Forward+ Renderer

CIS 565 Final Project

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Forward+: Bringing Deferred Lighting to the Next Level

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- Technique:
  - Depth Prepass
  - Light Culling
  - Final Shading

Demo Video

Forward+

- Depth Buffer
- Light Culling - Gathering Approach
  - Tile Based
  - Calculate Frustum
  - Check for Overlap
  - Create Buffer of Visible Lights
- Final Shader
  - Loop through Visible Lights
  - Blinn-Phong Shading Model

Performance

- With/Without light culling
  - Tested with 1024 lights with a radius of 10 and tile size of 16 x 16 pixels
  - Without Light Culling
    - Max FPS: 2
    - Min FPS: 1
    - Avg FPS: 1.7
  - With Light Culling
    - Max FPS: 93
    - Min FPS: 86
    - Avg FPS: 89.867

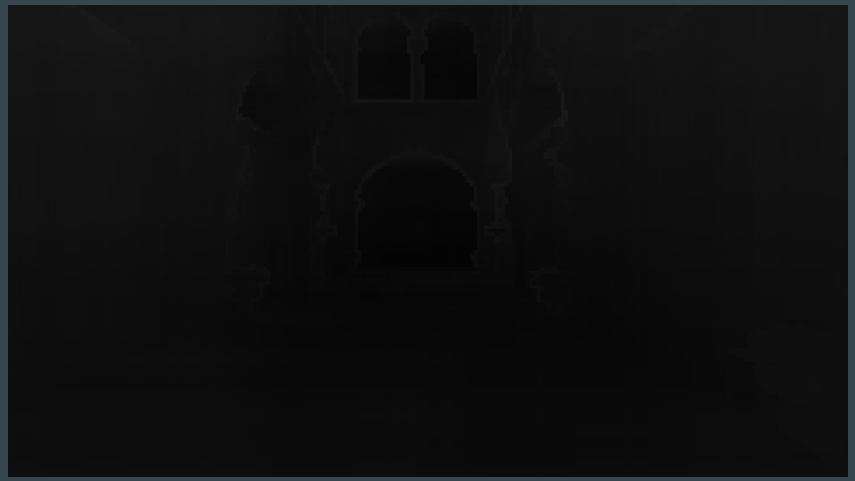
Forward Comparison

Forward+ Comparison

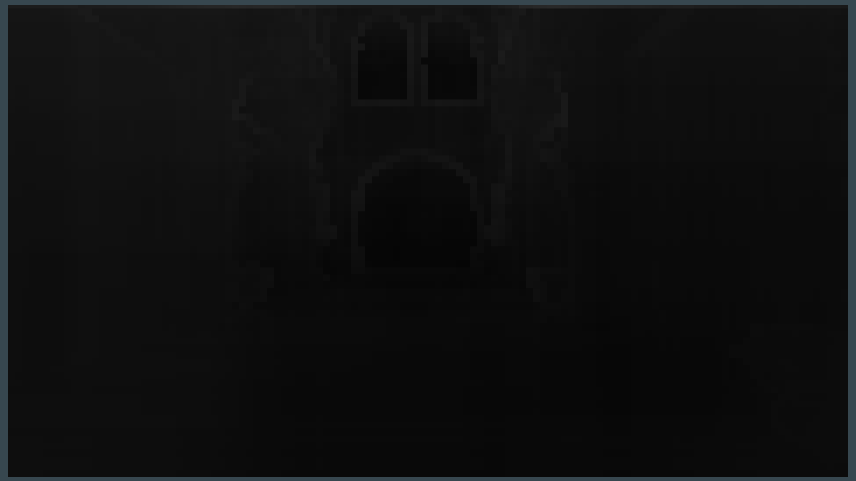
Performance

- Different size tiles
  - 16 x 16
    - ~ 90 FPS
  - 8 x 8
    - ~ 25 FPS

Light Culling Debug View - 1024 lights, 30 radius



8 x 8



16 x 16

Light Culling Debug View - 1024 lights, 50 radius

8 x 8

16 x 16

Extra Features

- Debug Views
  - Depth debugger
  - Lights per tile debugger
- Model Loader
  - Uses Assimp to load obj models and diffuse, specular, and normal maps
  - Sponza Crytek model used in demo
    - Created additional specular and normal maps
- Normal Mapping
- High Dynamic Range Lighting
  - Used floating point buffer
  - Reinhard tone mapping

Future Goals

- Directional lights
- Material properties
- Stenciled shadow volumes for point lights
- Screen space ambient occlusion
- Skybox - to see that beautiful night sky
- Gamma correction
- Cascading shadow maps

References

- OpenGL Help
  - http://learnopengl.com/ by Joey de Vries
- Forward+ Reference
  - http://www.slideshare.net/takahiroharada/forward-34779335 by Takahiro Harada
- DirectX 11 Rendering in Battlefield 3
  - http://www.dice.se/news/directx-11-rendering-battlefield-3/ by DICE
- Sponza Model
  - http://www.crytek.com/cryengine/cryengine3/downloads from Crytek, by Frank Mienl