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ORIGINAL

Generation of a 3D environment for a short audiovisual film based on stylised architecture

Generación de entorno 3d para cortometraje audiovisual basado en arquitectura estilizada

Mariano Joaquín Rago Casanova[1]

[1]Universidad Empresarial Siglo 21. Argentina.

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ABSTRACT

Introduction: the project was developed with the aim of creating a stylised 3D environment based on a concept art image. The reference represented a medieval crossroads, influenced by the architecture of Cinque Terre. For its realisation, Blender, Substance Painter and Unreal Engine were used, following a process divided in stages.
Development: firstly, blocking was carried out in Blender, which allowed us to establish proportions and spatial relationships between the elements. Then, we proceeded to the detailed modelling using tools such as loop cut, bevel, array and curve modifiers. Each architectural component was treated individually to ensure accuracy. Once the modelling was completed, the objects were exported to Substance Painter. There, multi-layered textures were applied using generative masks and gradients, simulating materials such as stone and weathered paint. This reinforced the stylised aesthetic based on the original reference. The textured models were then imported into Unreal Engine. In this environment, lighting elements such as Directional Light, Sky Atmosphere, Sky Light and Volumetric Clouds were configured. Finally, a Master Sequence was assembled with virtual cameras to achieve a coherent visual presentation.
Conclusions: the project successfully translated a 2D image into a stylised 3D environment, combining planning, technique and aesthetic sensibility. The iterative methodology allowed to adjust each phase, obtaining a final result faithful to the reference and influenced by styles seen in Luca and Loóna.

Keywords: Modelling; Texturing; Styling; Rendering; Iterative.

RESUMEN

Introducción: el proyecto se desarrolló con el objetivo de crear un entorno 3D estilizado basado en una imagen de arte conceptual. La referencia representaba un cruce de calles medievales, influenciado por la arquitectura de Cinque Terre. Para su realización, se utilizaron Blender, Substance Painter y Unreal Engine, siguiendo un proceso dividido en etapas.
Desarrollo: en primer lugar, se realizó el blocking en Blender, lo cual permitió establecer proporciones y relaciones espaciales entre los elementos. Luego, se procedió al modelado detallado utilizando herramientas como loop cut, bevel, array y modificadores de curva. Cada componente arquitectónico fue tratado individualmente para asegurar precisión. Una vez completado el modelado, se exportaron los objetos a Substance Painter. Allí se aplicaron texturas multicapa mediante máscaras generativas y degradados, simulando materiales como piedra y pintura envejecida. Esto reforzó la estética estilizada basada en la referencia original. Posteriormente, los modelos texturizados se importaron a Unreal Engine. En este entorno se configuraron elementos de iluminación como Directional Light, Sky Atmosphere, Sky Light y Volumetric Clouds. Finalmente, se armó una Master Sequence con cámaras virtuales para lograr una presentación visual coherente.

Conclusiones: el proyecto logró traducir con éxito una imagen 2D a un entorno 3D estilizado, combinando planificación, técnica y sensibilidad estética. La metodología iterativa permitió ajustar cada fase, obteniendo un resultado final fiel a la referencia e influenciado por estilos vistos en Luca y Loóna.

Palabras clave: Modelado; Texturizado; Estilizado; Renderizado; Iterativo.

INTRODUCTION

From a given reference (concept art), the stages for the audiovisual production will be established, generating a 3D environment through modeling, texturing, and rendering tools. Assembling the blueprints in parallel will facilitate the final output. Blender, Substance Painter, and Unreal Engine will be used as software for its development.[1,2,3]

Stylistic References

Concept art:

Source: Koloshina[1]
Figure 1. Background environment, concept

In the referenced digital piece (concept) compositional criteria related to a stylized aesthetic are observed, representing a crossroads of streets between medieval-style buildings of the sector of the Italian coast identified as Cinque Terre (consisting of a series of villages), two or three levels, showing an arch over one of the streets that open in the front towards a horizon.[4,5] The materials used in the buildings observed are stone, mud, and wood for the openings, with the addition of pigments for color, and narrow cobblestone streets, possibly intended for pedestrian use.[6,7] It is also observed that the presence of vegetation and elements, as well as tools, can be inferred to indicate that the first floor is the commercial sector, and the upper floors are residential.[8,9]

The worked scales are realistic, within the stylized style. The shapes (and light information, which represents a sunny day) tend to be representative of reality, while the textures suggest a style leaning towards the "cartoon" aesthetic.[10]

Background

Luca (Enrico Casarosa, 2021) is a Disney/Pixar film that shares criteria with the analyzed concept, both in its shapes, colors, and textures, as it is also based on the aesthetic characteristics of the same geographical area, such as narrow streets, medieval houses, and saturated pigments on the walls.

Figure 2. Luca (Enrico Casarosa, 2021)

Up (Pete Docter, 2009), also produced by Disney/Pixar which, although set in another geographical area, has an aesthetic criterion similar to the one we worked on, in terms of the stylization of the characters, above all, and the environment, which is what concerns us.

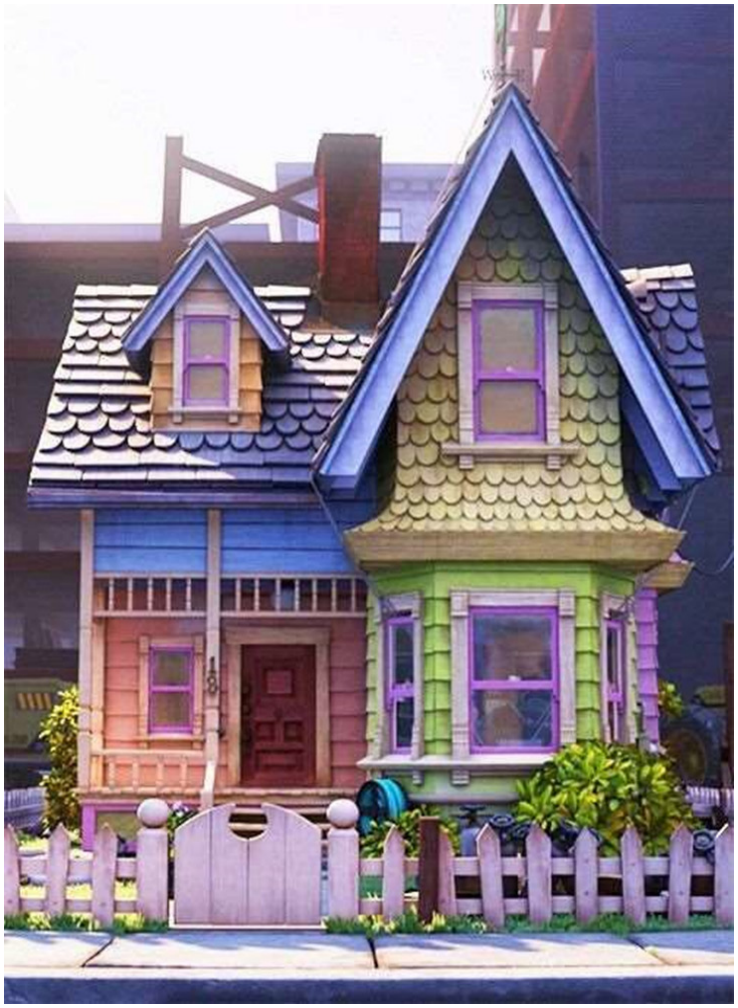

Figure 3. Up (Pete Docter, 2009)

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On the other hand, Loóna (Trace Studio, 2021) is an app developed with the aim of providing relaxation experiences to users through auditory, visual, and cinematic resources, presenting an interface visually related to our aesthetic search.

Regarding this last reference, we want to note that we found in the visual proposal of this application a similar result to our search, with the development of the 3D proposal based on the 2D reference provided.

