Lesplan (advanced) Graphics Programming

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| ***Les*** | ***Doel*** | ***Lesstof*** | ***Toets*** |
| 1 | How to (Richard) – 15 min.  3D Basics (Alexander) – 60 min.  Luna overview (Reggie) – 15 min. | Vertices, triangles/faces.. normal & culling  Transform (P, R, S)  Engine: overview  Frame rate(s),  interpolation @drawUpdate | Verplicht onderdeel 1  Primitives  ? welke opdrachten van Luna kunnen we gebruiken (Reggie/studenten) |
| Overview of Luna projects (the road ahead), video?  **Homework: Luna chapters 1-3** |
| 2 | Direct3D initialization &  The rendering pipeline (Richard) – 90 min. | Direct3D initialization  **Luna chapter 4** |
| Pipeline: (all stages), Z-Buffer,  **Luna chapter 5, stukje 6 (Box ofzo)** |
| 3 | Drawing primitives &  Virtual camera (Reggy) – 90 min. | Primitives  **Luna chapter 6 (overig)** | Verplicht onderdeel 2  Models  ? welke opdrachten van Luna kunnen we gebruiken (Reggie/studenten) |
| Camera, near/far plane, frustum culling  **Luna chapter 14**  **Luna chapter 15** |
| 4 | Models, static Meshes (Reggy) – 90 min. | Importing meshes, LOD (Level Of Detail)  **Luna chapter 23** |
| 5 | Pipeline performance (Alexander) – 90 min. | Vertex transform cost,  Pixel shading cost: shaders, opacity...  -- Implications of both (triangles, vs monitor/shader cost)  culling (in algemeen)  Draw Calls: CPU vs GPU, max DC’s on pc/console/mobile..  Batching (also, texture/mat batching) |  |
| 6 | Blending &  Stenciling (Richard) | **Luna chapter 9**  **Luna chapter 10** |  |
| 7 | Lighting, smoothing (Alexander)  Smoothing groups | Lights: ambient, omni, directional  Basic principle (…angle = emission..)  Smoothing: Vertex based, pixel based (on normal)  Smoothing groups (is 3d standard)  **Luna chapter 7** | Verplicht onderdeel 3  Lighting  ? welke opdrachten van Luna kunnen we gebruiken (Reggie/studenten) |
| 8 | Texturing (Reggy) | Unwrapping principle  UV coords (0.0-1.0) per vertex, 1 map  Commonly used map: diffuse, opacity-, specular exponent, illumination,  Bump-, Normal maps,  Virtual displacement(parallax) maps  Rendering to Texture (in-game cameras, cube maps, …) for reflections, portals, portraits, monitors, etc  **Luna chapter 8**  **Luna chapter 17**  **Luna chapter 18** | Verplicht onderdeel 4  Texturing  ? welke opdrachten van Luna kunnen we gebruiken (Reggie/studenten) |
| 9 | Texturing |  |  |
| 10 | Texture Performance (Alexander) | Memory impact,  Mipmaps, sampling  24bit, 16bit, S4 compression: DXT1 (-5?)  !: “2^” textureSize rule!:  Square texture rule  Texture atlas, Sprite atlas |  |
| 11 | Shadow mapping &  Instancing (Richard) | **Luna chapter 21** |  |
| 12 | Post render Effects: (Alexander) | Light Bloom (with hdr), Motion blur, Depth-of-field blur,..  Color filters  Screen Space: Ambient Occlusion(SSAO), -Reflections (SSR), -lighting (DS)  **Luna chapter 22** |  |
| 13 | Character animation, skeletal animation/vertex skinning (Reggy) | **Luna chapter 25** |  |
| 14 |  |  |  |

# Opmerkingen

Uit Luna behandelen we **niet**:

* Chapter 1-3, vectors/matrices,
* Chapter 11-13, Geometry, Compute, Tessellation Shader
* Chapter 16, Picking
* Chapter 19-20, Terrain Rendering, Particle systems
* Chapter 24 Quaternions,

Les 8 lijkt zwaar, of direct nog een les erna en stof verdelen of eerst les 10 en dan rest

Les 12 is rijk, nog een les erbij nemen?

# Toets

Aandachtspunten:

Klein (Instructie) – Groot (Casus)

Individu – Groep

Code – model – documentatie – paper

Toetsing: individuele eindopdracht met 4 verplichte onderdelen (Reggie) en 1 keuze onderdeel A, B of C. (Alexander)

* Keuzeonderdeel A: rijk gebied ‘mooi’ renderen (stad, sterrestelsel), LOD, Culling, performance, rich texturing (Focus op max visual effect)
* Keuzeonderdeel B: complexe scene ´slim´ renderen, door Mesh batching, HW instancing, compression, geometry creation (Focus op max performance)
* Keuzeonderdeel C: showcasing scene, postprocessing or SSFX techniques (Focus op complexe ‘actuele’ techniek)

Todo: omschrijving + toetsmatrijs/rubric

Acties