

Task 1: 3D car modeling

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Introduction

The goal of this part of the semester project was to create a digital 3D model of a car that can be used in the Unity game engine and that meets all the requirements of the assignment. I chose the Chevrolet Corvette C5 for modeling because it has distinctive body shapes, interesting surface transitions and typical features such as round rear lights and side air intakes.

Assignment and fulfillment of requirements

According to the assignment it was necessary to:

- model the car based on reference materials
- model only the exterior, with the body and chassis represented by a single 3D object
- create small details such as logos, air inlets, openings, exhausts and other complex features as separate objects suitable for later baking into a normal map
- create only one wheel geometry and share it between all four wheels
- use modifiers during modeling, for example Mirror and Subdivision Surface
- use smooth shading or auto smooth and set sharp edges where needed
- set the object representing the body and chassis as the parent of the wheel objects

My final 3D model of the Corvette C5 fulfills all of these requirements. The body and simplified chassis are merged into one object, the details are separate mesh objects, there is only one basic wheel geometry shared by all wheels and the object hierarchy is set so that the body is the parent of the wheels.

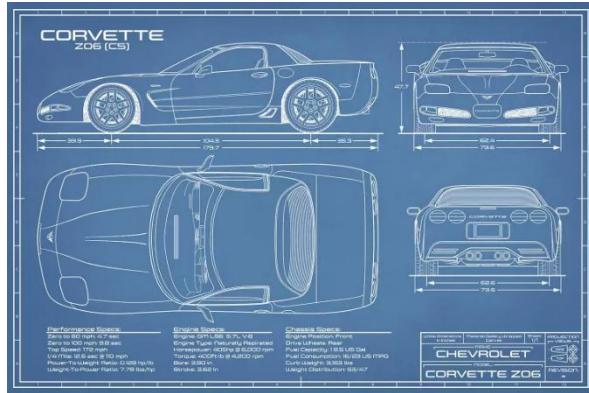
Time requirements

I spent approximately 30 hours creating the 3D model, including experimenting with different approaches and making corrections.

Reference materials

As the main source for the proportions and shape of the body I used a blueprint of the Chevrolet Corvette C5 with front, rear, side and top views. I downloaded the blueprint from the following web site:

<https://www.icanvas.com/canvas-print/corvette-c5-z06-blueprint-abp28#1PR3-24x16>



To capture characteristic shapes and details I also used several sets of photographs of the Corvette C5 taken from different angles.



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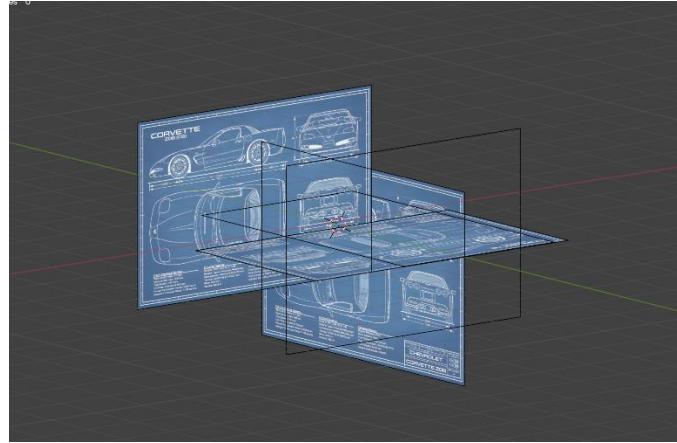
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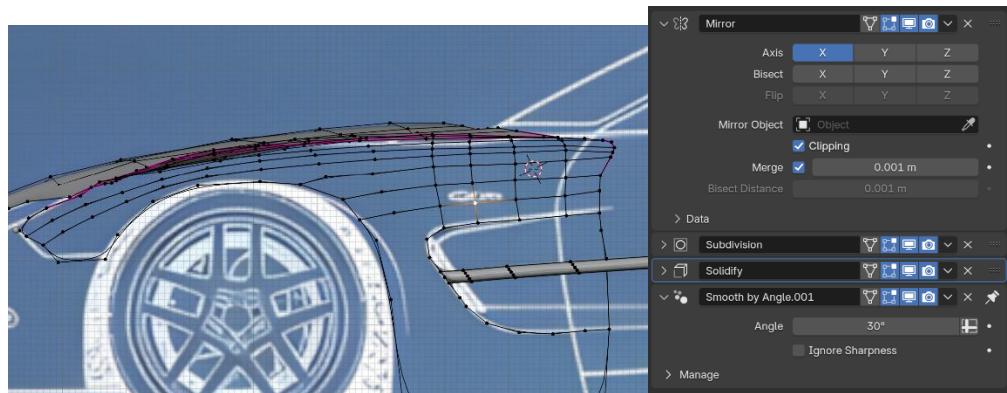
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In Blender I placed the reference images so that in each orthographic view I could see the corresponding side of the car. This allowed me to continuously check the silhouette and the main curves of the vehicle while modeling.

