

Procedural Art

Research document

Kamila Matuszak – 507513

Paris 1789 – AC Unity

CITY LAYOUT

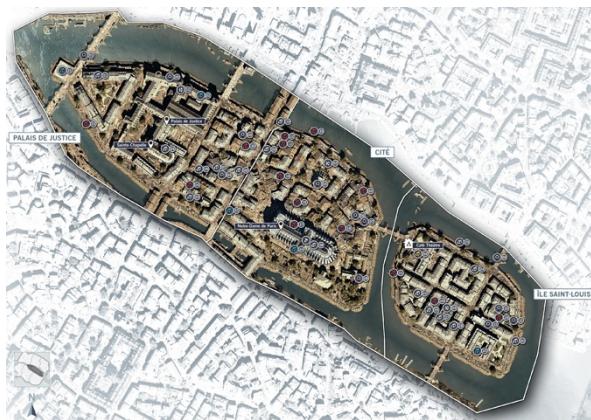


In Assassin's Creed games, the developers put a lot of effort into recreating the real Paris during the French Revolution. They divided the city into seven neighbourhoods, and although they don't have big differences in layout, the buildings vary depending on the area's wealth.

The neighbourhoods aren't clearly separated by any form of borders but are connected by wide roads. What you'll mostly find are narrow and cramped streets throughout the entire city. The buildings are right up against the streets, without any gardens or sidewalks in front of them.

In terms of elevation, the city doesn't feature significant changes in height levels. Most of the city is situated on a relatively flat surface. Most buildings have a similar height, creating a consistent skyline throughout the city. Only the churches and the landmarks stand out with their towers. They can be seen rising above the surrounding buildings, serving as distinctive landmarks.





For my assignment, I selected the Île de la Cité district in the city of Paris. This neighbourhood is divided into smaller sections, and I chose to focus on recreating one of them known as Cité. I chose for this area because, in my opinion, it holds the most significant and iconic object within the city - Notre Dame Cathedral.



The layout of the Cité is not as condensed compared to other areas. The buildings have mostly square shapes, with only a few triangular structures present. These buildings are closely connected, forming a tight structure.

One characteristic feature of the buildings in Paris is the presence of enclosed "backyards." These interior spaces are surrounded by the walls of the neighbouring buildings and create a more private space.

The highlight of the entire Île de la Cité is the Notre Dame Cathedral. The impressive beauty of Notre Dame Cathedral makes it the main attraction in the district, serving as a central visual symbol of the area's rich history and culture.

ARCHITECTURAL ELEMENTS



The buildings in the city are generally tall, consisting of about 3 or 4 floors each. However, it's important to note that they tend to have the same height, apart from churches, which are taller and more imposing.

Many buildings in the city have wooden ground floors. Sometimes this wooden structure can be seen on higher floors, adding a distinctive architectural element.

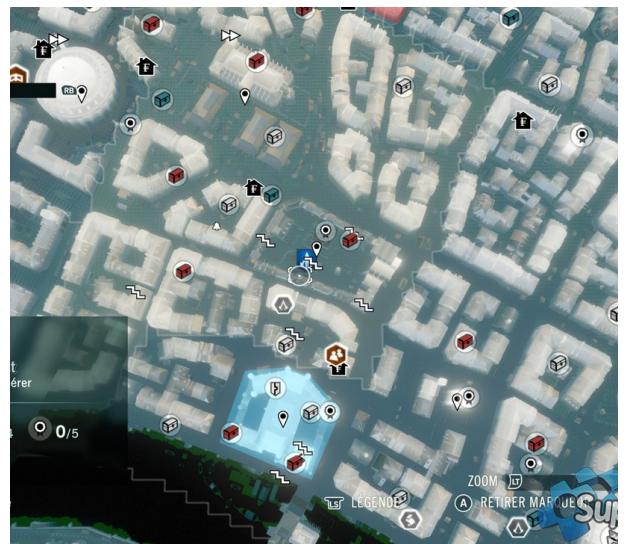
A notable characteristic of the

buildings is the number of windows. They are predominantly square and circular in shape, allowing for natural light to enter the interiors in the cramped city.