Figure 4. Loóna (Trace Studio, 2021)

METHOD

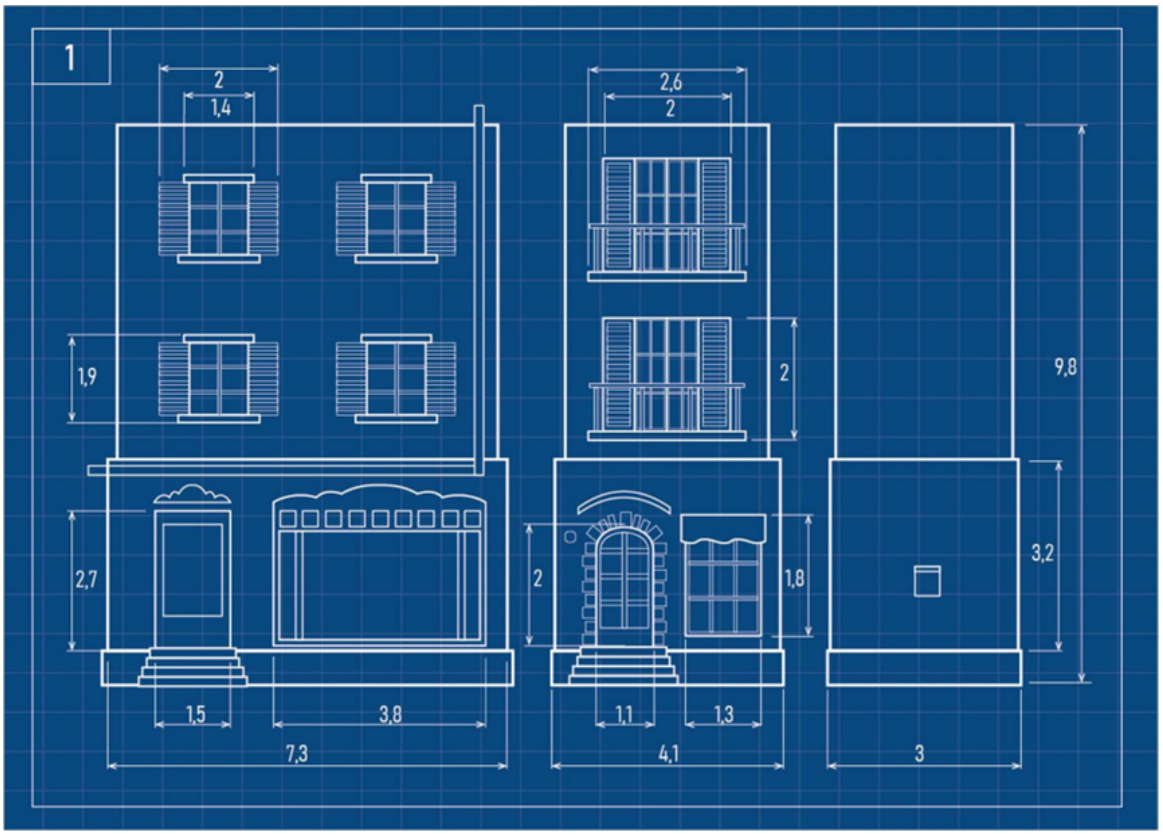

Figure 5. Blueprint

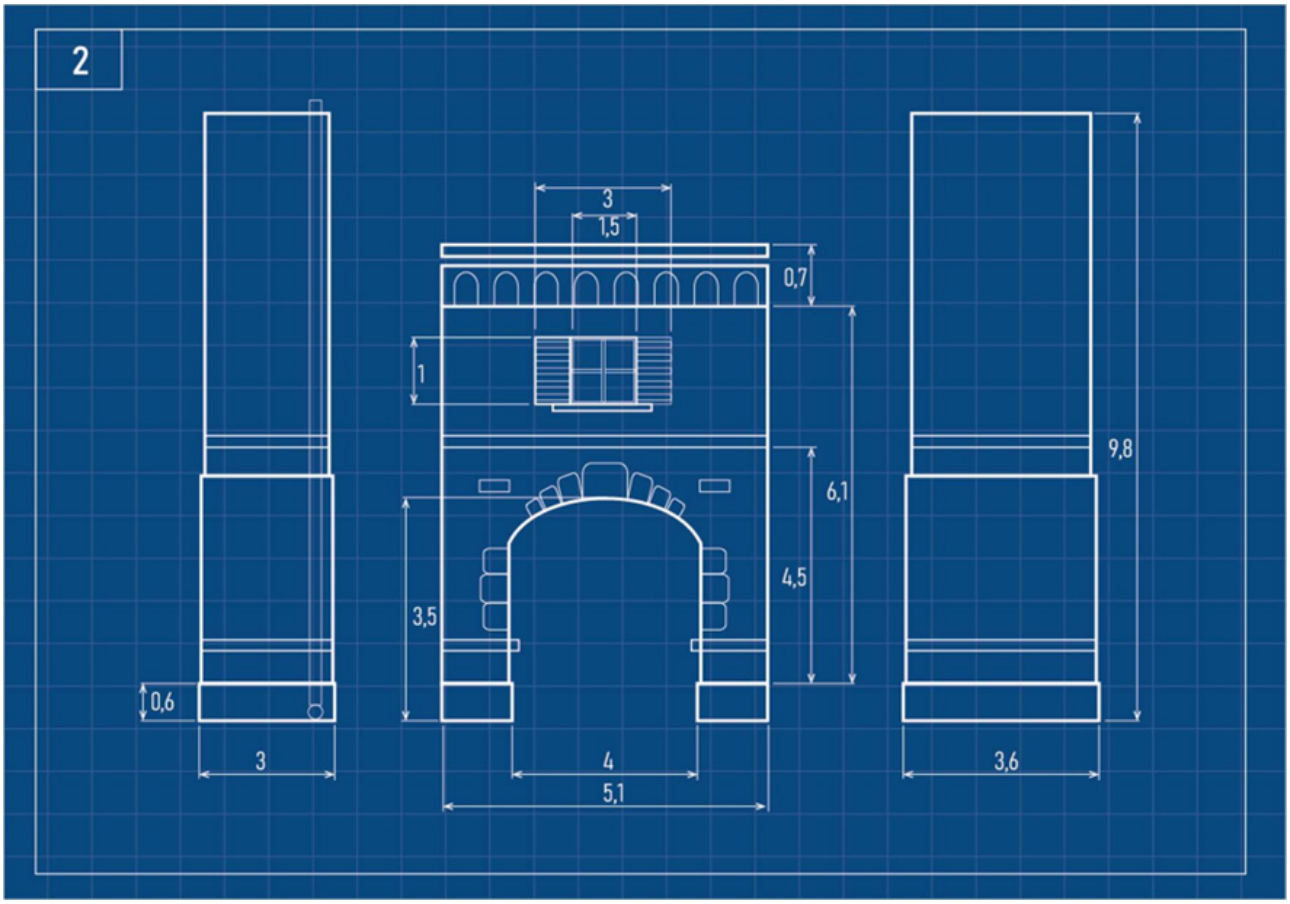

Figure 6. Blueprint

