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# Information Model for LAE in MAR

ISO/IEC JTC1 SC24 Plenary Meeting

7-11 August, 2017

Kwan-Hee Yoo

Chungbuk National University



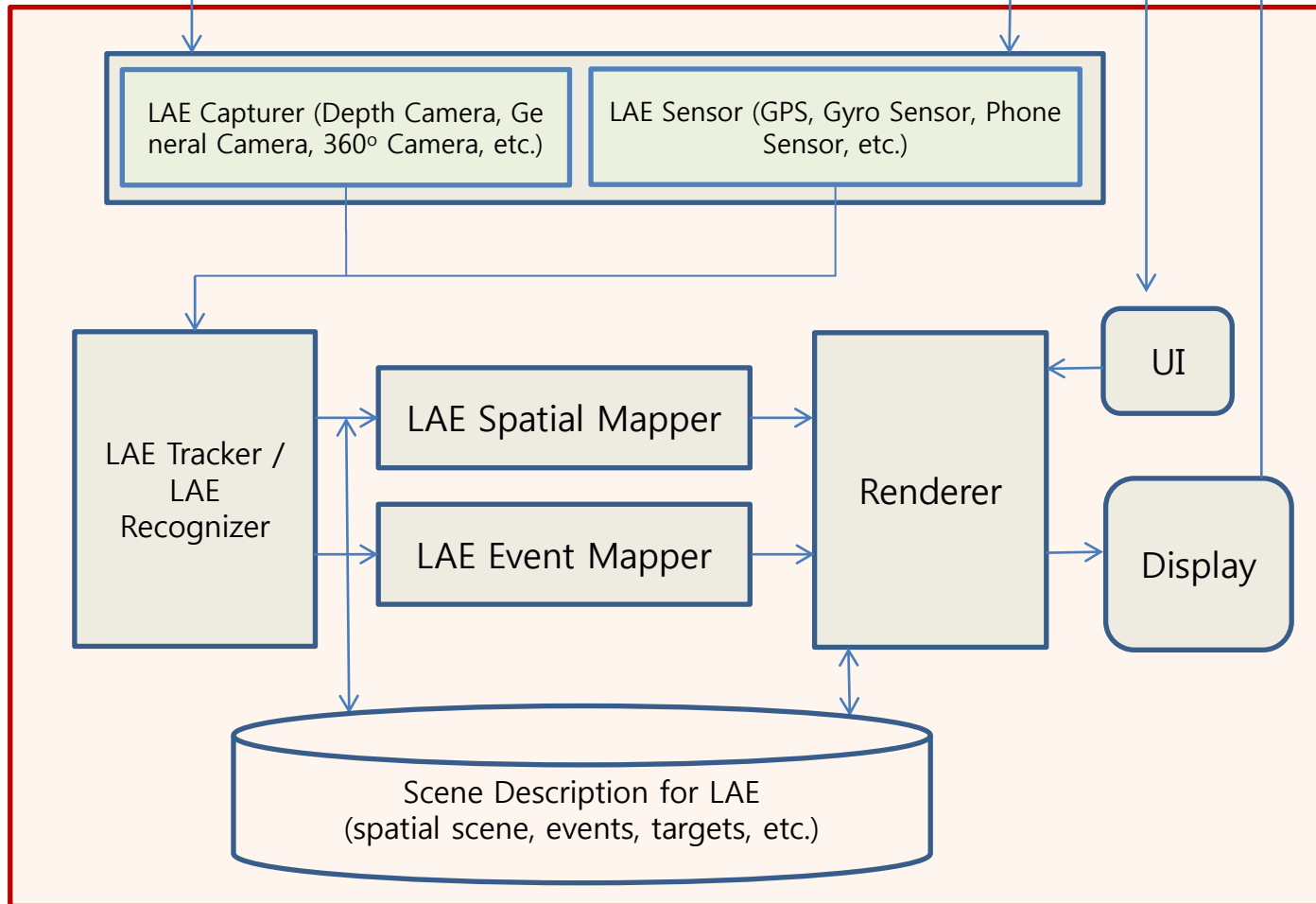
Physical world



MAR world



User



# Live Actor and Entity in a MAR world



An LAE integrated in a 2D video virtual world after Chromakeying



LAEs integrated into a 3D virtual world after Chromakeying

# Live Actor and Entity in a MAR world



(c) An LAE interact with virtual object in a 3D virtual world after Chromakeying



(d) Virtual representation of a LAE in MAR world as a 3D full virtual object

# Live Actor and Entity in a MAR world



A virtual LAE restricted to and communicating in a MAR world[Microsoft Holoportation ]



