Procedural Building Tool User Guide | George Peabody Library – Baltimore, MD

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Houdini Version: 17.5.327

Important statistics:

Beauty Render:

Average render time: 3 hours and 18 minutes
Number of Frames: 1
Resolution: 1280 x 720
Diffuse Quality: 3
Diffuse Limits: 2
Noise value: 0.01
Min rays: 4
Max rays: 12
Additional settings: set forced objects to render to all nodes that are named "rndr_*"
Number of lights in scene: 82 point lights, 34 sphere lights, 1 sun and environment light
Complexity of geometry (approximate): 900,000 primitives

Animation Renders:

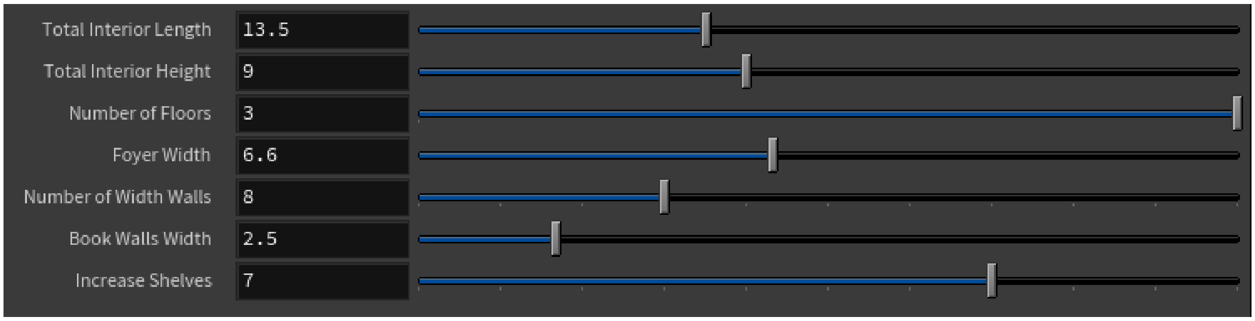
Average render time: 40 minutes
Number of Frames: 240
Resolution: 1280 x 720
Diffuse Quality: 3
Diffuse Limits: 2
Noise value: 0.01
Min rays: 4
Max rays: 12
Additional settings: set forced objects to render to all nodes that are named "rndr_*"
Number of lights in scene: 1 point light, 1 sun and environment light
Complexity of geometry (approximate): 900,000 primitives

User Guide:

This tool was designed to allow user customization of the George Peabody Library's simple construction. The building is defined by one whole lengths, but has two widths because there two separate sections of the library: the foyer and the stacks. The height is one control as well, but the height of each floor can be changed if the user would like a library with more floors. The controls in the interface start with controls that affect a larger area of the building and do down to smaller details, such as the number of shelves in the bookcases.

Parameter Controls-

- Total Interior Length- Used to control the complete length of the building. Increasing or decreasing the length affects the objects inside.
- Total Interior Height- Used to control the complete height of the building. Increasing or decreasing the length affects the height of objects inside.
- Number of Floors- Used to control the height of each floor and/or increase or decrease the number of floors. This will affect the items' height on each floor of the building, including bookcases, arches, the railing, and the columns.
- Foyer Width- Used to control the width of the foyer. Increasing or decreasing the width may change how many columns, arches, bookcases and/or doors there are on the wall. This is width one.
- Number of Width Walls- Used to control the number of walls that make up the length of the building. These are the walls that sit behind the stacks of bookcases. Increasing or decreasing affects the number of columns, the width and number of arches, and number of bookcases.
- Book Walls Width- Used to control the width of walls in the stacks area. Increasing or decreasing the length affects the length of the book cases and positions of the windows on the ends. This is width two.
- Increase Bookcase Shelves- Used to control the number of shelves on the bookcases. Increase to have fuller shelves or decrease to have space for larger books.