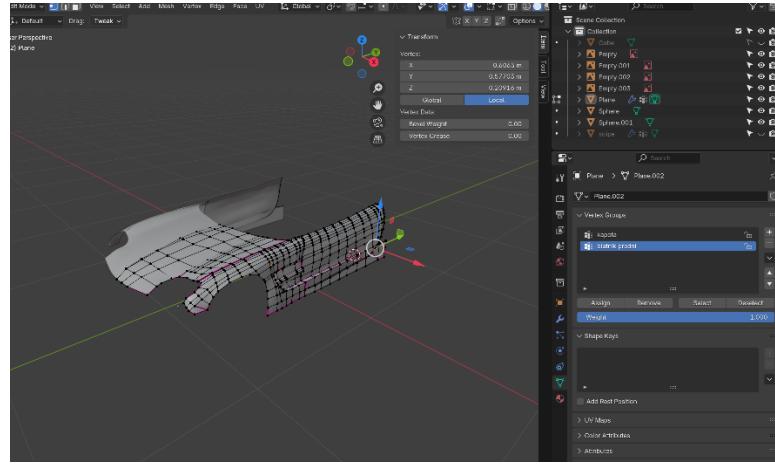


Car body modeling process

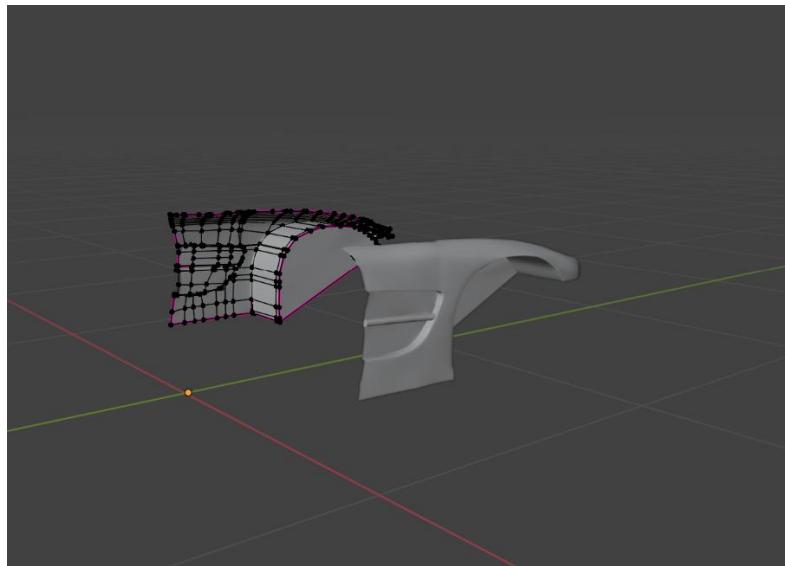
I started the modeling by placing a simple plane in the hood area in the side view. Right at the beginning I added a Mirror modifier with Clipping enabled to keep the model symmetrical and to work on only one half.



From this initial plane I gradually built the rest of the car. By adding loop cuts, moving vertices and extruding faces I shaped the front fenders and the doors. I constantly compared the shape with the silhouette from the blueprint in the side, front, rear and top views and focused mainly on the strongly shaped fenders that are typical for the Corvette.



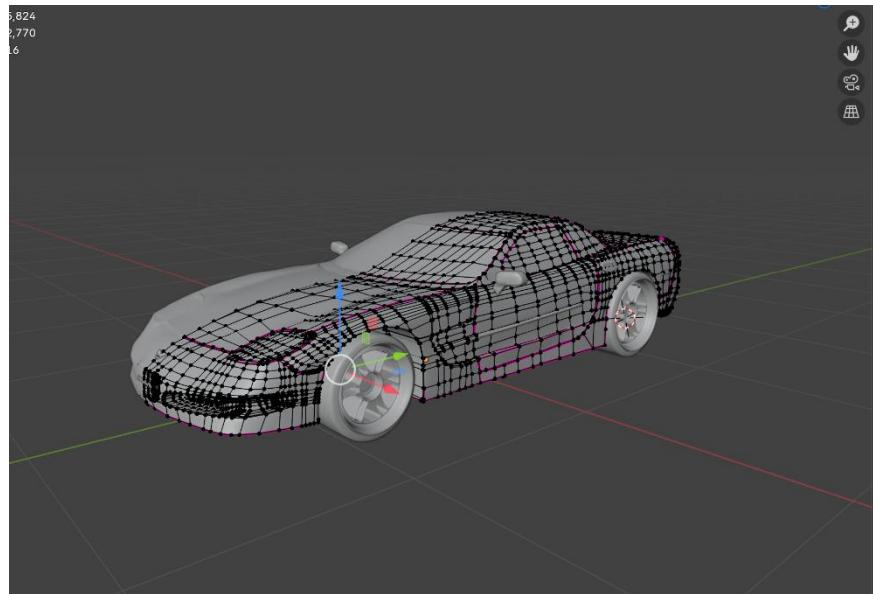
Once the basic volume was finished I tried to model the complex part on the front fender. It is an air intake from which a strong character line runs across the entire door. This feature is very characteristic for the Corvette C5, so I paid special attention to it.