[Mingsong Dou, etc, Fusion4D, 2016]

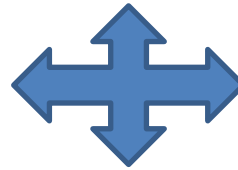
# Characteristics of a LAE representation in MAR world

## LAE

- 2D Chromakeying
- 3D full model
- Virtual Actor and Entity
- Virtual Actor and Entity (H-Anim)

## Environment

- 2D Image
- VR Environment  
(360 VR, Full 3D virtual space)



Spatial Mapping  
Event Mapping



MAR scene description for controlling a LAE

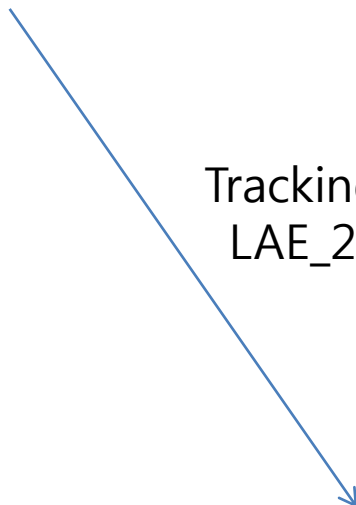




Tracking  
LAE\_1



Tracking  
LAE\_2



(non)Chromakeying

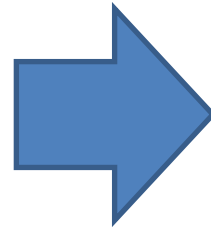




Fusion4D



Full 3D Model