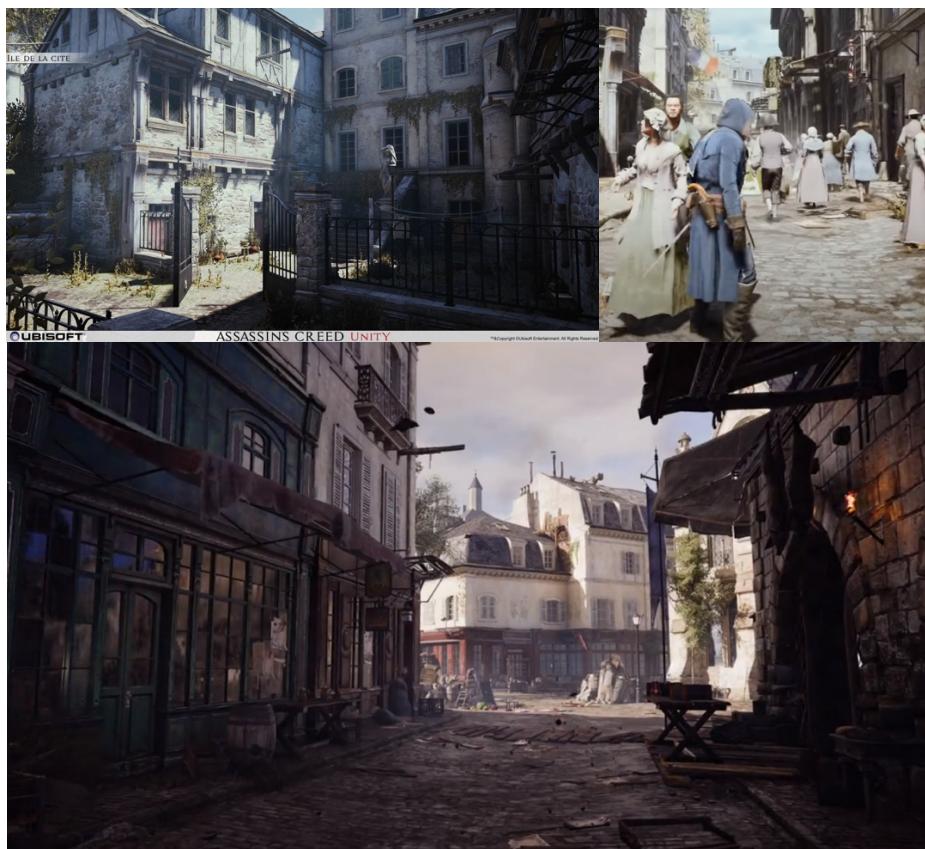
The roofs of the buildings are relatively simple and don't differ significantly from one another. They typically feature chimneys and additional windows, adding to the visual design and functionality of the structures.

The buildings in the city create enclosed areas with empty spaces in the middle. They are often connected and feature gates that provide access to these enclosed spaces. In cases where the buildings are not connected, there is typically a narrow gap between the walls that serves as the entrance.

In terms of architectural design, the buildings primarily have rectangular or triangular shapes. There are no round or curved elements; everything is characterized by straight walls, adding to a more angular and geometric appearance.



MATERIALS

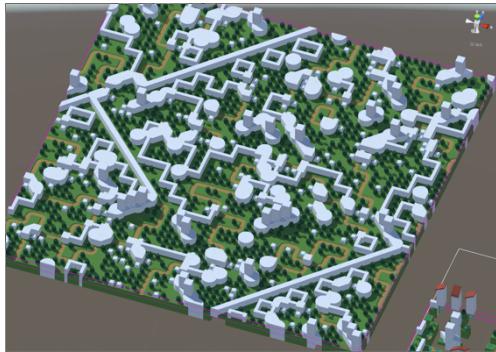


The materials used in creating the Cité district in Assassin's Creed Unity reflect the period of the French Revolution, resulting in a weathered and worn look. The buildings are often covered in dirty and cracked plaster, showing the passage of time. Similarly, the roads feature tiles that have seen better days, exhibiting signs of wear and tear. The roofs of the buildings are made of tiles that occasionally stick out, adding to the unkempt aesthetic. They are often covered in moss, giving them a neglected and forgotten appearance.

As mentioned earlier, some buildings in Cité feature iconic red wooden facades, which make them visually stand out from the predominantly greyish environment. These wooden elements add a pop of colour and contrast to the overall appearance of the district.

NEW PROCEDURAL TECHNIQUE

During my research I encountered a wave function collapse (WFC) algorithm. It is already being used to procedurally generate images and maps. I think it would work perfectly during generation of Paris.



As shown here someone already used the algorithm to procedurally create a city in Unity. This project can be found on itch.io:

<https://selfsame.itch.io/unitywfc>

WFC is an algorithm that takes a reference picture and recreates it in various forms. It's like if user was setting up a vibe that they want to keep, and algorithm was trying to fill the map according to those instructions.

How do I see the implementation of this algorithm?

1. Creating a possible tile set.

First the user would have to create building blocks that could be used by the algorithm. They would need to have a lot of different configurations so the structures can have a lot of variety. During this step there should be also implementation of some constraints since not everything looks good together. (For example: tall parts of buildings should spawn always at the bottom)

2. Implementing the starting part for the algorithm.

Since the WFC takes its “inspiration” from already existing pieces, the user would have to build a part of one neighbourhood as a starting point. It would also help defining the possible city grid.

3. Implementing the WFC algorithm.

The algorithm will start expanding the given piece according to the constraints and the look of the starting part.

4. Iteration and polishing.

The user would probably have to run the algorithm more than once to get the desired effect. It would also be the moment for the small changes to the buildings that didn't generate properly.

I think this technique could result in a fast and efficient creation of big city areas. Of course, it would need a lot of tooling to enable adjustments and possibility of changing the already generated structures. But overall I think it would be a good way of generating the city.