoerim CHOI (KT)
 - Meetings: 9 times
 - 3 Workshops on ILE (MPEG, EBU, DVB, etc)



Current Q8/16 (ILE) work



- Work items of Q8/16

- Published ITU-T Recommendation related to ILE
 - H.430.1: high-level requirements of ILE
 - H.430.2: functional framework of ILE
 - H.430.3: service scenario of ILE, including use cases

- Current work items

- H.ILE-MMT:
MMT profiles for ILE services
- H.ILE-PE:
Presentation environment for ILE services



Immersive Live Experience Use Cases

Live Sports Scenario

Sports continue to sustain popularity among other contents and present a great opportunity to harness technologies available to further enhance the experience for spectators

Entertainment Scenario

Music concerts or theatrical plays require live experience on stage where actors perform to appeal to their audiences and there are ways to reproduce the similar or better experience without actors on stage

Telepresence Scenario

Figure, either a person or an object, could be transported in real time to remote places as a whole for informative purposes.



Categorization for use cases of Immersive Live Experience is not limited to above scenarios and more classification should be further studied.

Requirements(H.430.1)

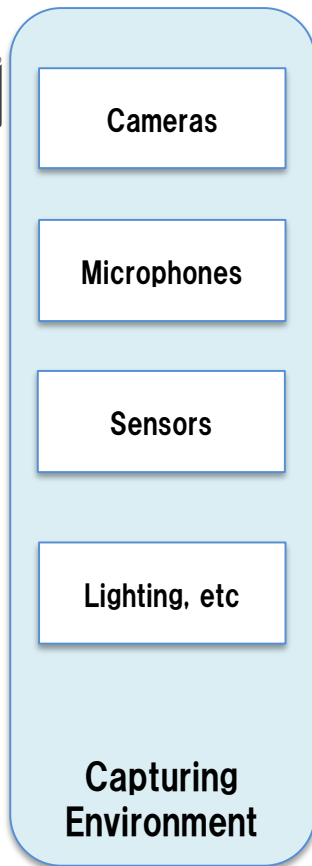
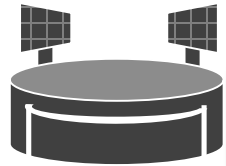


No	Mandatory	High level requirements	Places
1	Recommend	Display real sized objects on various terminals	Viewing sites
2	Require	Reproduce sound direction	Viewing sites
3	Recommend	Reconstruct suitable atmosphere by SE	Viewing sites
4	Require	Reconstruct spatial environment	Viewing sites
5	Require	Synchronous media representation	Viewing sites
6	Option	Augmented information attachment	Viewing sites
7	Require	Extract object information	Source site
8	Recommend	Capture spatial information	Source site
9	Require	Synchronous media transport	Transport
10	Option	Store synchronous data	Application
11	Require	Media processing for reconstruction virtual field	Application
12	Recommend	Auditory lateralization	Viewing sites
13	Option	Video stitching	Viewing sites

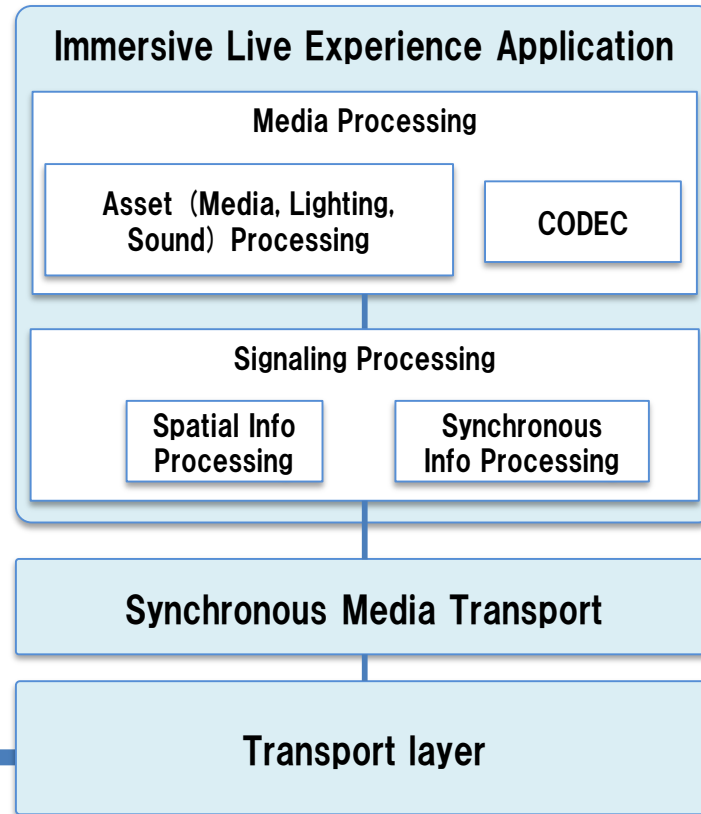
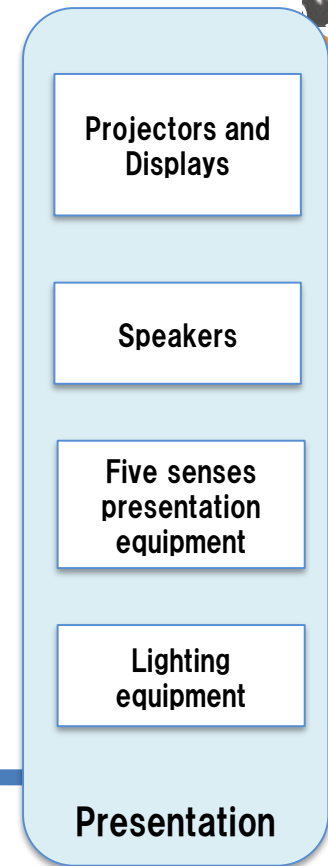
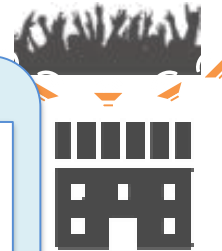
Architectural Framework(H.430.2)