## Fusion4D Another Example

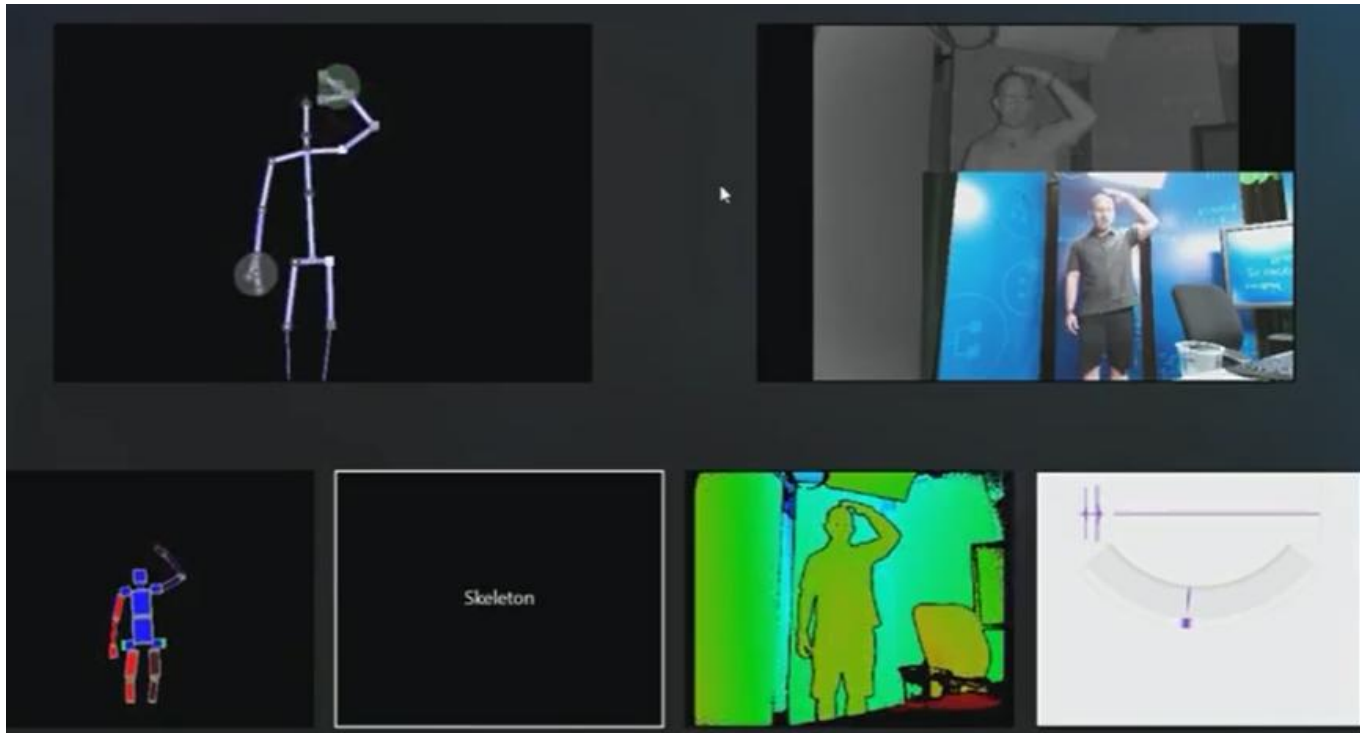


## Fusion4D Another Example





# Skeleton based LAE representation by Kinect



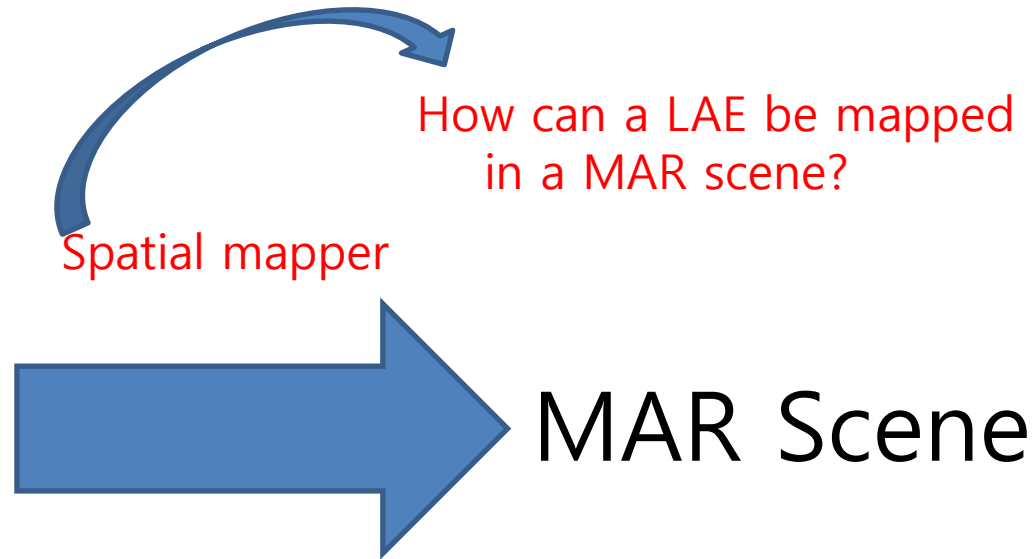
# LAE Representation

## Model

- 2D Image (Chromakeying)
- Full 3D models
- Skeleton Model (with Skin)

## Property

- Physical world Information
- Position
- Orientation
- Scale
- Behavior (Walking, Running, etc)



# LAE Modeling

- ✓ 2D Image with/without Chromakeying
- ✓ 3D full model with real texture image
- ✓ Virtual Actor and Entity
- ✓ Virtual Actor and Entity (H-Anim)

