glTF 2.0: Status and Outlook

31st July 2018

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Content

- Status (15 minutes)
- Outlook (35 minutes)
- Questions & Answers (10 minutes)
Status glTF 2.0

What we **currently** have!
Scene, nodes, cameras and geometries

- Multiple scenes
- Node hierarchy
  - Translate
  - Quaternion rotate
  - Scale
  - Or: Matrix
- Per node mesh
- Multiple primitives per mesh
  - Points
  - Lines
  - Triangles
- Per node camera
  - Orthographic
  - Perspective
Textures, materials and animations

- Textures
  - Images
  - Samplers
- Materials
  - Metallic-Roughness PBR
  - Emission
  - Occlusion
  - Normal
  - Blending
- Animations
  - Nodes
  - Joints
  - Morphing
Material extensions

- Materials
  - Specular-Glossiness PBR
  - Unlit
Compression and texture extensions

- Compression
  - Draco mesh compression ("JPEG" of 3D)
- Texture
  - Transform

\[
x' = (\cos \theta, \sin \theta) \quad y' = (-\sin \theta, \cos \theta)
\]

\[
\begin{bmatrix}
\cos \theta & -\sin \theta & 0 \\
\sin \theta & \cos \theta & 0 \\
0 & 0 & 1
\end{bmatrix}
\]

mat3(vec3( cos(theta), sin(theta), 0.0),
      vec3(-sin(theta), cos(theta), 0.0),
      vec3( 0.0, 0.0, 1.0))
Large glTF ecosystem

- Big industry support
- glTF is the “JPEG” of 3D
Outlook glTF

What we **could** have!
(Do not say it will or should come)
Extending glTF PBR materials

- Driven by
  - Games
  - Movies
  - ...
  - ...

- “Take the latest stuff from the engines and put it into glTF!”

Source: http://blog.selfshadow.com/publications/s2017-shading-course/
Extending glTF PBR materials (cont.)

- Materials
  - Subsurface Scattering
  - Sheen
  - Coating
- “Just” need to agree on parameters

Extending glTF PBR materials (cont.)

- Materials
  - Refraction
  - Anisotropy
    - Tangent texture
- It’s getting sophisticated ...
  - ... for real-time

INDEX OF REFRACTION

1.001  1.07  1.3

Source: https://www.creativeshrimp.com/create-realistic-ice-lighting-book-02.html
Extending glTF PBR materials (cont.)

- Materials
  - Thin Film
- Dynamic material layering

Source: https://belcour.github.io/blog/research/2017/05/01/brdf-thin-film.html
https://support.allegorithmic.com/documentation/display/SPDOC/Dynamic+Material+Layering
Extending glTF PBR materials summary

- Define for usage with rasterizer and real-time/offline ray/path tracer
- Encoding: GPU vs. transfer friendly
- Limits: Embedded vs. render farm
Adding lighting to glTF

- Lighting
  - Punctual lights
  - Environment lights
    - Cube maps
    - Mip mapping
    - HDR
  - Area lights
- Shadowing
  - Decision up to engine


http://blog.magnum.graphics/guest-posts/area-lights-with-llcts/
Enhancing the animation system

- Animate
  - Scalars and vectors (e.g. factors and colors)
- Generic “everything” animation vs. animation for specific element
  - E.g. any parameter vs. base color value
Final pixel on the screen

- Tone mapping
- Post processing
- gltF becomes huge

Source: https://www.researchgate.net/figure/Visual-comparison-of-different-tone-mapping-algorithms-a-global-tone-curve-16-b_fig5_262237809
https://cutsceneartist.com/tools/unity-post-processing-stack/
Extending geometry and compression

- Geometry
  - Procedural e.g. spheres, cubes etc.
  - Displacement mapping
  - LOD

- Compression
  - Texture / image data
  - Animation
  - glTF JSON data

Source: http://help.chaosgroup.com/vray/help/150SP1/tutorials_displacement.htm
Organizing glTF

- glTF files can get quite large
  - Facebook is restricting size
- Scene composition
  - Referencing other glTF files
Rendering quality

- Quantity: Lot of tools etc.
  - Very good
- Quality: Minor Differences
  - Game-industry: “Fine, I’ll adapt anyway”
  - Non-game-industry: “No go!”
Organizing the extensions

- Many Khronos companies involved
  - Already hard to agree :-)
- Huge community support
  - https://github.com/KhronosGroup/gltf/issues

- What we need:
  - Many small extensions
    - Dependency graph
  - Or: Few large extensions

- How do we avoid extensions overlapping and fragmentation?
Progress of glTF

- Fast or slow progress of extensions
  - People/companies need time to implement
- Next version of glTF
  - Frequent vs. not frequent
Extending glTF with non-graphics

● “Level” description
  ○ Events and triggers
  ○ Audio
  ○ Video
  ○ ...

● MPEG of 3D
  ○ Do we want this?
Outlook Summary

- glTF is the JPEG of 3D
  - Required features available now
  - Lot of features to come (if we want)

- Eco system
  - Quantity: Huge
  - Quality: Good, but this 1% needs to be fixed

- Extension and future glTF coordination
  - Biggest challenge in my mind
Questions & Answers

2018 SIGGRAPH
Khronos BOFs: Wednesday, August 15
Location: Pinnacle Ballroom, Vancouver Marriott Pinnacle Downtown

https://www.khronos.org/gltf/