Source Sites (Stadiums, Halls, etc)



Viewing Sites (Halls, Theaters, etc)



An implementation of ILE



NTT's technology suite to realize ILE

Current development and NTT's ILE technology suite Kirari!

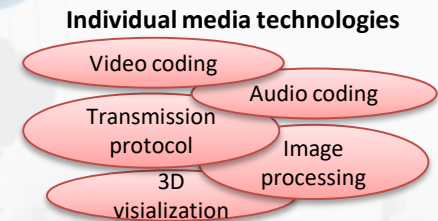


◆ In 2020:

- People will “share the excitement” by watching TV, or large public screens
- High picture quality and resolution (4K/8K) will be taken for granted

◆ NTT has been contributing to:

- Video codec technologies (MPEG2, H.264, and HEVC)
- Audio technologies (MPEG4-ALS, surround audio, ...)
- Multimedia technologies (recognitions, synthesis, ...)



For new experience and more excitement,

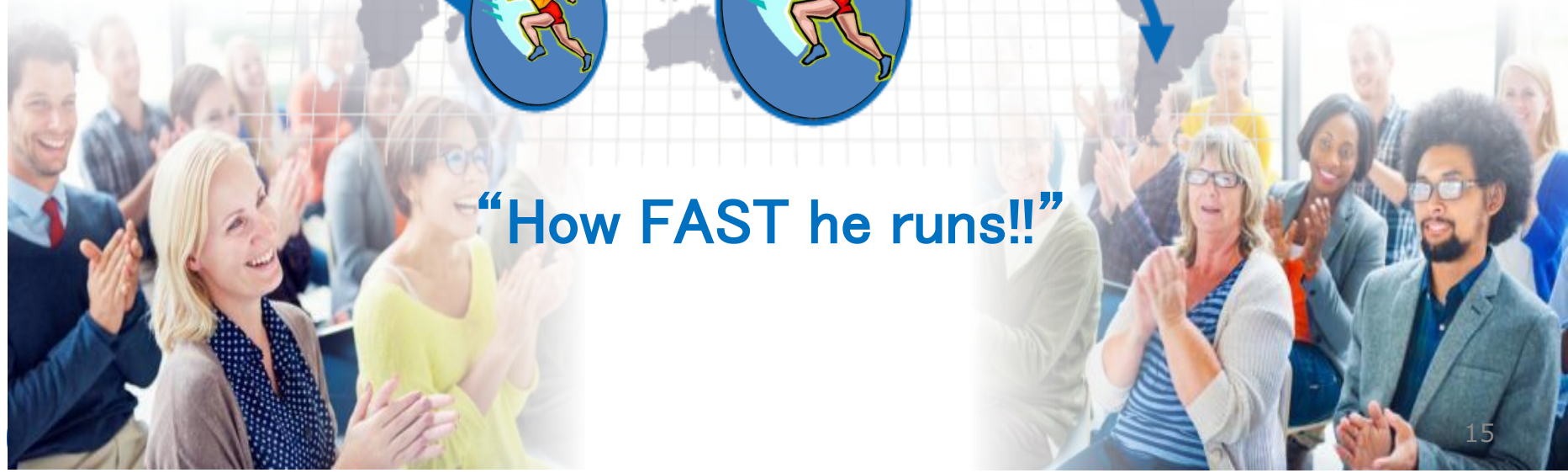
Kirari! delivers “ the entire event space to remote location in real-time”.

Feel it as if you're there, wherever it's happening



*“Kirari!” - Japanese word
“Sparkling”, “Twinkling”
--Brighten your eyes!*

Wherever it's happening



“How FAST he runs!!”

Kirari! application fields



◆ Wide application fields from sports viewing to entertainment stages

For show-biz



Music concert

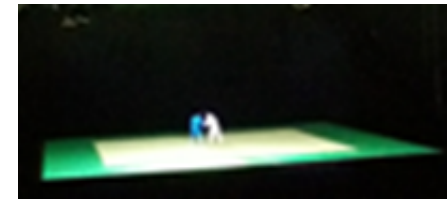


Stage performance

For sports



Public viewing of field sports (soccer, baseball, etc.)



Public viewing of arena sports (Judo, Karate, etc.)