*LAE\_2D* {

....  
}

*LAE\_3D* {

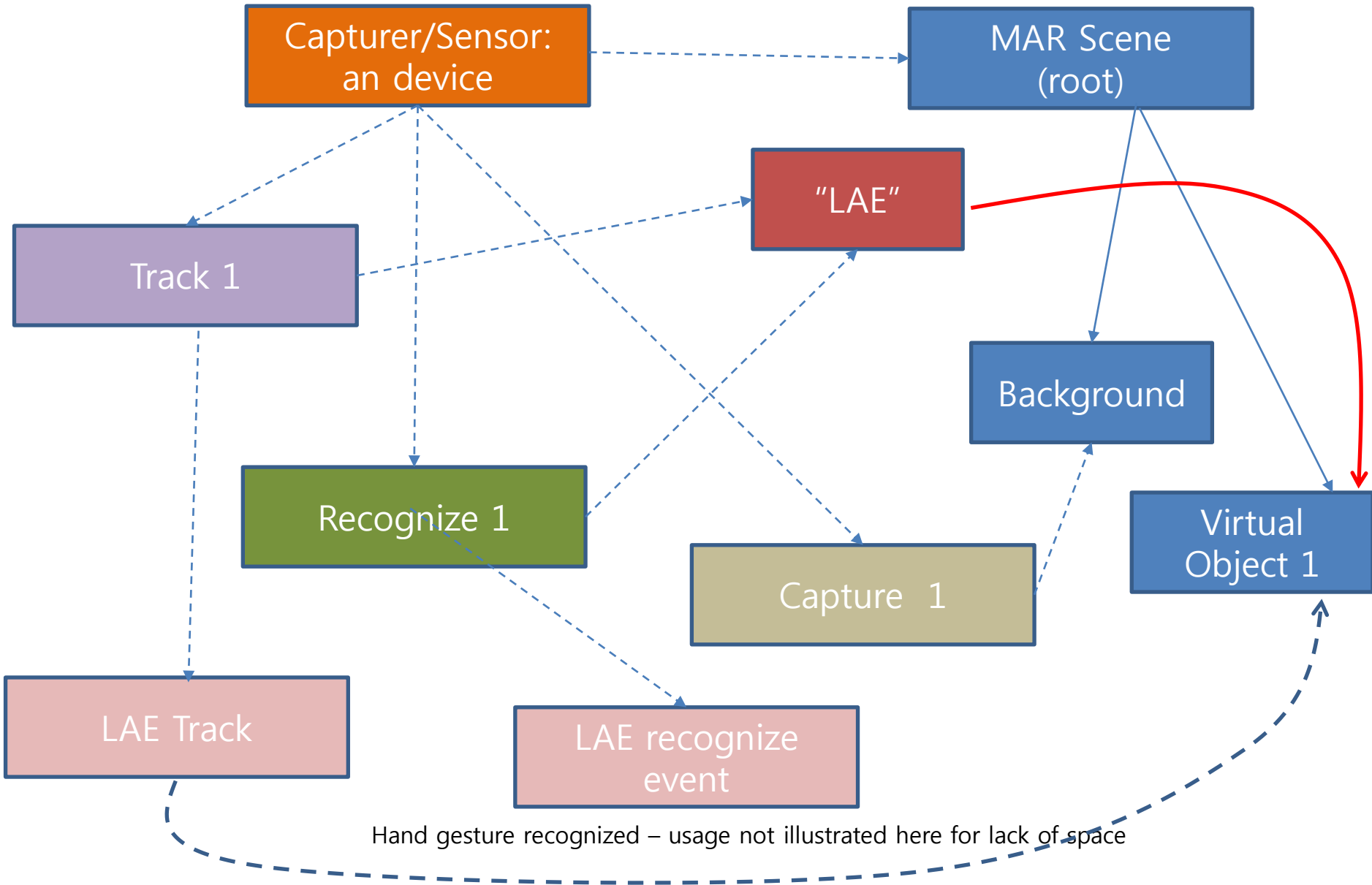
....  
}

*LAE\_VAE* {

....  
}

*LAE\_VAE* {

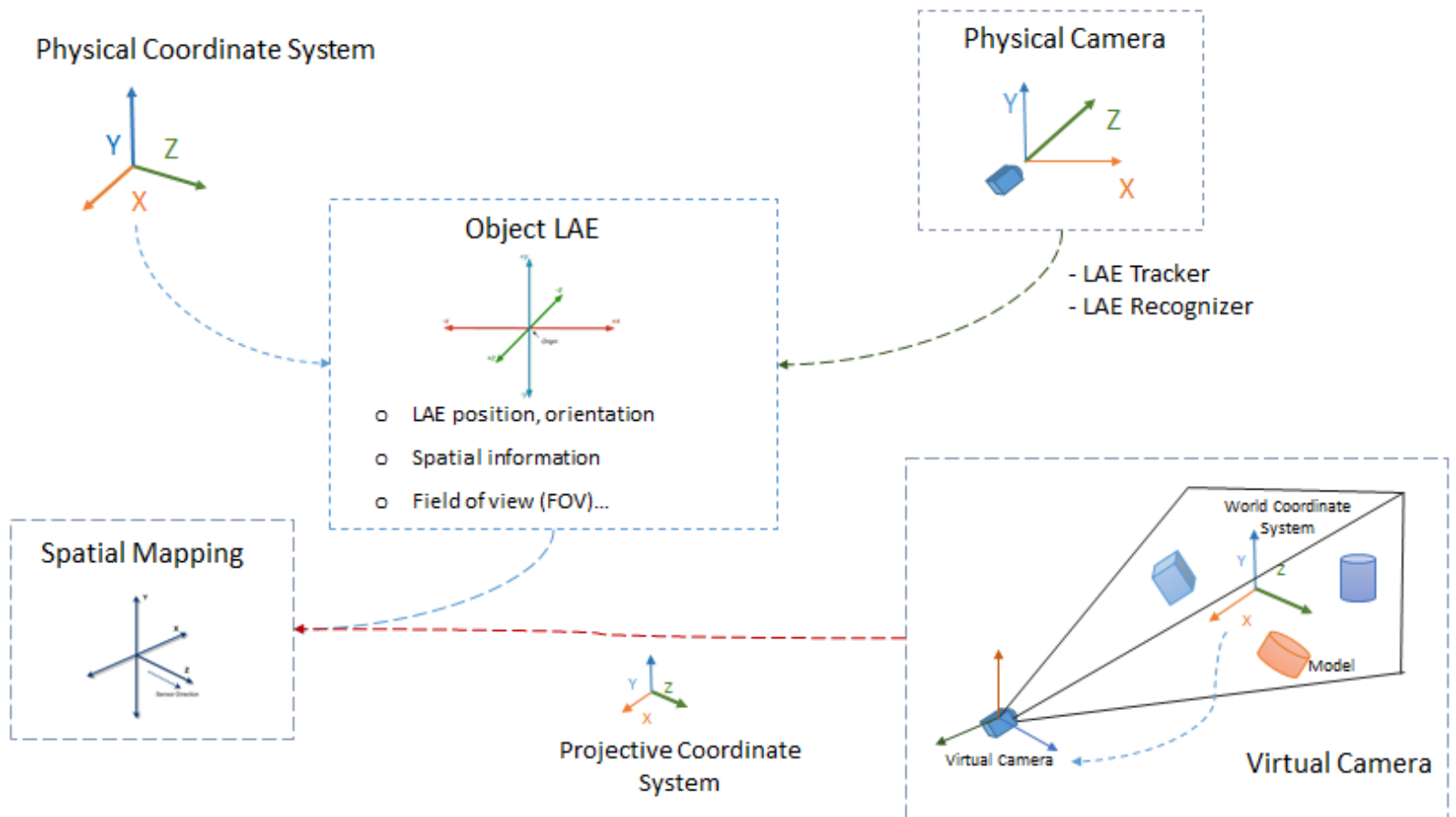
....  
}





# Coordinate System

- The coordinate system of a LAE starts from a model coordinate system that gets transformed into a world coordinate system, then into a virtual camera coordinate system, and finally into a projection coordinate system.



# LAE Events

















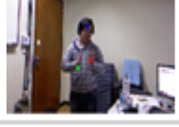


Virtual DDR dancing



Dodging a piece of wood



Crossing a balance beam

Initial state	LAE gestures	Left hand	Right hand	Callback functions	
			-	<b>Left (Rotation)</b> Move the camera in positive direction of axis Y based on 3D model	
		-		<b>Right (Rotation)</b> Move the camera in negative direction of axis Y based on 3D model	
			-		<b>Up (Rotation)</b> Move the camera in positive direction of axis X based on 3D model
			-		<b>Down (Rotation)</b> Move the camera in positive direction of axis X based on 3D model
					<b>Zoom In (Scaling)</b> Decrease distance between a camera position and the center of 3D model
					<b>Zoom Out (Scaling)</b> Increase distance between a camera position and the center of 3D model