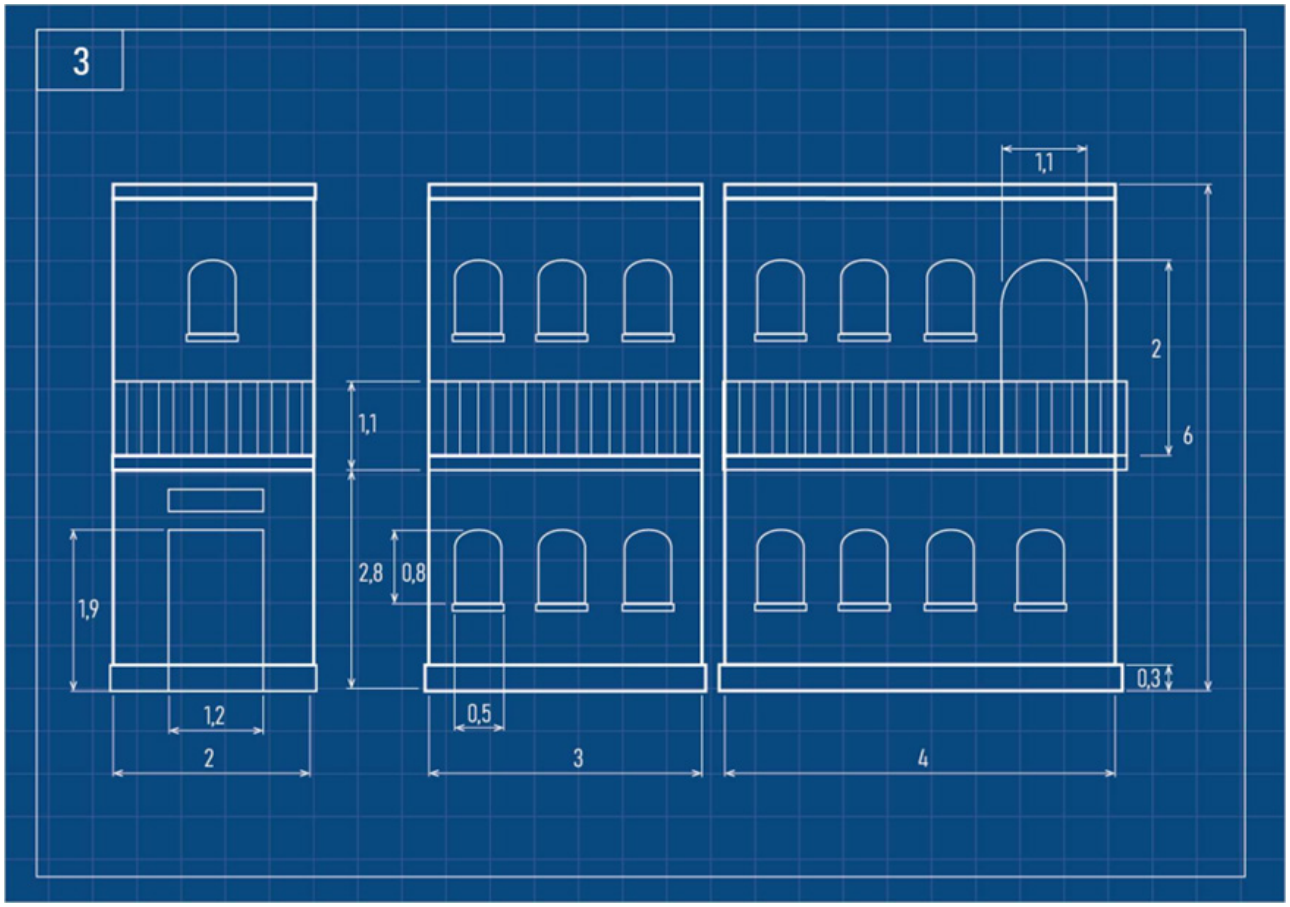

Figure 7. Blueprint

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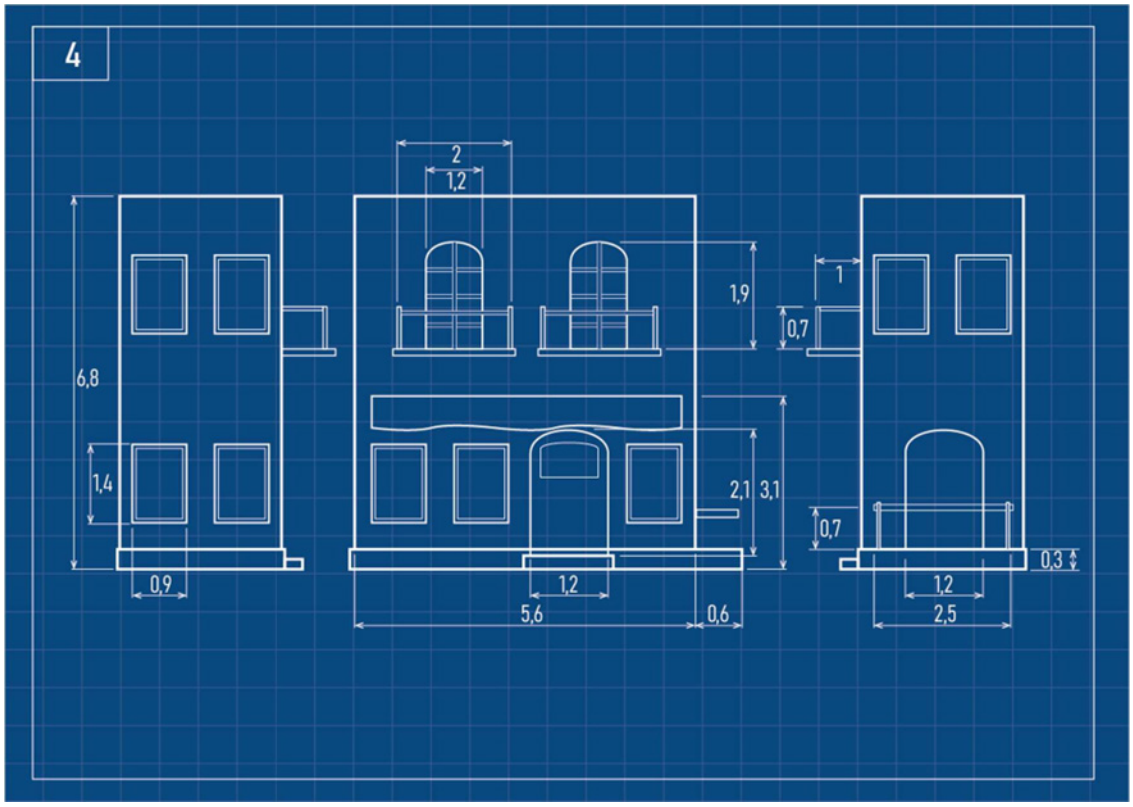