For enterprise



Remote seminar or conference



Remote reception or consultation

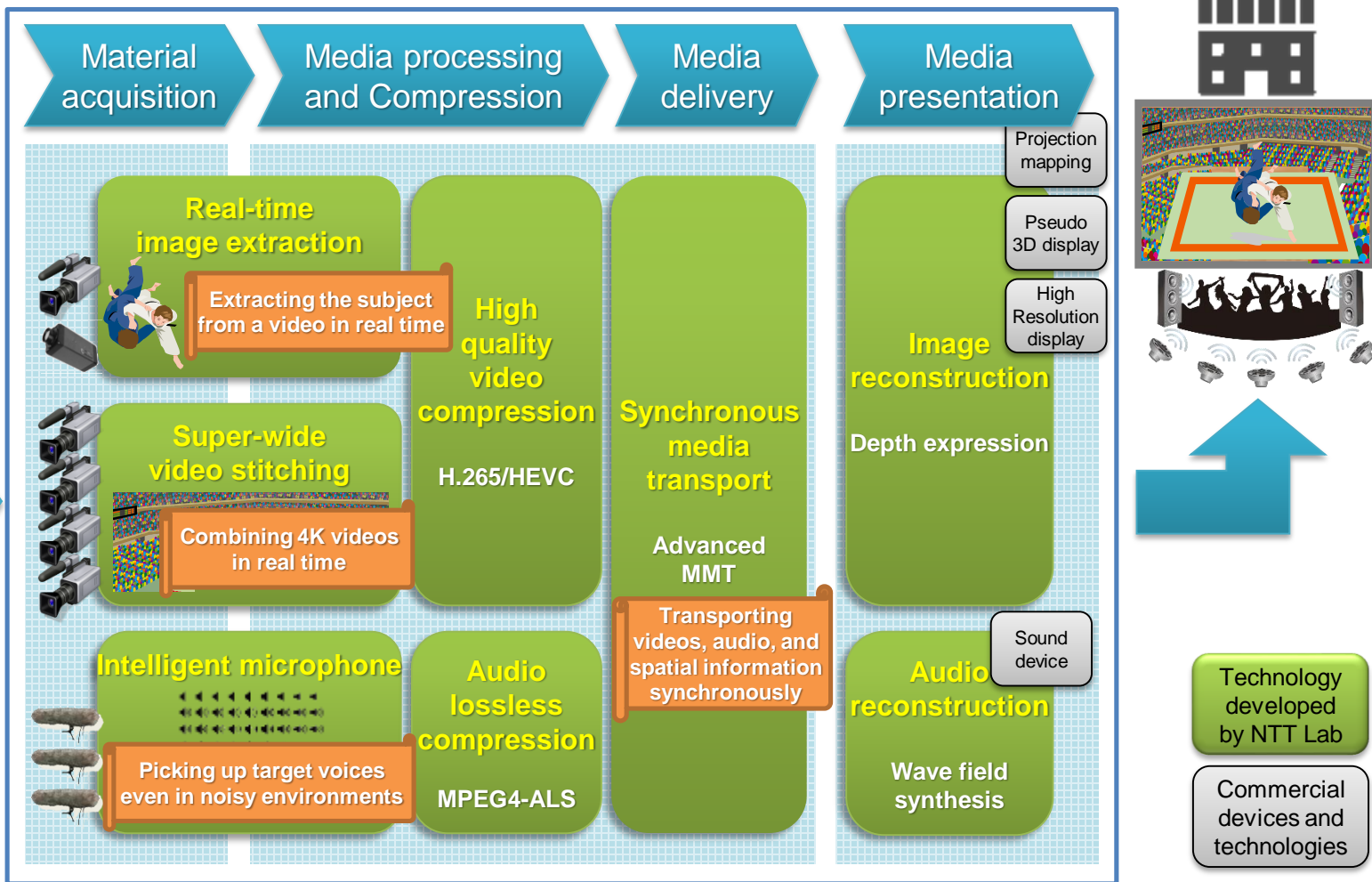
Kirari! Technology Suite



A stadium

Real-time streaming of an environment information at a stadium to a remote venue

A remote venue



Kirari! Technology Suite



A stadium



Real-time streaming of ~~... information~~
at a stadium



AI-based real-time image extraction