I modeled the body step by step in larger sections in the following order: hood, front fender, door, rear fender, trunk, rear bumper, front bumper, windshield, side window in the door and finally the rear window. During the work these parts were separate objects, which made it easier to edit them and control the shapes. In the final stage I joined them into a single object representing the body and chassis.



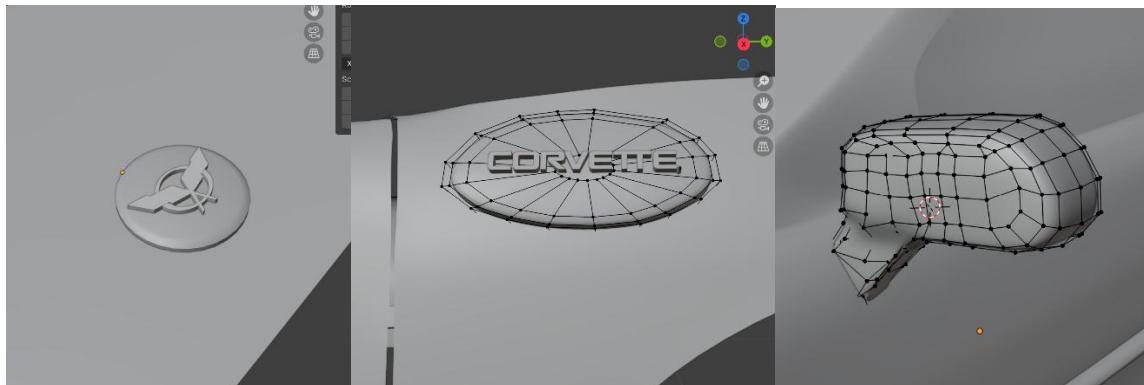
On the edges where separate body panels meet on the real car I used crease with a value of one in combination with Subdivision Surface. This way the visible gaps between the panels remain readable, but the mesh is technically a single object and satisfies the requirement of the assignment.



Body and exterior details

After completing the main body volume I added a number of details that are typical for the Corvette C5 and will be useful for later normal map creation.

- I created the side mirrors as separate objects. They are built from simple base shapes that I further refined using Bevel, Extrude and vertex editing so that they match the shapes from the references.
- I modeled the exhausts as hollow tubes starting from cylinders. I beveled the edges and adjusted their diameter and length to match their position in the rear bumper.
- I created the fuel cap with the Corvette text so that this detail is present in the model and can later be emphasized through texturing.
- On the rear bumper I added characteristic shapes, edges and openings based on references, including the area for the exhaust tips and the forms around the rear lights.
- On the front bumper and on the trunk I added the Corvette logos as separate objects, which allowed me to place them accurately and later use them during normal map baking.
- On the front bumper I also modeled the typical Corvette license plate frame with the Corvette text that is often located in the center of the bumper on this model.

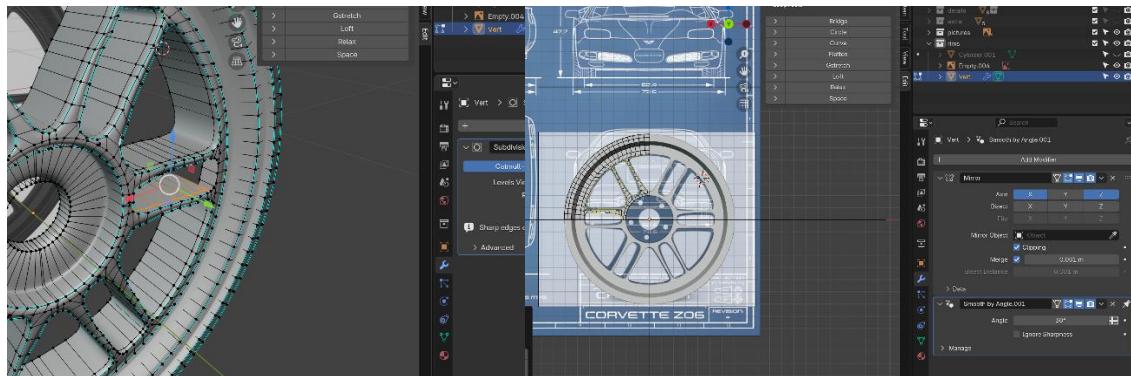


The round rear lights are one of the iconic features of the Corvette C5. First I shaped the openings in the body and then placed separate light objects into them. These lights have the correct basic shape and position according to the references, but their internal detail will be added later through textures.