Figure 8. Blueprint

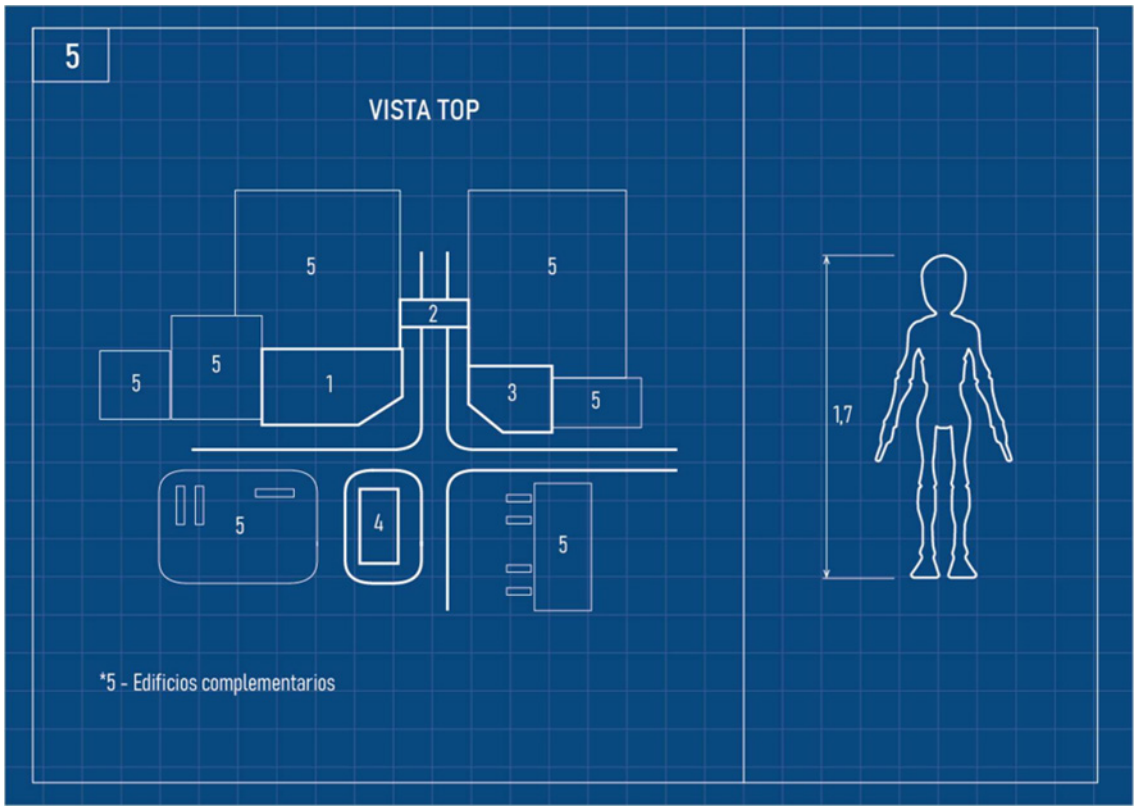

Figure 9. Blueprint

The production process of a stylized 3D environment, based on a concept art image, was structured into different phases that integrated specific modeling, texturing, and integration tools in real-time, using Blender, Substance Painter, and Unreal Engine software. The applied methodology focused on an iterative and modular development logic, allowing detailed control of each element that composes the scene.

The first stage consisted of volumetric blocking within Blender to establish the relative scale between

architectural objects and verify the correct spatial arrangement of the elements. This step enabled us to identify potential volumetric conflicts and validate the overall proportion of the environment. Next, a basic lighting test was performed, using a directional light source to simulate solar conditions. This operation enabled the evaluation of the coherence of the shadows cast and the detection of possible absences of built mass.

Subsequently, each architectural element was modeled in detail. From the initial blocking, models with a higher level of complexity were generated, using tools such as loop cut, bevel, array, and curve modifiers, which facilitated the creation of elements with stylized and detailed geometry. Each architectural component (doors, windows, curbs, vegetation, etc.) was modeled individually, allowing for greater precision in the final distribution of assets and optimizing the subsequent texturing process.[11]

Once the modeling was finished, the individual elements were exported.FBX format to be processed in Substance Painter. In this environment, texture bakes were generated, and multilayer materials were used to replicate textures such as stone, aged paint, and wood. Generative masks and chromatic gradients were employed to enhance the stylized character of the environment, drawing inspiration from visual references in conceptual art and audiovisual productions, such as Luca (Casarosa, 2021) and Loóna (Trace Studio, 2021).

With the textures applied, the models were imported again to Unreal Engine, where a new level (Level) was created from scratch. Ambient lighting actors, such as Directional Light, Sky Atmosphere, Exponential Height Fog, Sky Light, and Volumetric Clouds, were incorporated to achieve a coherent atmosphere for the represented daytime scene. Subsequently, a base landscape was built, and the modeled elements were dragged with their hierarchy preserved from Blender. We proceeded to create materials within Unreal, linking the previously worked textures.[12]

Finally, a master sequence (Master Sequence) was configured with multiple virtual cameras, establishing the shots and parameters of framing and duration. The cameras were based on presets that emulate absolute optics, ensuring a fluid and coherent visual narrative with the proposed aesthetic style. This sequence was rendered directly in Unreal, generating the final audiovisual piece ready for analysis and evaluation.

RESULTS AND DISCUSSION

Modeling

The first step in this process begins with the generation of the 3D space starting with a blocking, in order to check that the scale used works correctly, i.e. that the buildings do not overlap each other, that the size of any of them is disproportionate to the rest, or that the individual pieces that make up a larger object correspond to where they belong.

Figure 10. Blocking

Next, a basic lighting test is performed to try to represent the reference as faithfully as possible, illuminating the scene with direct light and generating shadows cast by the buildings on other similar ones. The objective of this step is to have a notion of the information about the buildings that are in the scene, since, if there is no surplus, it is deduced that there is no building. This also helps to corroborate whether the scales of the objects are optimal.

The next step is the modeling of fine details. Starting from blocking, using the exact measurements, to generate a much more detailed environment, mainly following the reference.

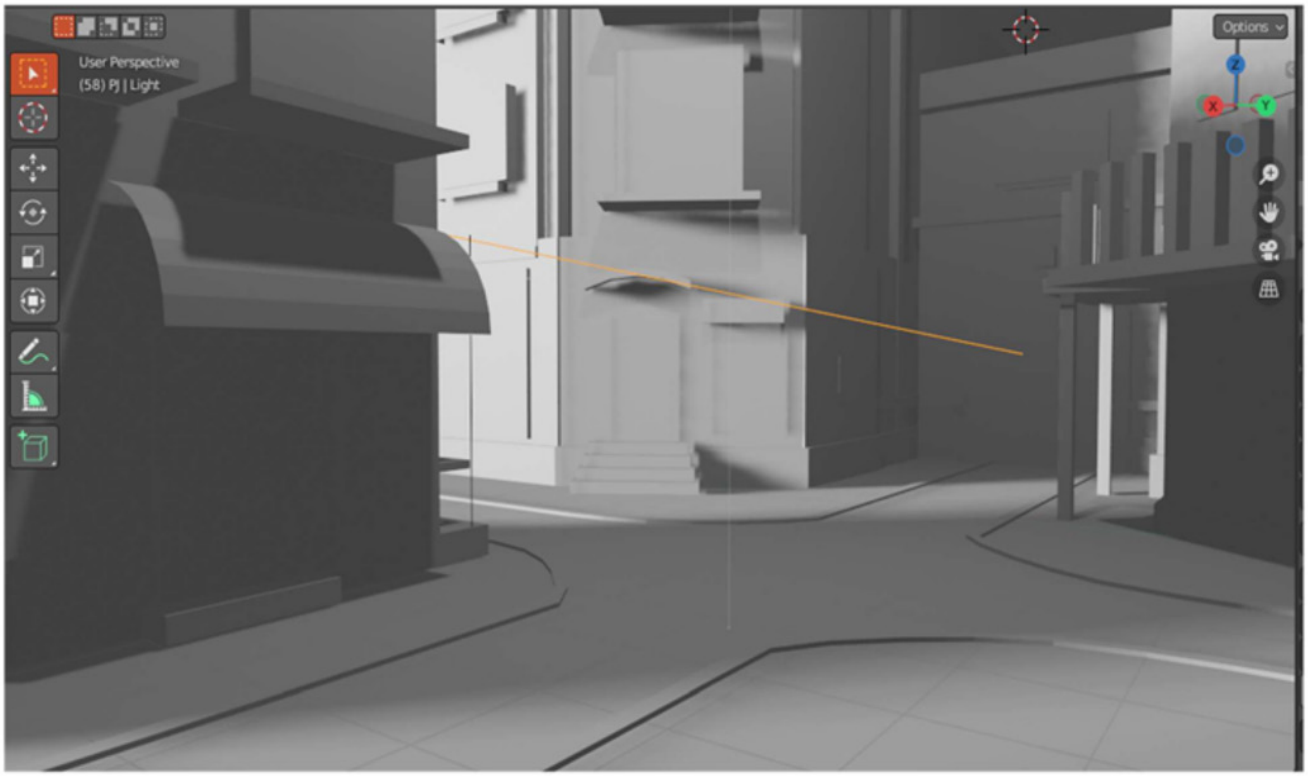

Figure 11. Ilumination

Figure 12. Modeling

At this stage we treat the elements that make up a building independently, to have greater control of the details. Assets.

Figure 13. Assests

Let's take for example the realization of a door, starting from a prism, we use the tool "loop cut" to generate a edge in all its faces. Then to the

edge is then beveled to create the curvature of the upper frame. This technique was used for almost any curve in the composition.