Total Interior Length 13.5
Total Interior Height 9
Number of Floors 3
Foyer Width 6.6
Number of Width Walls 8
Book Walls Width 2.5
Increase Shelves 7

Figure 1. Parameter Controls

Technical guide:

- Majority of placement of models/other assets is done with a line to lessen the use of hscript in copy stamps and allow for easier debugging.
- At the obj level, there is a network of geometry containers that hold the modeling of detail geometry such as bookcases and their UVs and material SOPs. Those are imported to the "library_build" node, except for anything that would be assigned glass. The result of "library_build" is object merged into a container that will always be rendered (avoid display mistakes at render time).
- Anything with a glass material is made separate because in the shadow tab of the Sun light, the container holding the glass has been excluded from the shadow selection. This allowed for better dispersion of light inside the building.
- Most of the UV sops are from the Game Development Tools Shelf. User must download or update those tools in order for UVs to work. In the shelves tab there's a plus sign. Click on that and mouse down the drop menu to "Shelves" and check the box for Game

Development Toolset. There will be joystick icon that pops up in the shelf. Click on that and follow the prompts.

Beyond the Requirements:

Point Light and Sphere Light Instancing –

- Used procedural lines (length, number of points, selecting and deleting certain points using group expressions and group by range) to place instanced point lights. One node contains the points, which are them object merged into an Instance node where the object to instance is the point lights. The same was done for sphere lights. The point lights were used for the smaller, non-decorative lights in the library and the sphere lights were used for the decorative lights in the foyer.
- I used over one hundred instanced lights in total for the beauty render. To optimize the render: the attenuation of the lights were customized to reach a reasonably short active radius; culling of the points being instanced to was employed using a volume and group SOPs; deletion of instances entirely that were not seen by the camera and were not grabbed by culling.

Texturing –

- UV textured each assets with a different material using the Game Development SOP AutoUV Tool, UV texture, UV unwrap and UV layout. Those were then exported through the FBX ROP in a separate container to Substance Painter for texturing. Tool can be used to customize building and it will be automatically UV textured and ready for export in the material export containers.
- The floor base color, and the railing opacity (also applied to displacement) were created in Adobe Illustrator using the UVs of those objects and references from research.

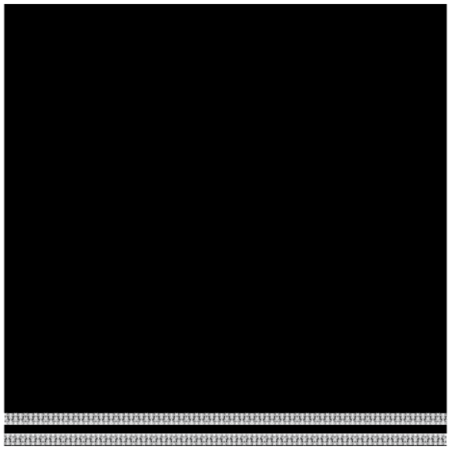


Figure 2. Railing Opacity

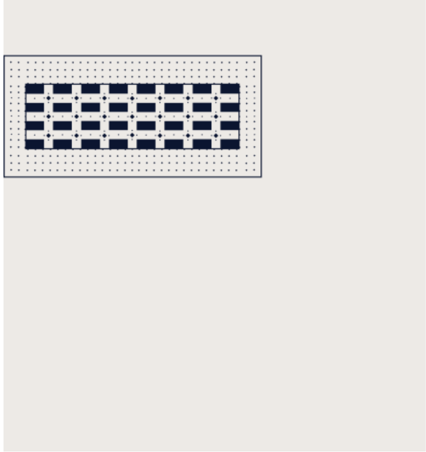


Figure 3. Floor Base Color

- Glass texture was applied to the ceiling and the windows. After studying the lighting in the photographs compared to what the test renders looked like with no geometry acting as the glass, it was determined a glass material was needed to disperse the sun and environment lights in a more realistic manner. This can be easily turned off by renaming the ”rndr_glass” geo container to “x_rndr_geo.”