Exploring the Artistic Frontier: Unleashing Creativity in 3D Models with glTF and PBR

glTF Meetup
September 19, 2023
Eric Chadwick, Senior 3D Technical Artist, DGG
echadwick@dg3d.com

- Workflow improvements for 3D rendering and interactivity
- 20 years in game development
- Polycount admin, forum + wiki
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Khronos Group for open source standards, including glTF
Weekly conference calls: glTF features, interop, extensions, workflow, tooling, tutorials ...
Triangles: 336,300  Material: Diffuse texture
Retopology in 3ds Max
Unfold UVs, Relax UVs, Pack into 2048x1024
Bake To Texture: normal, diffuse, occlusion
Generating Textures

- ambient occlusion
- roughness
- metalness
- base color
- normal bump
- iridescence strength
- iridescence thickness
Channel-Packed Textures
Final Textures

- base color
- normal bump
- orm
- iridescence
BabylonJS Exporter for 3ds Max
BabylonJS Exporter for 3ds Max
Blender glTF

https://docs.blender.org/manual/en/2.80/addons/io_scene_gltf2.html
Blender glTF

Different rendering models, no glTF renderer in Blender, feature compatibility not 100%

In development... Principled v2 BSDF shader node
https://projects.blender.org/blender/blender/issues/99447
Visual Studio Code + Cesium’s glTF Tools Extension
Editing glTF in VS Code

```json
{
  "asset": {
    "version": "2.0",
    "generator": "babylon.js glTF exporter for 3dsmax 2022 v20238608.5"
  },
  "scene": {
    "nodes": [
      {
        "mesh": 0,
        "translation": [
          0.432322,
          0.7163625,
          -0.81367244
        ],
        "name": "AbaloneShell"
      }
    ],
    "meshes": {
      "primitives": {
        "attributes": {
          "POSITION": 1,
          "NORMAL": 5,
          "TEXCOORD_0": 3,
          "TEXCOORD_1": 4
        },
        "indices": 0,
        "material": 0
      },
      "name": "AbaloneShell"
    }
  }
}
```
Materials: Before and After
What are the Iridescence Parameters?

Check the spec: [KHR_materials_iridescence](https://github.com/KhronosGroup/gltf-extensions/tree/main/KHR/KHR_materials_iridescence)

### Extending Materials

The iridescence materials are defined by adding the `KHR_materials_iridescence` extension to any glTF material.

```json
{
  "materials": [
    {
      "extensions": {
        "KHR_materials_iridescence": {
          "iridescenceFactor": 1.0,
          "iridescenceColor": 1.3,
          "iridescenceThicknessMaximum": 400.0
        }
      }
    }
  ]
}
```

### Properties

All implementations should use the same calculations for the BRDF inputs. Implementations of the BRDF itself can vary based on device performance and resource constraints. See [appendix](https://github.com/KhronosGroup/gltf-extensions/tree/main/KHR/KHR_materials_iridescence) for more details on the BRDF calculations.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Type</th>
<th>Description</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>iridescenceFactor</td>
<td>number</td>
<td>The iridescence intensity factor.</td>
<td>No, default: 0.0</td>
</tr>
<tr>
<td>iridescenceTexture</td>
<td>texture2d</td>
<td>The iridescence intensity texture.</td>
<td>No</td>
</tr>
<tr>
<td>iridescenceColor</td>
<td>number</td>
<td>The index of refraction of the dielectric thin-fil layer.</td>
<td>No, default: 1.3</td>
</tr>
<tr>
<td>iridescenceThicknessMinimum</td>
<td>number</td>
<td>The minimum thickness of the thin-film layer given in nanometers.</td>
<td>No, default: 100.0</td>
</tr>
<tr>
<td>iridescenceThicknessMaximum</td>
<td>number</td>
<td>The maximum thickness of the thin-film layer given in nanometers.</td>
<td>No, default: 400.0</td>
</tr>
<tr>
<td>iridescenceThicknessTexture</td>
<td>texture2d</td>
<td>The thickness texture of the thin-film layer.</td>
<td>No</td>
</tr>
</tbody>
</table>

The values for iridescence intensity can be defined using a factor, a texture, or both. The `iridescenceFactor` is multiplied with the red channel of `iridescenceTexture`, to control the overall strength of the iridescence effect. If the texture is not set, a value of 1.0 is assumed for the texture.
Iridescence Parameters

Thickness, IOR, Color

https://github.com/KhronosGroup/gltf-Sample-Assets/tree/main/Models/IridescenceMetallicSpheres
Iridescence Parameters  Metallic vs. Dielectric

https://github.com/KhronosGroup/glTF-Sample-Assets/tree/main/Models/IridescenceDielectricSpheres
glTF Extension - KHR_materials_anisotropy
Based on a Real Product

Antique Copper Barn Light on Wayfair

Brushed copper with a clearcoat finish
Anisotropy examples

Horse: Sabu Varghese
Record: Ryankusumojr
Braid: Stilfehler
Pan: NatalieMaynor/
glTF Material & glTF Exporter in 3ds Max
Anisotropy - Inputs
Anisotropy Texture - RGB Channels

- w/out red channel
- w/out green channel
- w/out blue channel
Anisotropy Texture - Radial Directions
Anisotropy Texture - UV Directions
Anisotropy Texture - Compared to Other Renderers

- Clarisse
- Filament
- Modo
- Sketchfab
- Substance
- V-Ray
- glTF
Anisotropy Texture - Normalized vs. Not
Anisotropy Texture - Normalize in Substance3D Designer


(https://shorturl.at/lwSX5)
Normal Bump - Masking
Links

**Event Page for Video and Slides**

**glTF Iridescence**
- [IridescenceAbalone](#) glTF sample asset
- [KHR_materials_iridescence](#) specification
- [BabylonJS Exporters](#) for 3ds Max, Blender, Cinema 4D, Maya, etc.
- [Blender glTF Exporter](#) Blender Manual
- [Blender BSDF v2](#) Blender Projects
- [Visual Studio Code](#) and [Cesium glTF Tools](#)
- [IridescenceMetallicSpheres](#) glTF sample asset
- [IridescenceDielectricSpheres](#) glTF sample asset

**glTF Anisotropy**
- [AnisotropyBarnLamp](#) glTF sample asset
- [KHR_materials_anisotropy](#) specification
- [3ds Max glTF Exporter](#) help

**Bonus!** [Adding Material Extensions to glTF Models](#)
A recording of this presentation and the slides will be available on the Khronos Group website.

www.khronos.org/events

For more information on glTF and links to online resources, please visit

www.khronos.org/gltf