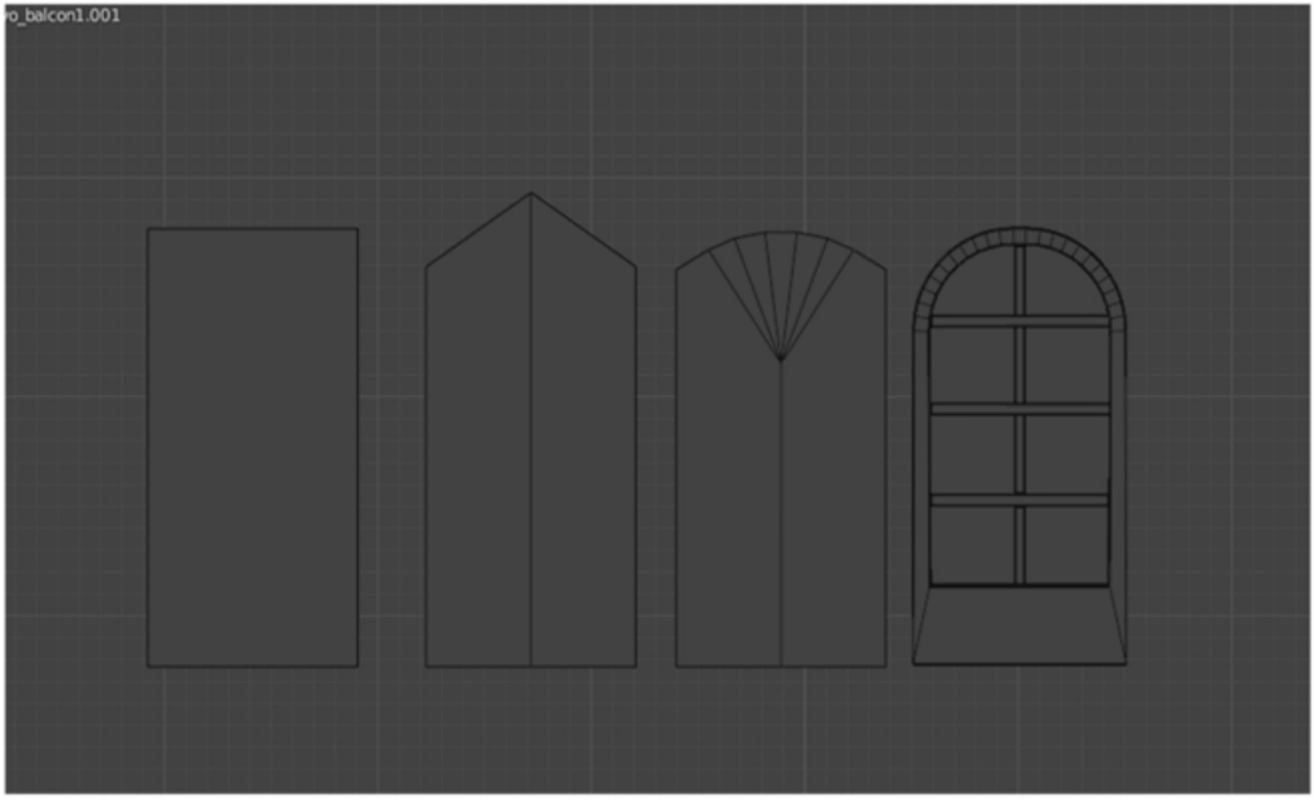

Figure 14. Openings

Another widely used tool is the "array", which allows to generate copies of the same element with the ability to configure the distance between them.

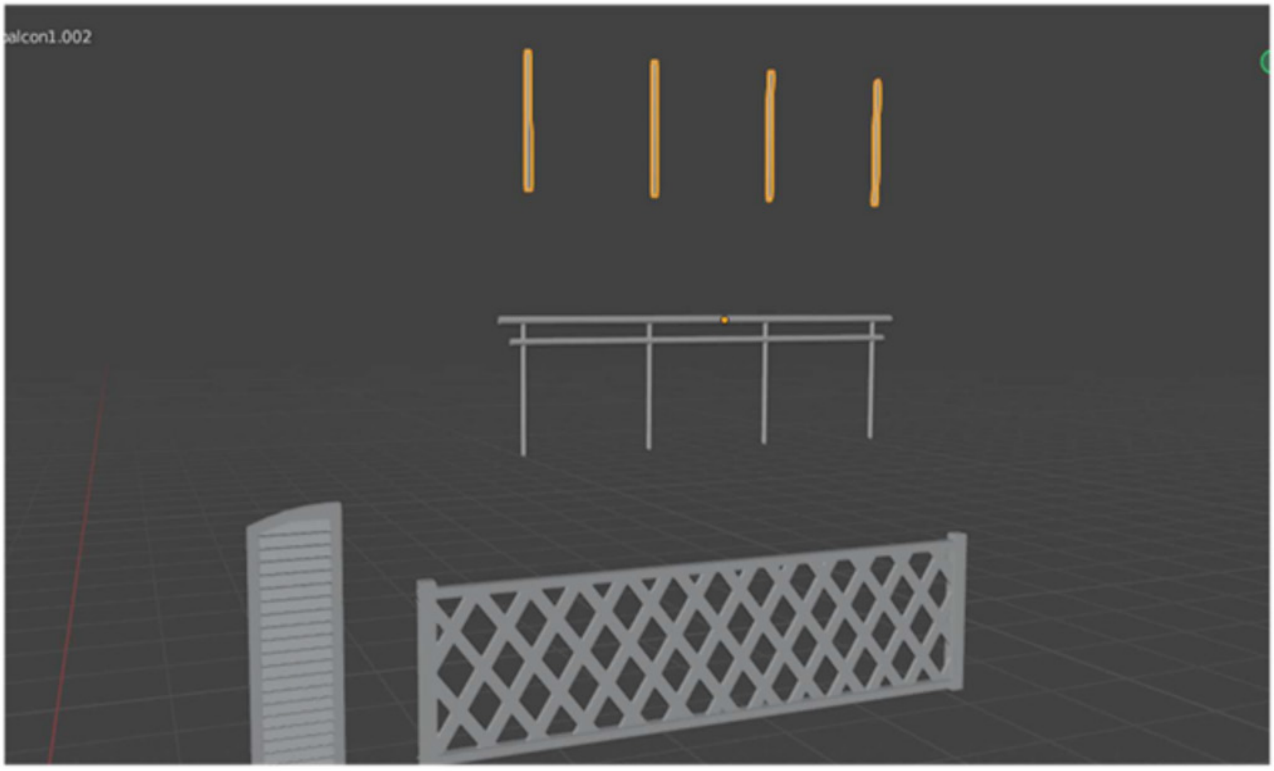

Figure 15. Patterns

Curves (modifier "curve") are another element to be highlighted, since it allows, through a stroke, to generate this type of shapes quickly. For example, following a curve movement with an object, as is the case of the bricks that make up the curb of the street.

