

# PROCEDURAL BUILDING

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## IMPORTANT STATISTICS

### Render

- **Renderer:** Mantra
- **Average render time:** 16.7 min per frame
- **Image resolution:** 1280x720
- **Number of lights** 2 (One direct light and one environment light with an HDRI)

### Sampling

- **Noise value:** 0.01
- **Min/ max ray samples:** 1 - 9
- **Global quality:** 6
- **Diffuse quality:** 3
- **SSS quality:** 1
- **Reflection quality:** 2
- **Refraction quality:** 2
- **Volume quality:** 1

### Geometry complexity

- **Primitives:** 7,321
- **Points:** 10,653

# ABSTRACT

- This is the first project for the VSFX 721 class (Procedural modeling and animation) using procedural modeling methods in Houdini to create a building that is capable of resizing and create variations of itself. The building I chose to create was inspired by Haussmann architecture, found mostly in Paris and some other regions in France.
- The tool can modify the building by changing its width, depth and amount of floors, through high-level parameters. It also lets the user change the distance between windows.

# INSPIRATION AND REFERENCE

The building created replicates the Haussmannian architecture which can be found and still defines the city of Paris and some other cities in France. It was designed by Baron Georges Eugène Haussmann in the 19th century, with the intention of modernizing Paris. This style has become a symbol of the city and its appeal has made Paris one of the most visited and loved cities in the world.



Stock Photos from sylv1rob1/Shutterstock



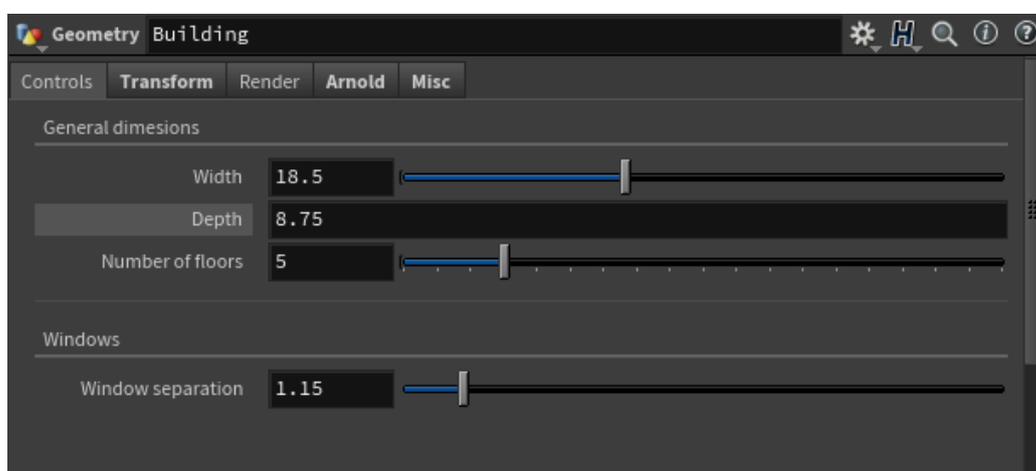
Picture from [www.unjourdeplusparis.com](http://www.unjourdeplusparis.com)

# USER'S MANUAL

This tool can be used to customize the appearance of a Haussmann styled building with some top level controls. These controls are located at the top of the **Building** node under the **Controls** tab.

## Controls

- **Width:** This parameter controls the width of the whole building. As the building gets wider, more windows will generate along the x axis and they will fit on the width established by the user. If the building gets slimmer, the remaining windows that don't fit will vanish.
- **Depth:** This parameter controls the depth of the whole building. As the building gets longer, more windows will generate along the z axis and they will fit on the depth established by the user. If the building gets flatter, the remaining windows that don't fit will vanish.
- **Number of floors:** This parameter controls the amount of floors of the building. As the amount of floors rise, the building will get taller with floors added along the y axis. If the amount of floors is an even number, the design of each floor is the same, but if the amount of floors is an odd number, the last floor will have a different design.
- **Window separation:** This parameter controls the separation between each window, it controls the same width for each floor, using the same value for all. As the separation changes, the windows will reaccommodate themselves centered depending on the width and depth of the building.



# TECHNICAL GUIDE

- All the nodes that compone the building are under just one geometry node, inside it everything is organized into separate containers so it is easier to understand which part of the structure one is building, it helps to keep the networks clean and more accesible.
- There are five total big containers: first floor, middle floor, last floor, balcony and roof. This is to keep everything organized and accesible.



- Each of these containers have one thing in common which is the main structure (usually just a box) that defines the width and depth of each component controlled by the top level parameter.
- The placement of the windows, railings, bars and other features were mostly managed through copy nodes and using HScript.
- For the modeling of each component I used different techniques, always trying to use the best approach for each item. Using tools like booleans, extrusions and in some rare cases there was the need to use edit nodes for very specific shapes.
- I used size parameters and bbox to put the items in place and keeping the structure functioning when the controls were manipulated. Changing the pivot with HScript came in handy when doing this.

- **First floor:**



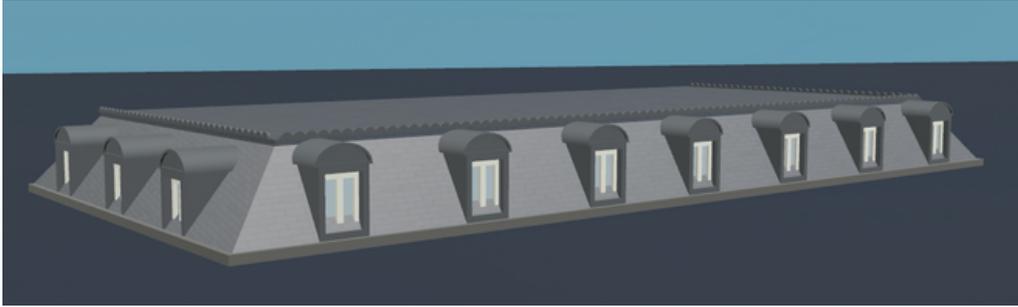
- **Middle floor:**



- **Last floor:**



- **Roof:**

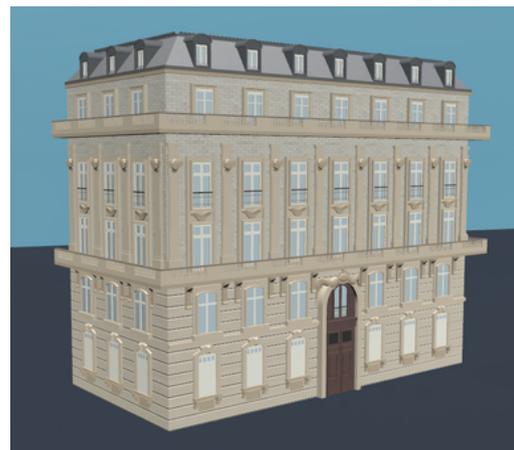


## BEYOND THE REQUIREMENTS AND CHALLENGES

- One of the challenges I encountered was copying the last floor at the top right below the roof only when the amount of floors were an odd number. I did it through HScript using an if statement and bbox to know the height of the existing floors.



Even floors



Odd floors

- I added the option to change the spacing between the windows so that the user can define if there should be more or less windows. All of the floors are using the same value so that the windows are evenly spaced, the structure looks symmetrical and organized, which is a great characteristic of the Haussmann architecture.
- Regarding shading, for some materials I hand painted or modified image textures in Procreate, for some other materials I created procedural textures using noise.
- I tried creating every detail of the building as close as possible, although there are a few elements missing, the structure looks like it truly belongs on the streets of Paris.

## BIBLIOGRAPY AND REFERENCES

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