# LAE Representation

## Model

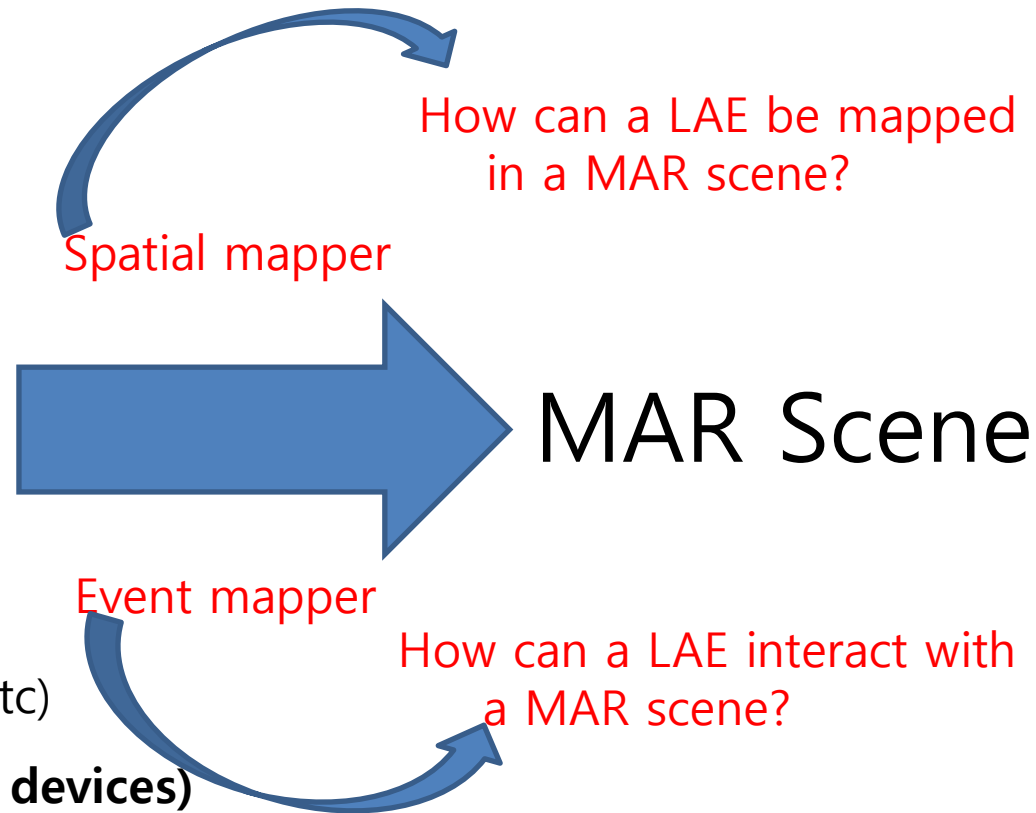
- 2D Image (Chromakeying)
- Full 3D models
- Skeleton Model (with Skin)

## Property

- Physical world Information
- Position
- Orientation
- Scale
- Behavior (Walking, Running, etc)