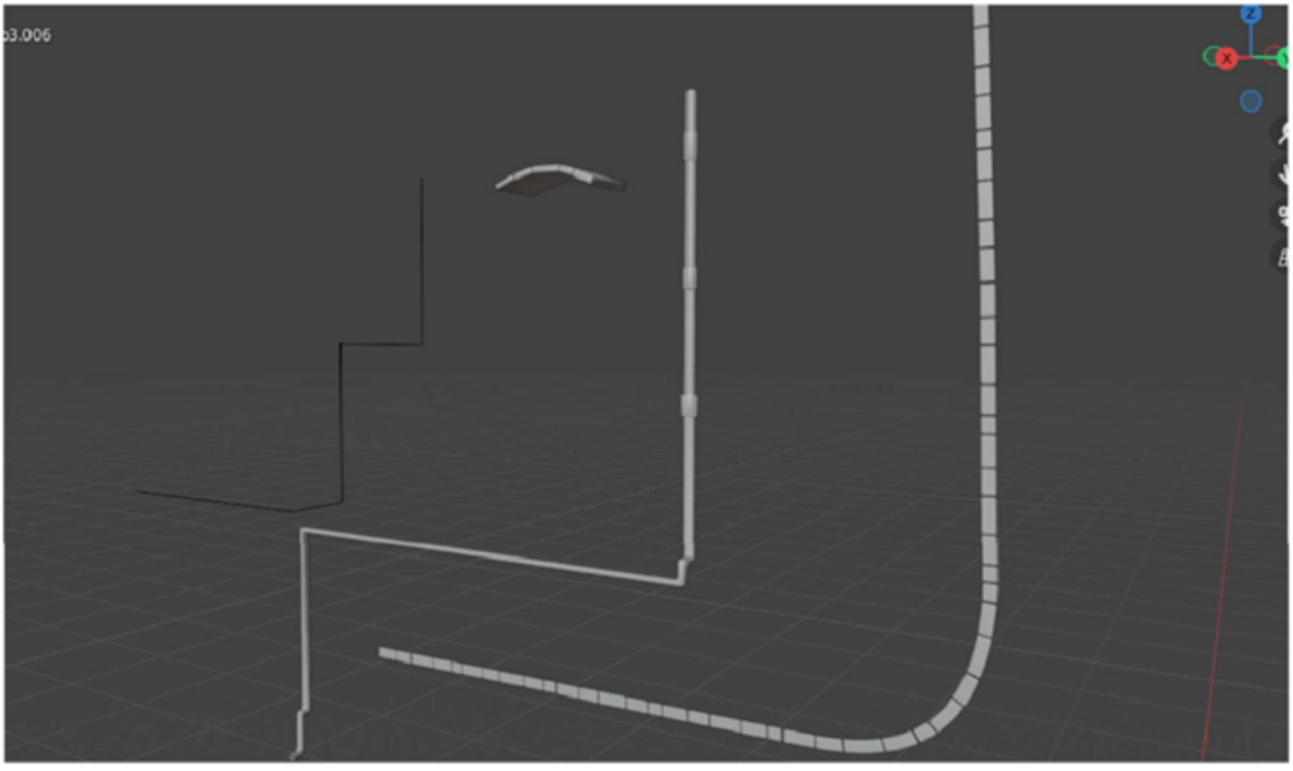

Figure 16. Curves

Once the elements have been made individually, we position them following the composition of the reference scene.

Figure 17. Final modeling result

Textures

The first step to perform at this stage is to export under the extension. FBX each of the elements that make up the buildings. In this way we work independently all the materials of which they are composed.

Once we have the elements ordered, we will use Substance Painter. In this software the files are imported one by one.

Once we have imported our first accessory, we must generate a bake to the textures as a first step.

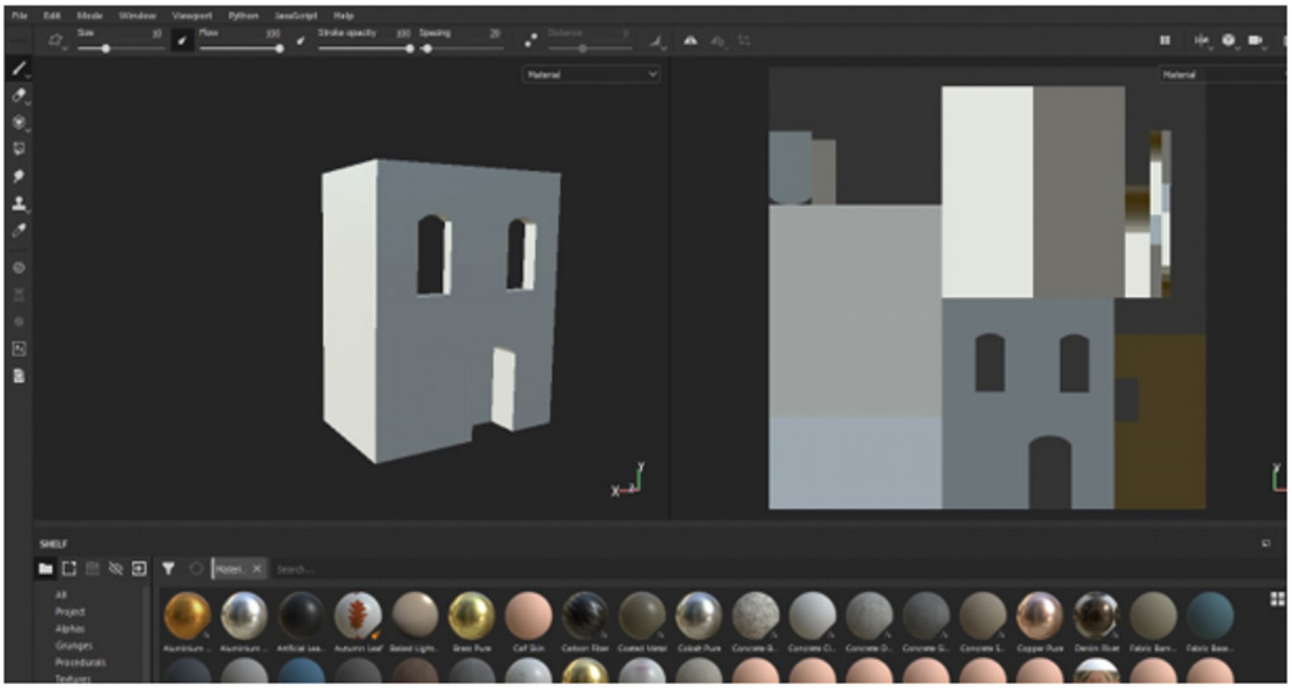

Figure 18. Textured

The next step is to add a base material to the piece. In this particular case it is a thin concrete. Remembering that Substance works in layers, we will place on top of it a layer of filler simulating the green base paint.

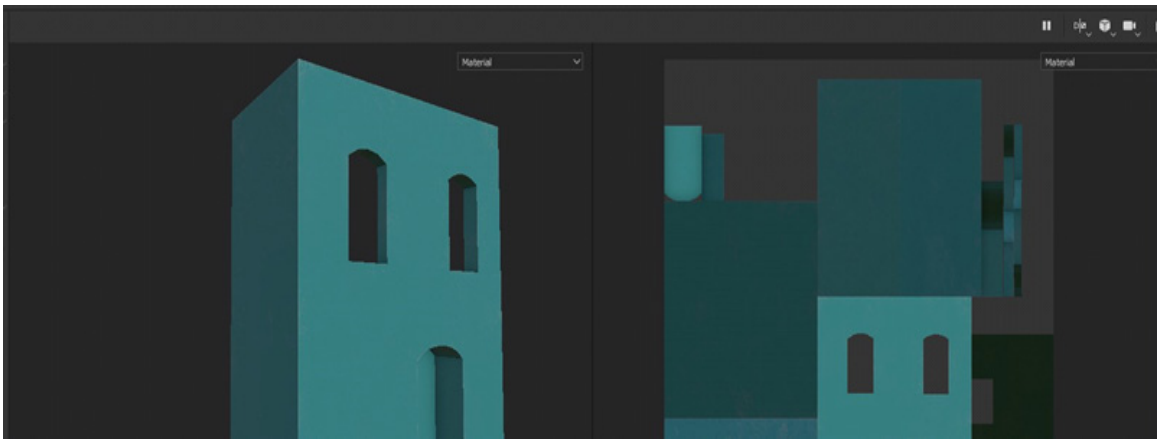

Figure 19. Texturing

By creating a new layer and adding a mask together with a generator we can give wear to the paint, thus simulating a greater credibility in the piece.