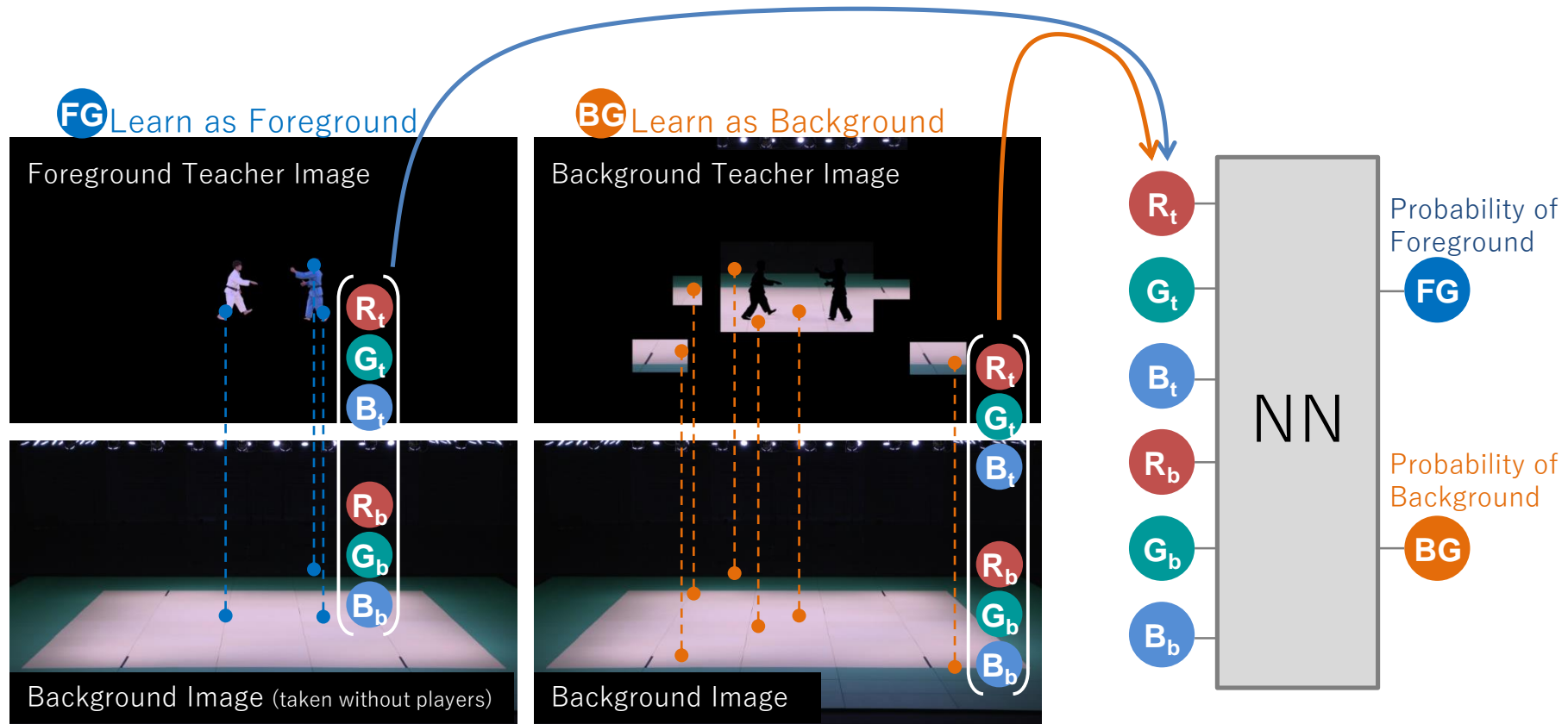
Background / foreground classification by AI (artificial intelligence)



technologies

AI-based real-time image extraction

Learn the color pairs (6-D) of foreground and background by neural network (NN)



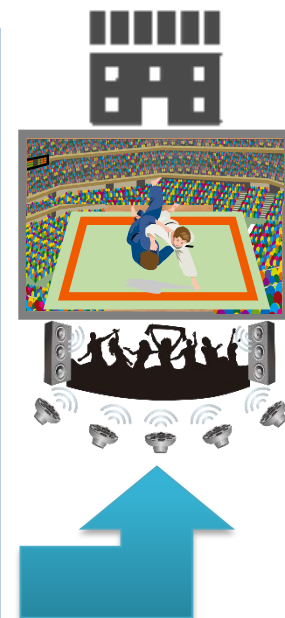
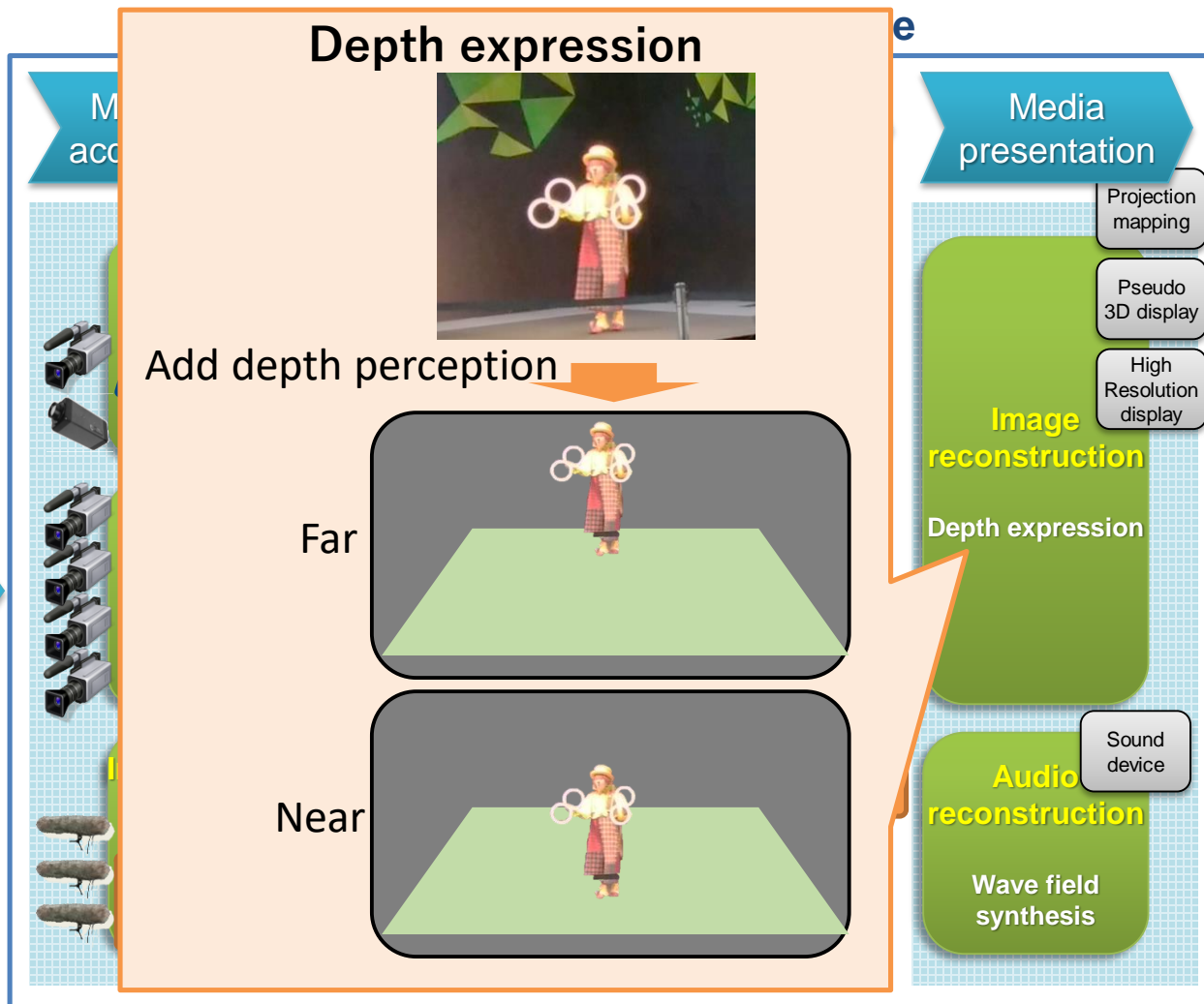
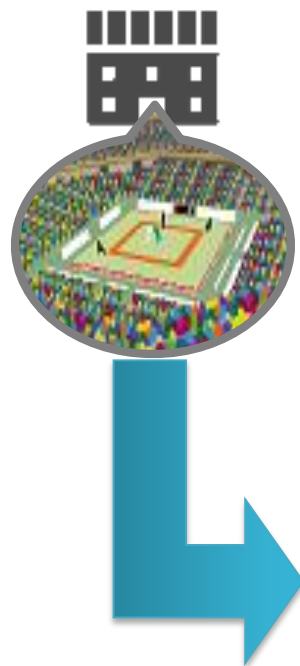
Kirari! Technology Suite