## Events (him/herself + handheld devices)

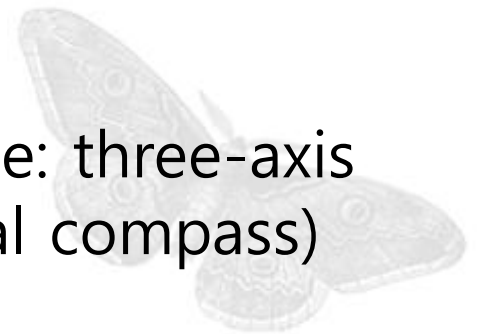
- Gesture
- Voice

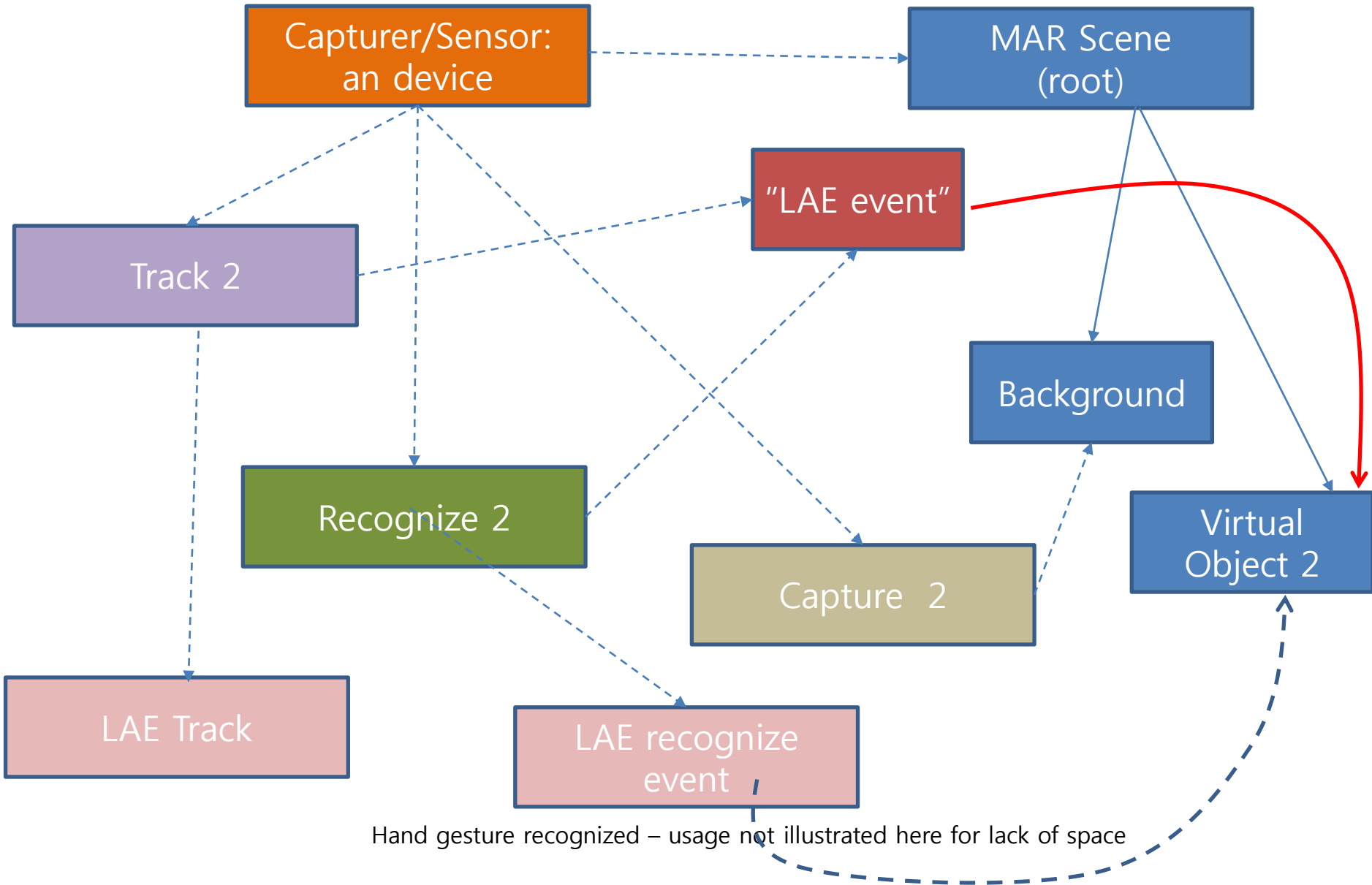


## Interaction of LAE and MAR scene

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- Interaction of LAE itself (LAE Capturer)
  - ✓ Gestures – hands, fingers, head, body
  - ✓ Facial expressions
  - ✓ Speech and voice
- Interaction of LAE held devices (LAE Sensor)
  - ✓ AR marker
  - ✓ Global Positioning System (GPS)
  - ✓ Remote Wii motion data
  - ✓ Other sensing data by a smart device: three-axis accelerometer, magnetometer (digital compass)





# Objective of this work

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Modeling a LAE

Developing LAE-MAR Applications

File Level Description for a LAEMAR application



## Camera Capturer & 2D chromakeying image for a LAE

//Capturer

<LAECapturer

id = "dcam0" type = "camera" fov="50" framerate= "60" >

</LAECapturer>

<LAETracker

id = "t1, laecapturer = "dcam0" laeid = "id1" chromakeying = "true" >

</LAETracker>

//Scene Description for spatial mapping of LAE

<LAESMSceneDesc id = "smsd1" description = "" initialPosition

= "2 2 2" LAEObject= "obj1d" > </ LAESMSceneDesc >

<MARScene id= "sc1" MARScene= "demo.x3d" > </MARScene>

//Spatial Mapping

<LAESpatialMapper id = "sm1" tracker= "t1" sceneDescId = "smsd1" >

</LAESpatialMapper >

<LAERenderer id= "rd" spatialMapper= "sm1" marScene= "sc1" >



# Information Model for LAE-MAR

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- Define the following for
  - Live Actor and Entity
  - Capturer and Sensor
  - Tracker and Recognizer
  - Spatial Mapper and Event Mapper
  - Scene Description
- use X3D file or others for MAR Scene
- use HTML5 for Information Model Description of LAE-MAR



# NWIP

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- Submit the NWIP when the document of Information Model of MAR content is prepared for CD ballot



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# Thank you.