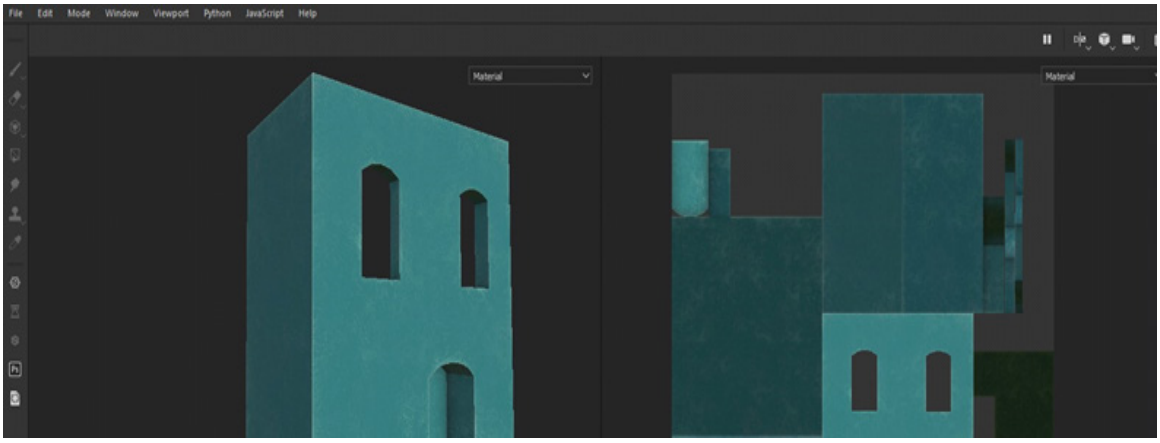

Figure 20. Texturing

One of the characteristics of a stylized object is that it usually has a gradient in its base color. Here we see it applied.

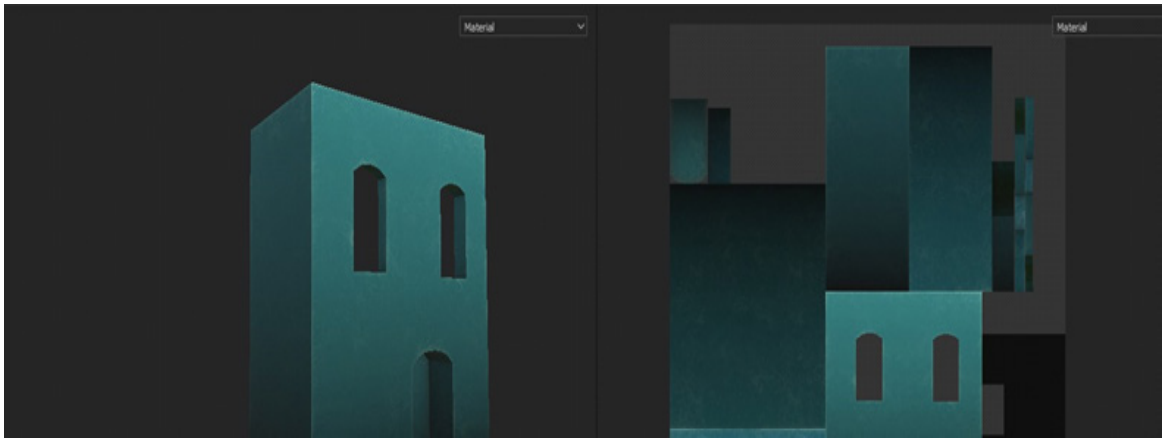

Figure 21. Texturing

Finally, we generate more wear on the paint, emphasizing the corners, which by logic is where the paint is more likely to wear.

This process is similar in most of the elements of the scene.

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Figure 22. Final result of texturing

The last step is to export the textures for later use in Unreal.

Lights and final composition

As first instance we create a new Level; this level by default comes in Empty mode. There are no actors interacting with each other. That is, there is no information in the level.

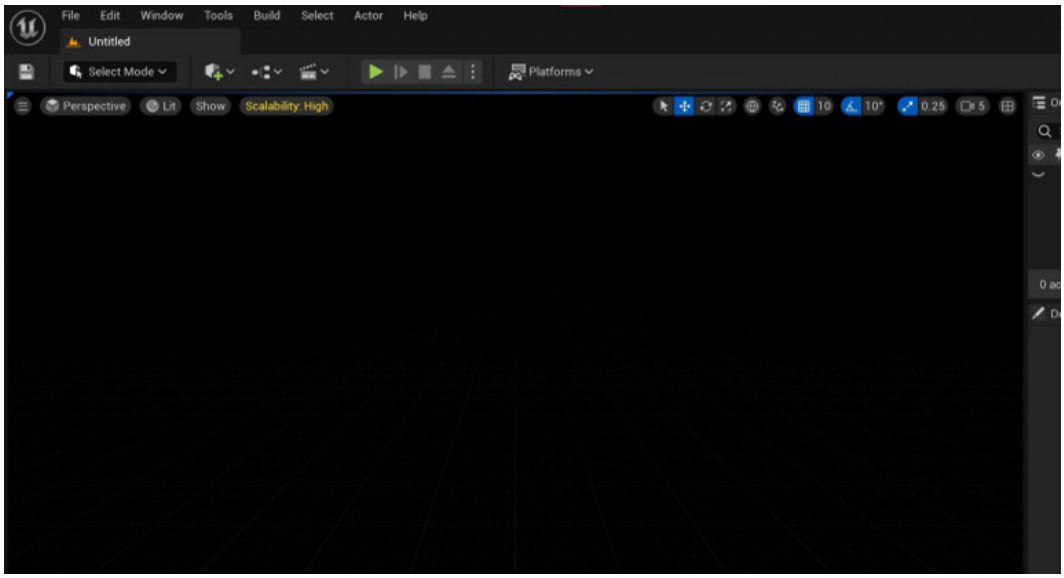

Figure 23. Illumination

Following this, a directional light is created. In its parameters, we find “Atmosphere Sun Light”. By checking this box, we inform the software that we want a dynamic light and that it should represent sunlight.

The next thing is to create a “Sky Atmosphere”; with this actor, we can visualize the sky. At this point, we have a significant contrast between the sky and the ground that we can reduce through the “Exponential high fog” option.

Then we must create “Sky light”: it is a light that mimics the appearance, light, and reflections of the sky.

And finally, we add the clouds through “Volumetric cloud”. Thus, we achieve global illumination straightforwardly and effectively.

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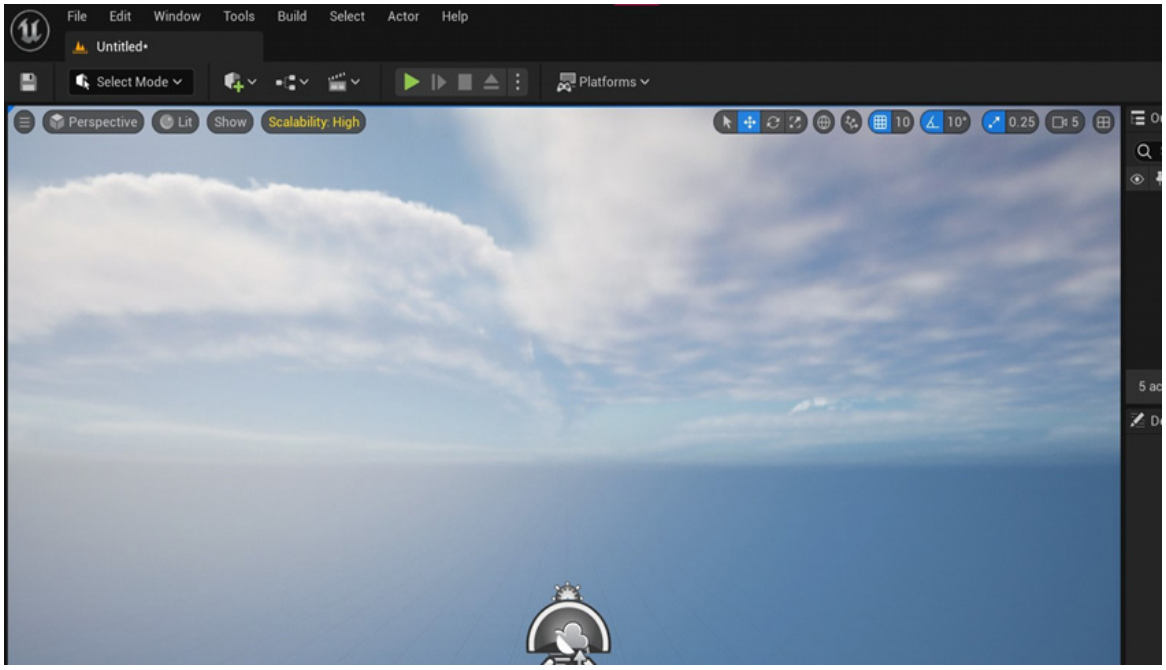