A stadium

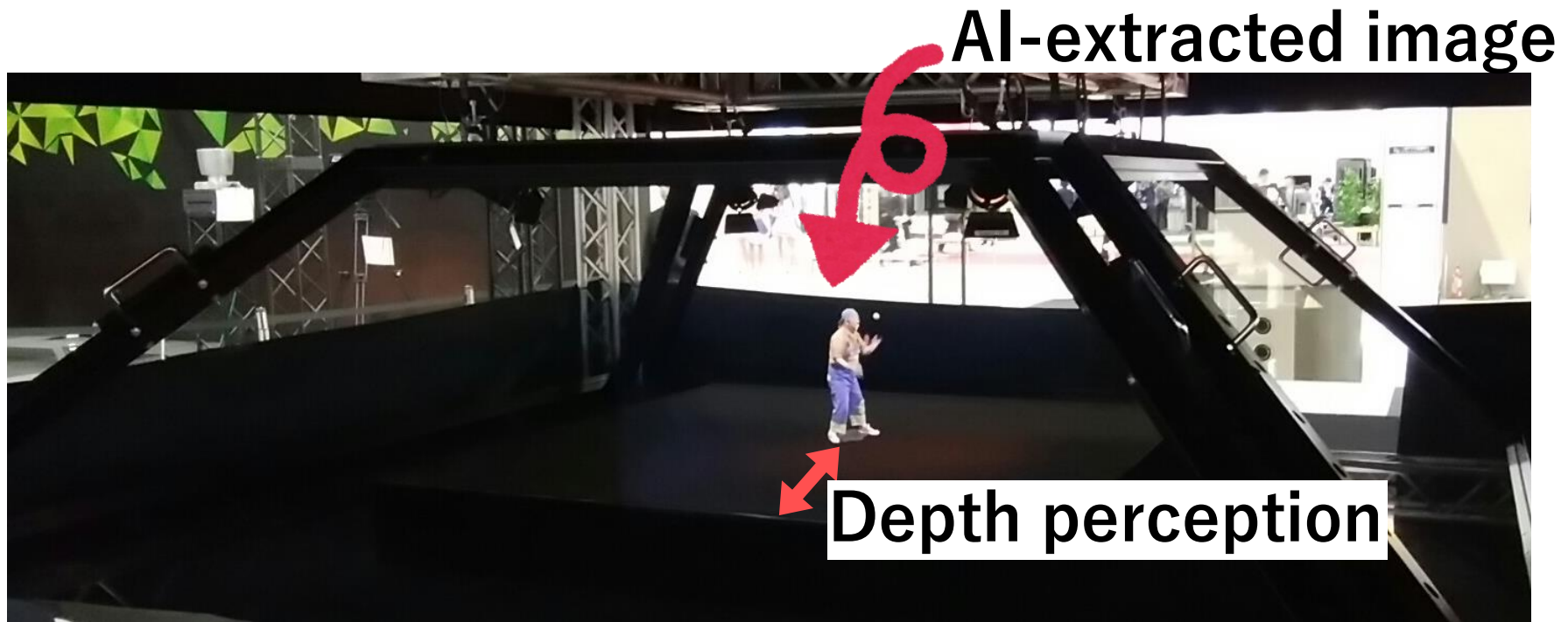
Real-time streaming of an environment information

