

Augmented Reality Working Group - Web3D Consortium

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AR WG in Web3D Consortium

- Started up and running since June 2011
- Co-chairs:
 - Gun Lee (HIT Lab NZ), Yvonne Jung (Fraunhofer IGD)
- Members:
 - Gerard J. Kim (Korea Univ.), Myeong Won Lee (Univ. of Suwon)
 - Sabine Webel, Johannes Behr (Fraunhofer IGD)
 - Oliver Neubauer (Bitmanagement)
 - Don Brutzman (NPS), Anita Havele (Web3D)
- Final goal is to produce a unified proposal to extend X3D specification for AR and MR applications
- Tasks
 - Requirement and use cases – August 17, 2011 - Done
 - Comparison of X3D AR proposals - Final editing March, 2012 - Done
 - From March 2012, developing plan to merge proposals – Done
 - Develop unified proposal - Doing

Web3D AR WG – Requirements & Use cases

http://www.web3d.org/x3d/wiki/index.php/X3D_AR_Requirements_and_Use_cases

- Requirements

- Functional requirements
 - Supporting image (camera) sensors, live video background and textures, tracking camera motion, camera calibration, correct image synthesis
- Non-functional requirements
 - Simplicity and extensibility

- Use cases

- Augmented Reality applications,
 - where live video stream is shown on the background and the 3D scene is shown as registered in the physical space of the live video stream.
- Augmented Virtuality (or virtual studio) applications,
 - where live video stream of physical objects can be placed within the 3D scene.

Web3D AR WG – Compare & merge proposals

http://www.web3d.org/x3d/wiki/index.php/Comparison_of_X3D_AR_Proposals

- Comparison of X3D AR proposals from Korea Chapter and Fraunhofer IGD
 - Trade off between simplicity and flexibility/extensibility
 - KC proposes on higher level AR/MR focused features, while Instant Reality has lower-level multi-purpose nodes
- Based on this comparison, currently, AR WG is discussing how to merge the X3D AR proposals.

Comparison Table (1/2)

Table 1. Comparison of X3D AR proposals (Bold : newly proposed nodes, <i>Italic</i> : modification to standard nodes)			
	Proposal KC1	Proposal KC2	Proposal IR
Using Live Video stream as a texture	<i>MovieTexture</i> node (or optionally with routing from CameraSensor node)	LiveCamera node, routing to a <i>PixelTexture</i> node	IOSensor node, routing to a <i>PixelTexture</i> node
Using Live Video stream as a background	MovieBackground node (or optionally with routing from CameraSensor node)	LiveCamera node + <i>TextureBackground</i> node	IOSensor node + PolygonBackground node (or optionally ImageBackground node)
Supporting color keying in texture	<i>MovieTexture</i> node	N/A	N/A (use general shader support)
Retrieving tracking information	CameraSensor node	ImagePatch and GPSSensor node	IOSensor node
Using tracking information to change 3D scene	routing tracking data from CameraSensor node	routing tracking data from ImagePatch and GPSSensor nodes + events generated by VisibilitySensor and RangeSensor nodes	routing tracking data from IOSensor node

Comparison Table (2/2)

Table 1. Comparison of X3D AR proposals (Bold : newly proposed nodes, <i>Italic</i> : modification to standard nodes)			
	Proposal KC1	Proposal KC2	Proposal IR
Retrieving camera calibration (internal parameters) information	CameraSensor node	LiveCamera node	IOSensor node
Using calibration information to set properties of (virtual) camera	MatrixViewpoint node	<i>Viewpoint</i> node	Viewfrustum and <i>Viewpoint</i> nodes (alternatively MatrixTransform node)
Specifying nodes as physical object representatives	GhostGroup node	N/A	ColorMaskMode and <i>Appearance</i> nodes (together with sortKey field)

Plans for Merging Proposals

- http://web3d.org/x3d/wiki/index.php/Plans_for_Merging_X3D_AR_Proposals
- 1. Discuss general strategy/policy/guidelines
 - Revise non-functional requirement
- 2. Produce a merged proposal for each functional components
 - Investigate each functional features stepwise:
 - Camera video stream image into the scene (texture and background)
 - Tracking (including support for general tracking devices)
 - Camera calibration (viewpoints)
 - Others (color-keying, depth occlusion)
- 3. Check Integrity of the merged proposal
 - Check and resolve conflicts between individual functional components
 - Merge overlapping features between individual functional components
- 4. Specification writing
- 5. Review

Strategy/Guidelines for Merging

- Try to reuse/extend existing nodes as much as possible
 - Specify a default value/behavior for new field/feature backward compatibility.
 - For consistency, mixing multiple functions into a single node should be avoided.
- Device independence must be kept
 - The scene description should be independent from the hardware/software environment (type of tracker, camera device, browser, etc.)
 - Detail hardware configuration should be adopted to or reconfigured by the users' hardware/software environment
 - The scene description should only specify generic type/role of interface (e.g. position tracker, orientation tracker, video source)
 - Identifying devices by high level feature (usage or generic setup, e.g. main camera, front facing camera, back facing camera), not by low level features (e.g. UUID, device number, port)
- Balance between simplicity and detail control
 - Specify default values/behaviors to provide simplicity with detailed control.
- Follow the naming convention in current specification
- New features must include examples/use cases that show the validity of its compatibility with other features of X3D.

=> Fed into Non-functional Requirements

Web3D AR WG – Summary and Next Steps

- Use cases and requirement specification
- Comparison between proposals
- Merge multiple proposals into one
 - Discuss general strategy/policy/guidelines => NFR
 - Produce a merged proposal for each functional components
 - Check Integrity of the merged proposal
 - Specification writing and review
- Planning to be included in X3D v3.4