Figure 24. Result with the actors involved

At this point, we will continue creating a landscape, which is the surface where we will place our objects.

The next step involves importing the .FBX files generated by Blender, combined with textures imported from Substance Painter.

We begin by selecting all the elements associated with a building. One of the facilities that Unreal offers is that by selecting all the chosen objects and dragging them to the main screen, they will be displayed in the same order in which they were viewed in Blender.

Figure 25. Import

Having the element imported in its entirety in a single step, the next step is to create the corresponding materials.

The material must be composed of the imported textures and once created we drag it over the element to which it corresponds.

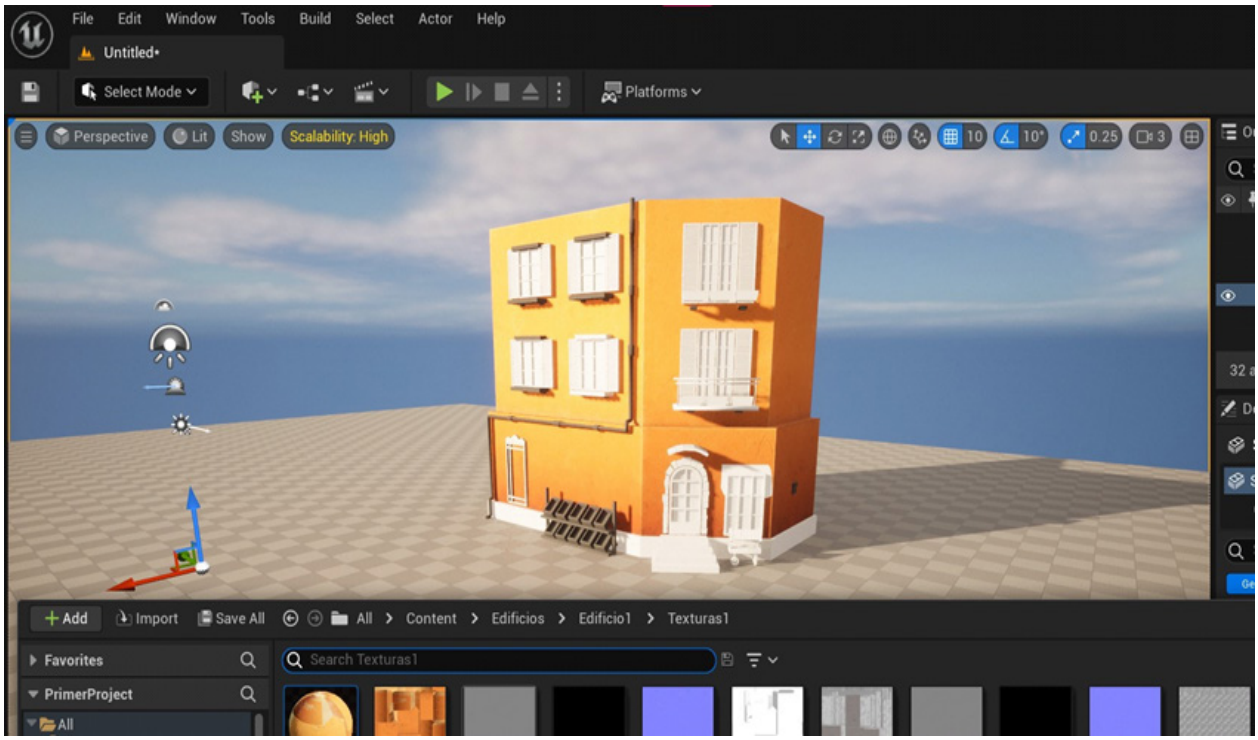

Figure 26. Materials

Following the same steps, the other materials are created.
Once all the actors involved (lights, shades, textures) are in place, we are left with something like this:

Figure 27. Complete composition

And we conclude by adding and configuring a Master sequence.

Once inside the Master sequence, we indicate the number of shots (cameras) that we are going to use along with the duration of each one.

The camera configuration is very simple, since Unreal has presets of cameras that simulate the real ones and selecting one of them we only have to frame the shot with each of the cameras created.

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Figure 28. Camera

Thus, everything is ready for subsequent rendering.

The development of a stylized 3D environment from a conceptual art image involved a rigorous technical and artistic process, which combined various tools and methodologies of contemporary digital audiovisual production. Throughout the project, a two-dimensional reference was effectively transferred to a three-dimensional space, respecting both the original aesthetics and the technical parameters required by the platforms used. This process showed the importance of planning in stages, from the initial blocking to the final rendering.

The use of specialized software, such as Blender, Substance Painter, and Unreal Engine, allowed for the achievement of a highly detailed, functional, and coherent result that aligned with the initial aesthetic intentions. Blender was essential for the modular and precise modeling of the architectural elements, facilitating individualized control of the assets. Substance Painter provided a flexible working environment that allowed for the generation of complex textures using layers, generative masks, and gradients, resulting in objects with a stylized yet plausible appearance. Finally, Unreal Engine enabled the integration of all components in real-time, adding lights, fog, sky, and volumetric clouds, which generated an enveloping atmosphere that was coherent with the visual narrative.

One of the most remarkable aspects of the project was the fidelity to the stylized style of the reference image, achieving a balance between the realistic representation of the shape and the cartoon treatment of the textures. The decisions made in terms of lighting, composition, and camera use also contributed significantly to reinforcing this visual identity, connecting the final result with recognized referents such as Luca and Loóna.

In addition, the iterative methodology applied allowed us to progressively adjust and improve each stage of development, correcting any possible mismatches in scale, composition, or texture before moving on to later phases. This strategy ensured a polished final product, both in its technical and expressive dimensions.

In conclusion, this project not only successfully recreated a stylized 3D environment based on concept art but also served as a comprehensive learning instance on the workflow of digital scenery creation. The synergy between software, methodology, and aesthetic sensibility was key to achieving a visually appealing, technically sound, and conceptually coherent result with the initial image.

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None.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

AUTHORSHIP CONTRIBUTION

Conceptualization: Mariano Joaquín Rago Casanova.
Data curation: Mariano Joaquín Rago Casanova.
Formal analysis: Mariano Joaquín Rago Casanova.
Research: Mariano Joaquín Rago Casanova.
Methodology: Mariano Joaquín Rago Casanova.
Project Management: Mariano Joaquín Rago Casanova.
Resources: Mariano Joaquín Rago Casanova.
Software: Mariano Joaquín Rago Casanova.
Supervision: Mariano Joaquín Rago Casanova.
Validation: Mariano Joaquín Rago Casanova.
Visualization: Mariano Joaquín Rago Casanova.
Writing - original draft: Mariano Joaquín Rago Casanova.
Writing - proofreading and editing: Mariano Joaquín Rago Casanova.