A remote venue



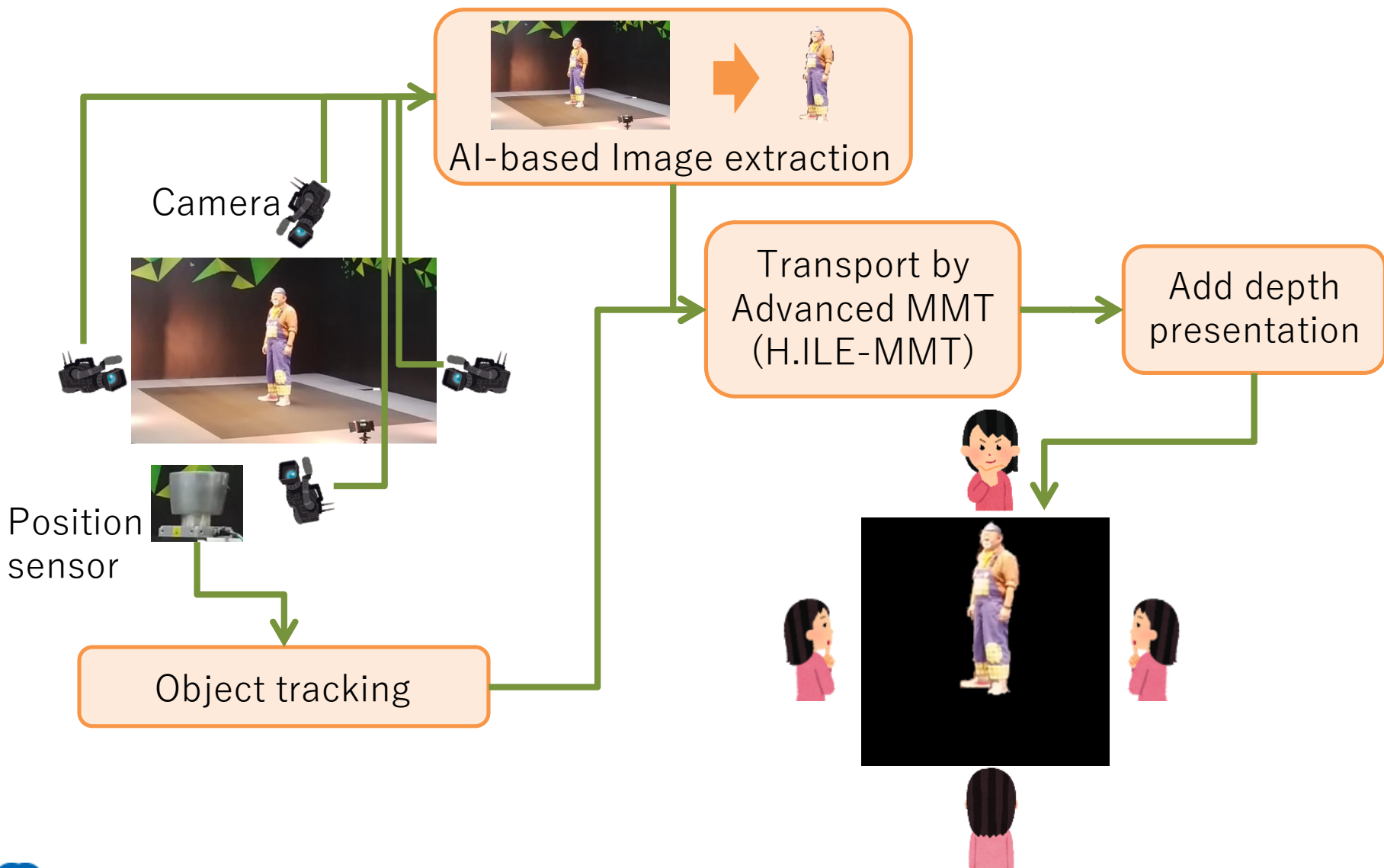
Technology developed by NTT Lab

Commercial devices and technologies



- Aerial image by Pepper's ghost
- Views from 4 directions (front, rear, left, right)
- Real-time
- Depth perception

