AR Standards Community
+ Khronos and AR

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AR Standards Community

• A grass roots community seeking open and interoperable AR
  - Born from the realization that Augmented Reality needs the cooperation between many companies and standards organizations

• NOT creating standards
  - Fostering cooperation between Standards Defining Organizations (SDOs)

• No Such Thing as an “AR Standard”
  - AR is a young (immature), highly dynamic and innovative market space

• BUT communication between AR Players WILL help move AR forward
Who and How?

• Diverse Organizations
  - Standards Organizations
  - Industry
  - Government
  - Academia
  - Individuals

• Global Reach
  - Western Europe
  - Eastern Europe
  - North America
  - Asia
  - Australia
  - Middle East

• Regular Face to Face Meetings

• Online Resources
  - AR Standards Community Portal
  - http://www.arstandards.org
  - Discussion Archive
    http://arstandards.org/pipermail/discussion/
  - Announcements Archive
    http://arstandards.org/pipermail/news
Key Current Projects

• Creating an AR Reference Model - ISO/IEC 23000-14
  - A set of agreed terms and language to enable effective communication
  - Using ISO model developed for the Open Distributed Processing Reference Model
    ISO/IEC 10746-1 which provide five stakeholder viewpoints
  - Will reference foundational open standards of the OGC, W3C, Khronos, ISO etc.

• Catalyzing discussion around Wearable Displays
  - Use cases, connectivity standards, processing requirements

• Discussion over industry cooperation around a 3D transmission format...
Need 3D Transmission Standard?

- Efficient codecs for compressed binary 3D asset blobs
  - Geometry, textures, materials, animations, physics…
  - Separate form scene graph description – e.g. WebGL could use JSON
  - Perhaps use RESTful APIs and LOD management – web services approach?

- Many initiatives under way - time for communication and collaboration?
  - MPEG 3D Mesh Progressive Streaming (3DMC), Bones Based Animation (BBA)
  - Google Body compression - Delta and ZigZag encoding
  - COLLADA2JSON at COLLADA working group
  - Papers presented here at Web3D 2012!

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3D Codec

**Concepts**
- Transmission Format Specification enables reliable encoding and decoding of 3D Assets
  - Encoding/Decoding can be independent of server/client
  - Standardized, widely-used codec catalyzes optimized implementations

**Challenges**
- Complexity and variety of 3D asset types to be processed
- Efficiency of general codec versus application-specific encoding schema

WebGL browser community suggests to try multiple techniques in open source and JavaScript to inform standardization
Transmission Format Collaboration

- Exploring multi-SDO collaboration
  - To accelerate transmission format exploration and development
- Khronos has drafted liaison MOU to encapsulate this model
  - Feedback welcome!

1. Members of Participating SDOs can attend liaison working group
2. Liaison Working Group drafts specification
3. Liaison Working sends draft spec to each SDO for ratification - using SDO’s own ratification process for royalty-free specifications
4. Each SDO ratifies specification to be royalty free and publicly distributes

+ Other SDOs!
Get Involved!

• Sign-up on mailing lists at AR Standards Community Portal
  - http://www.arstandards.org

• Seventh AR Standards Community meeting at ISMAR 2012 - Georgia Tech
  - Atlanta, Georgia, November 8-9 2012
  - Position Paper Abstracts deadline Sept 7, 2012

• Christine Perey - AR Community Instigator in Chief 😊
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API Standards Evolution

**DESKTOP**
- OpenGL
- OpenMAX
- OpenCL

**MOBILE**
- OpenCL
- Android
- OpenGL ES

**INTEROP, VISION AND SENSORS**
- OpenVL
- EGL
- StreamInput
- Augmented Reality

**WEB**
- HTML5
- WebGL
- WebCL

New API technology first evolves on high-end platforms.

Mobile is the new platform for apps innovation. Mobile APIs unlock hardware and conserve battery life.

Apps embrace mobility’s unique strengths and need complex, interoperating APIs with rich sensory inputs e.g. Augmented Reality.

Diverse platforms - mobile, TV, embedded - mean HTML5 will become increasingly important as a universal app platform.
Example use of Khronos APIs in AR

- **Positional Sensors**
  - Positional and GPS Sensor Data
  - Computer Vision and Tracking
  - Synchronization and sensor fusion

- **Camera Processing**
  - Control Camera, Preprocess and generate video streams

- **Video TAP to Vision Subsystem**

- **EGLStream**

- **3D Rendering and Video Composition**

- **Application on CPU**
  - Position and Tracking Semantics

- **Audio Rendering**

- **OpenVL**

- **OpenMAX AL**

- **EGL**

- **OpenGL ES**

- **OpenSL ES**
Portable Access to Sensor Fusion

Apps request semantic sensor information
StreamInput defines possible requests, e.g.
“Provide Skeleton Position” “Am I in an elevator?”

Advanced Sensors Everywhere
RGB and depth cameras, multi-axis motion/position, touch and gestures, microphones, wireless controllers, haptics keyboards, mice, track pads

Processing graph provides sensor data stream
Utilizes optimized, smart, sensor middleware
Apps can gain ‘magical’ situational awareness

Universal Timestamps
Standardized Node Intercommunication

E.g. align samples from camera and other sensors

Apps Need Sophisticated Access to Sensor Data
Without coding to specific sensor hardware
OpenVL

- **Vision Hardware Acceleration Layer**
  - Enable hardware vendors to implement accelerated imaging and vision algorithms

- **Diversity of efficient implementations**
  - From hardware pipelines to parallel programmable processors

- **Can be used by high-level libraries or applications directly**
  - Primary focus on enabling real-time vision apps on mobile and embedded systems

- **OpenCV is widely used open source library for vision projects**
  - Future versions could leverage OpenVL
  - Do not duplicate OpenCV functionality – JUST provide acceleration

![Diagram showing OpenCV open source library, Other higher-level CV libraries, OpenVL, Open source sample implementation, Hardware vendor implementations]
Leveraging Proven Native APIs into HTML5

• Leverage native API investments into the Web
  - Faster API development and deployment
  - Familiar foundation reduces developer learning curve

• Khronos and W3C creating close liaison
  - Multiple potential joint projects

[Diagram showing native APIs and JavaScript APIs with labels for shipping status and possible future JavaScript APIs]
Questions?

• Any APIs missing for real-time AR acceleration?
  - What is best way to collaborate to bring them to HTML5?

• Right direction for transmission format collaboration?
  - Let me know if you want to provide feedback on liaison MOU
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