



Forward+ Renderer

CIS 565 Final Project

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Forward+: Bringing Deferred Lighting to the Next Level

- Authors: Takahiro Harada, Jay McKee, and Jason C. Yang
- 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
- Different size tiles
 - 16 x 16
 - ~ 90 FPS
 - 8 x 8
 - ~ 25 FPS

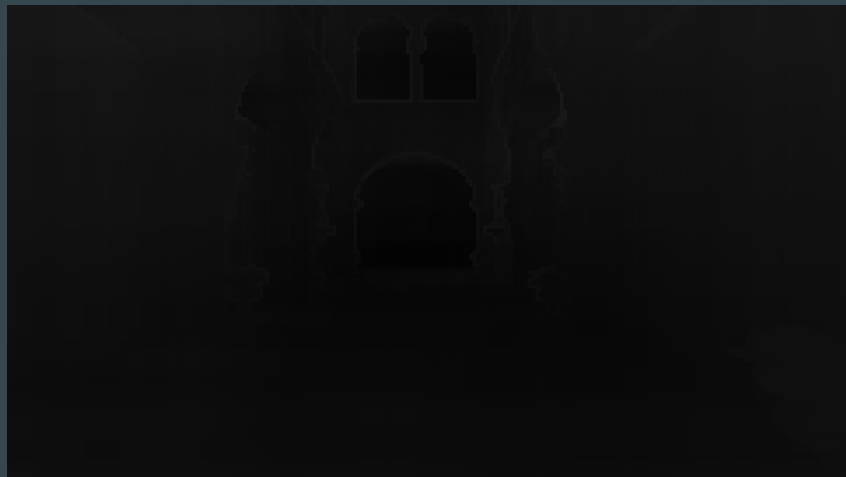
Forward Comparison



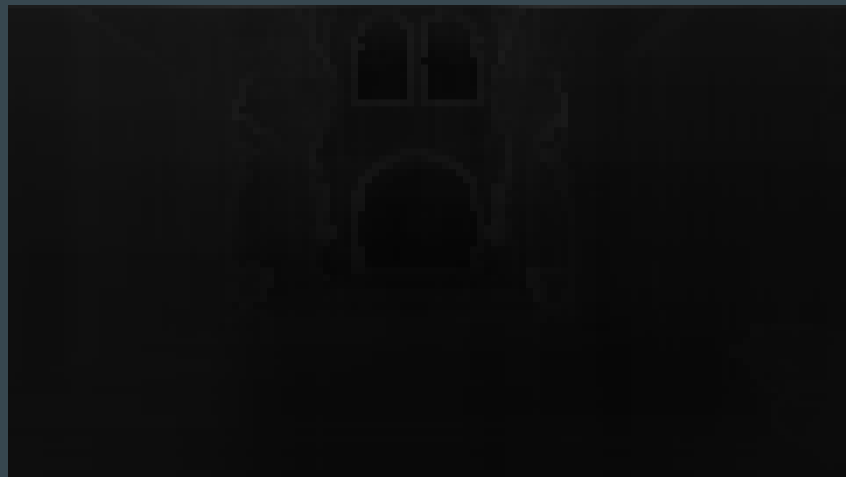
Forward+ Comparison



Light Culling Debug View - 1024 lights, 30 radius

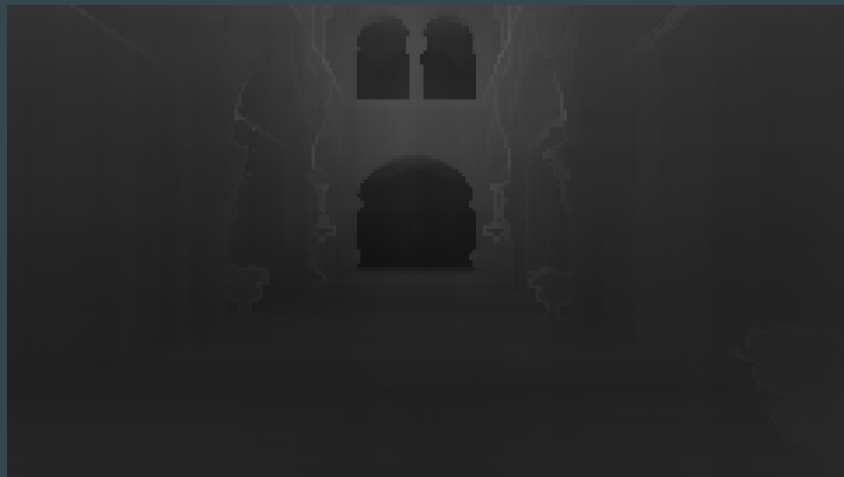


8 x 8

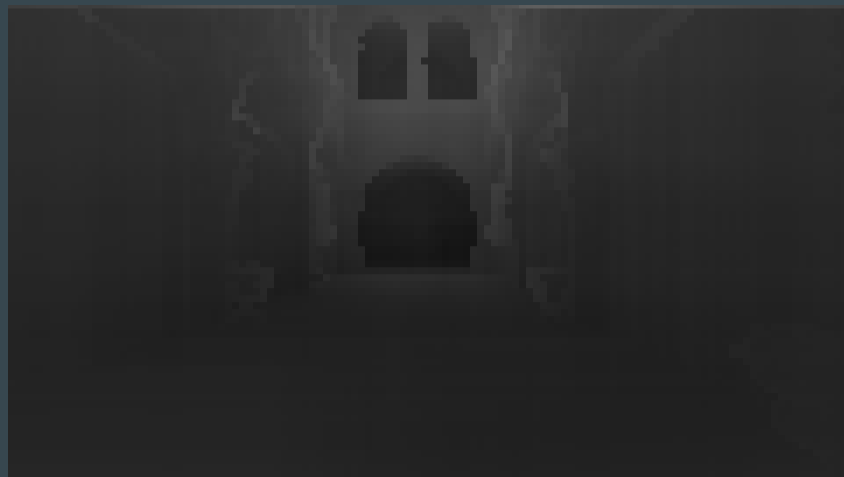


16 x 16

Light Culling Debug View - 1024 lights, 50 radius



8 x 8



16 x 16

Depth Debug View



Extra Features

- 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
- Debug Views
 - Depth debugger
 - Lights per tile debugger

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
- Deferred Shader (helpful with lighting)
 - <http://www.dice.se/news/spu-based-deferred-shading-battlefield-3-playstation-3/> by DICE
- Sponza Model
 - <http://www.crytek.com/cryengine/cryengine3/downloads> from Crytek, by Frank Mienl