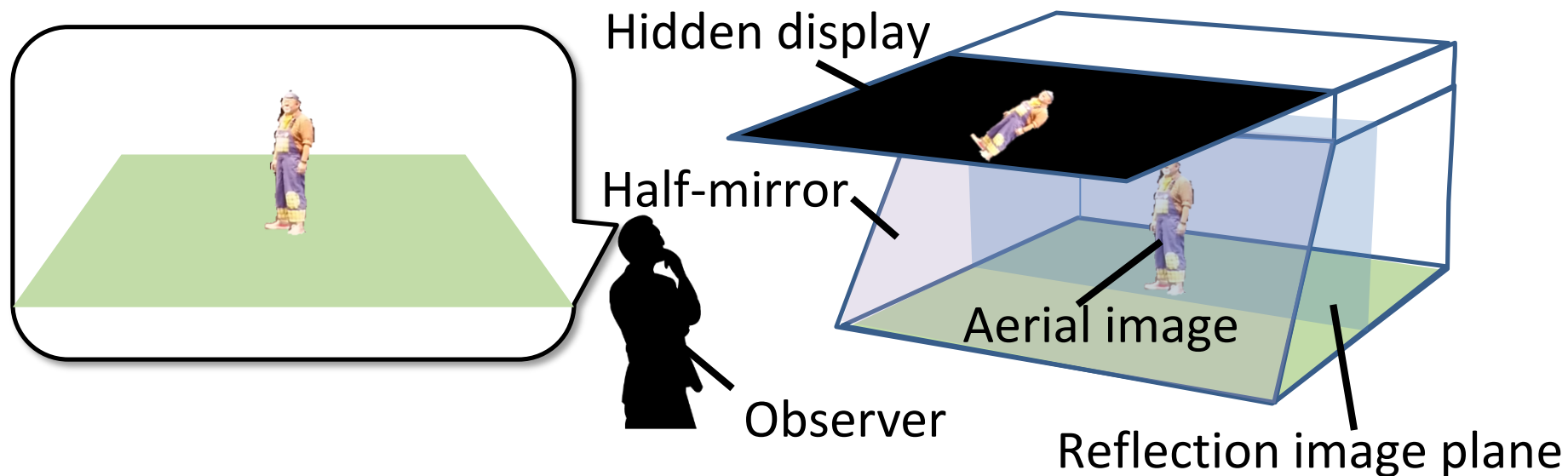
Kirari! for Arena system configuration



Areal image display



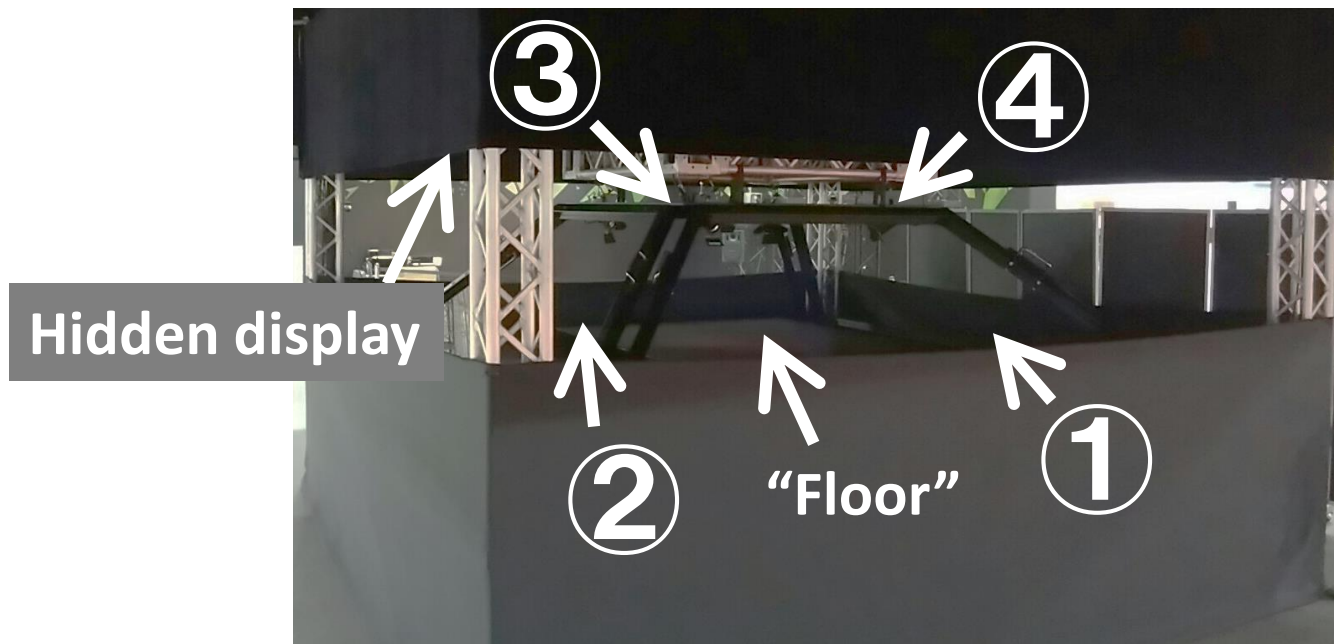
- Use “Pepper’s Ghost” to show aerial image
 - Hidden display shows the image of the performer
 - Tilted half-mirror reflects the image
 - Observer sees the reflection as the aerial image