Wheel and tire modeling

I tried to design the wheels so that they fit the sporty character of the car. The rim is not an exact copy of the original Corvette C5 rim, but it is inspired by a sporty multi spoke design. I started from a cylinder and by extruding, scaling and using Inset I created the shape of the rim with spokes and the central part.



The tire in the current version of the model is a smooth volume without modeled tread. I focused on achieving the correct width and profile of the tire according to references, and the tread will later be created using a texture and normal map. For the basic shape of the tire I used a profile repeated along a circle, but the final mesh is smooth and does not contain a geometric tread pattern.

Scene organization and tools used

For the work in Blender I used several tools and modifiers.

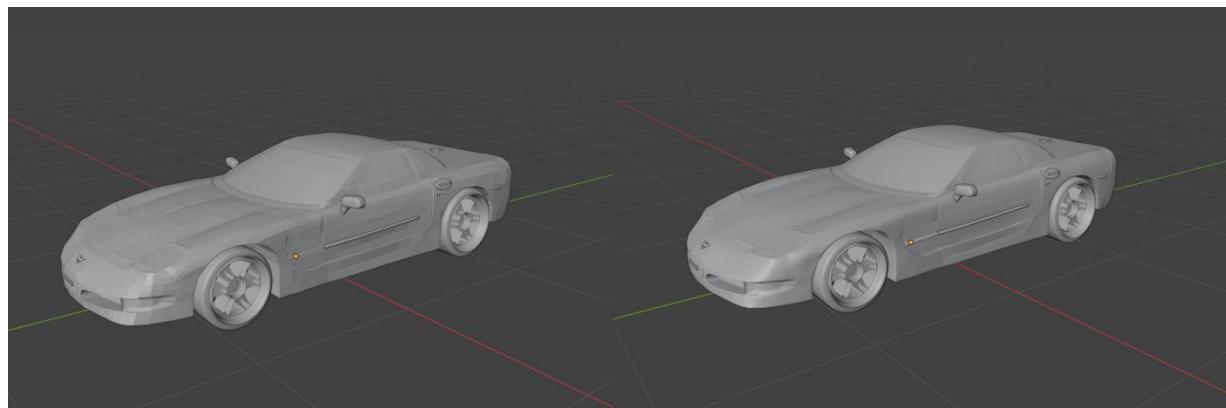
- Mirror for symmetry of the model, most of the time with Clipping enabled so that vertices along the center line are merged automatically
- Subdivision Surface to smooth the body, wheels and some details
- Auto Smooth and manual marking of sharp edges to achieve correct shading
- classic modeling tools such as Extrude, Inset, Loop Cut, Bevel, Knife and edge or vertex sliding

To keep the model organized I also used vertex groups. Individual groups of vertices allowed me to hide specific parts of the geometry and focus only on the area I was currently editing. I modeled the car piece by piece and only at the end I merged these parts into a single main body and chassis object. On the edges of these parts I set crease to a value of one, so even after merging into one object it is still visually clear where individual panels are separated.

Use of the Subdivision Surface modifier

The Subdivision Surface modifier plays an important role in my model. I added it to the body object and set the subdivision level. Thanks to this it is possible to keep a relatively simple base topology and at the same time achieve smooth curves and gentle transitions that are typical for the Corvette.

I also use Subdivision Surface on the wheels and selected detail parts where the shapes needed additional smoothing. In combination with sharp edges and crease settings I achieved soft transitions in the main surfaces, while the edges between individual parts and sharper corners remain clearly readable.



Conclusion

Within the first task of the semester project I created a 3D model of the Chevrolet Corvette C5 in Blender. The model is based on a blueprint and photographic references, the body and chassis are represented by a single object, the details are separate objects suitable for later baking into normal maps and a single shared geometry is used for all four wheels.

During modeling I used the Mirror and Subdivision Surface modifiers, set smooth shading with sharp edges and created a hierarchy in which the body acts as the parent of the wheels. The model therefore meets all the requirements of the assignment and is ready for the next steps of the semester project, that is for the creation of materials, textures and levels of detail intended for Unity.