4-directional display



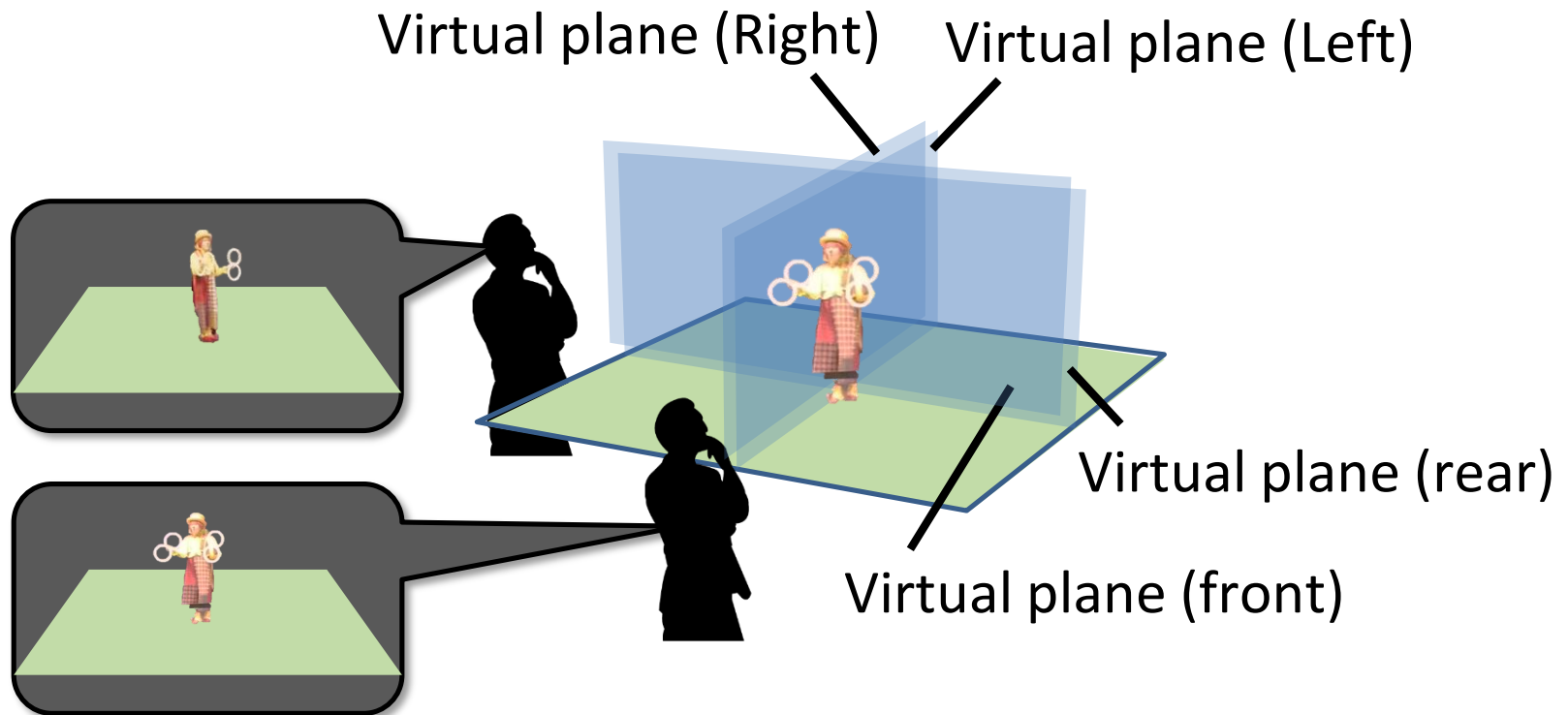
- 4 Tilted half-mirrors to form a pyramid
- Hidden displays above the half-mirrors
- Place a stage inside the pyramid as a “floor”



Alignment of virtual image planes



- Locate 4 planes to cross at the center
- Performer looks as if he stands at the center from all directions



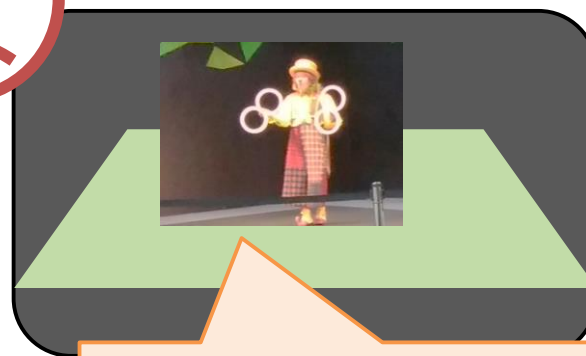
- With background, it doesn't look “as if it's there”
 - It looks like “a 2D image plane is there”



Extracted image



With background



Doesn't look “as if it's there”

Fine and **real-time** extraction is essential

Future prospects

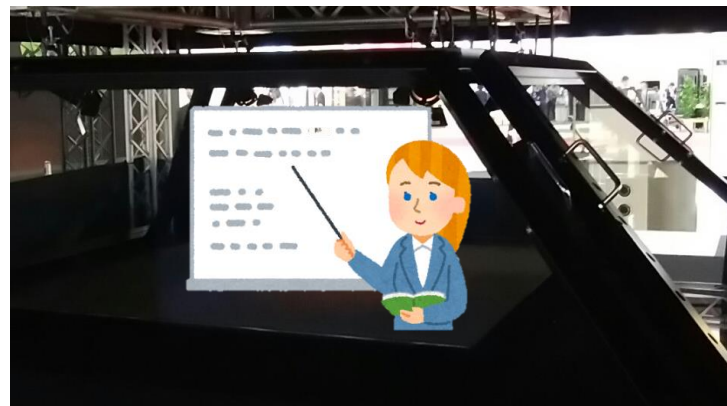
Future developments of Kirari! for Arena



Remote surgery



Education



Adult Care Services



Future of media with ILE



- Transport the whole environment
- More than the whole, more than real



- Enhance your ways to enjoy sports and entertainment
- Create unprecedented services and businesses

Q8/16 standardization work plan



- 1 draft Recommendation; H.ILE-MMT, planned to be consented in this SG16 meeting
- Continue work on reference models of presentation environment, including 3D projection, auditory lateralization, interfaces, etc., for ILE
- 4th Mini-workshop on ILE
- Further collaboration with MPEG, DVB, EBU, and other standard development organizations
- Further relation with stakeholders, such as broadcasters, event promoters and telecom operators



Thank you for your kind attention

