# CHARACTER DESIGN

Introduction

The Olympoid was created to represent Romania in Artistic Gymnastics during the Summer Olympics and in Figure Skating during the Winter Olympics. Both sports require the robot to be flexible and graceful, therefore these qualities are the basis of the design.

Pre-production and planning

I started the designing process having Figure Skating in mind. Based on that, I needed the robot to have ice skates and a lean, flexible body. Inspired by the winter theme, I designed the shape of the head to give the impression of wearing earmuffs. Skating also made me think of adding elbow and knee pads to the design.

While trying to come up with ideas for the abdomen, I decided to include elements from my culture. Therefore, the torso is heavily inspired by traditional Romanian clothes, which are represented in the design by the vest and the patterns on the body of the robot. It will also be apparent by choosing traditional colours for the design: brown, red, black and white. Using this cultural theme, I also added a skirt with a traditional apron. The skirt itself is short and stiff, projecting horizontally from the waist to allow wide movement of the legs, similar to ballet tutus. I later decided to add more layers to the skirt in order to give it a bit more depth.

Since Romania has a history of winning medals in Gymnastics, I decided to design my robot to compete in that sport as well. In order for the Olympoid to be suited for both sports, the ice skates need to have retractable blades. Adding a second Olympic sport also provided me with ideas for the arms. I designed them to resemble chains but with the ability to lock into place, making them flexible but also capable of sustaining the weight of the body in a handstand. For the hands, I gave the robot mechanical claws, specifically designed for the uneven bars apparatus, ensuring that the athlete has a good grip and can spin easily.
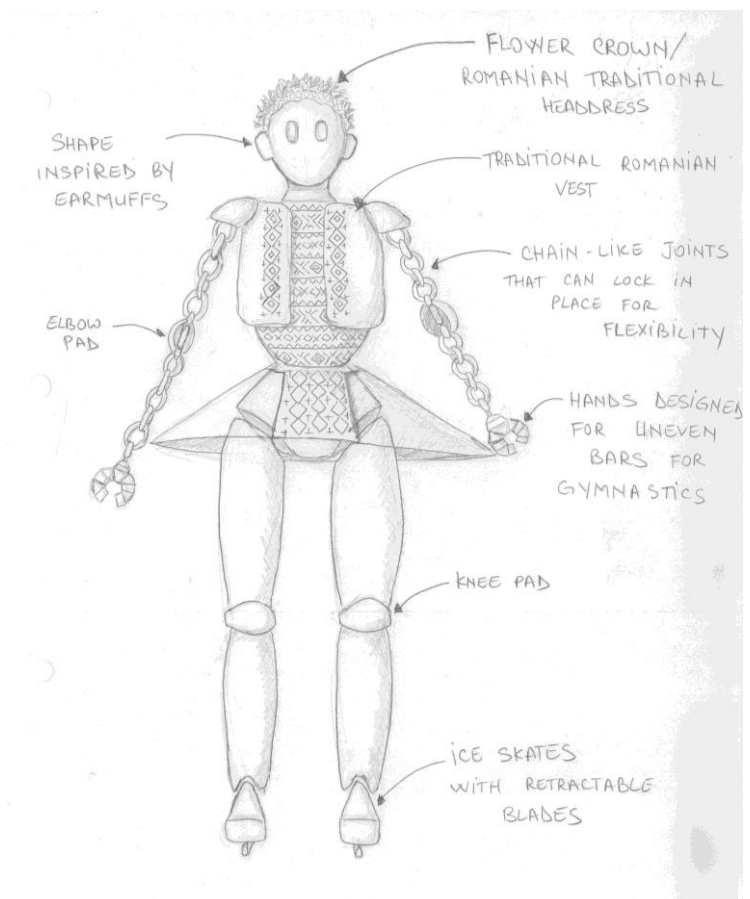
Techniques and surfaces

- **Sculpting**

One of the techniques used was sculpting, which is choosing a standard polygon similar to the object I wanted to create and making direct alterations in order to get the desired shape. This method alongside extruding was used to create the upper half of the torso, by extruding the vest out of the body, which was initially a cube, and creating the holes where the shoulders are, by pulling vertices in and creating new edges and vertices. I also used this technique to alter the foot and give it a more rounded shape, by moving and resizing faces, edges and vertices. For the leg, I started with a cylinder, deleted some of the faces and bridged the gaps, as can be seen in the image on the right.
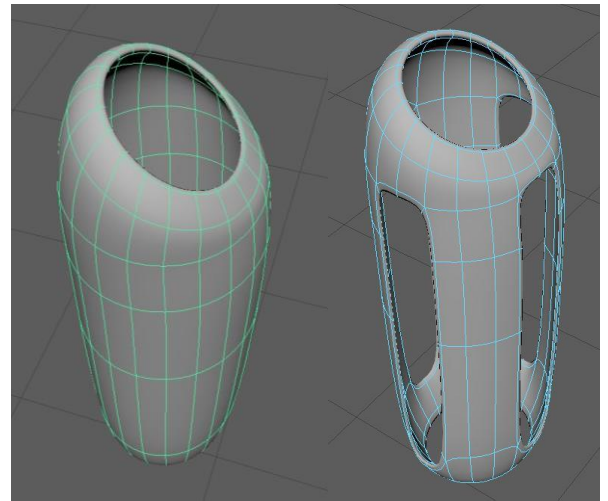

- **Extrude**

As I mentioned above, I created the vest by extruding faces of a cube. I also used this method for the head, starting with a sphere and extruding the earmuffs and the eyes. For the foot, I created the gap and the compartments where the ice blades retract to, using this technique, as well as the indent on the sides.
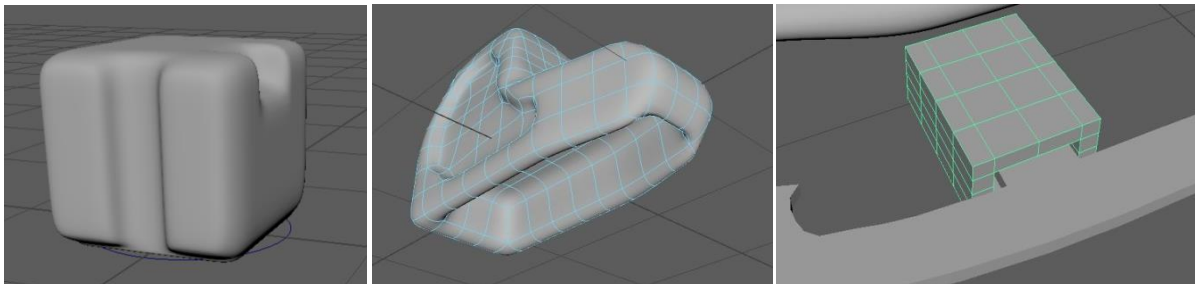

I also found this method useful when trying to convert a 2D surface into a 3D object, which I experimented with while creating many of the robot parts, such as the top layer of the skirt, the legs, the flowers, the shoulders and the ice blades. The images below demonstrate how this technique was used for the shoulders and knees.
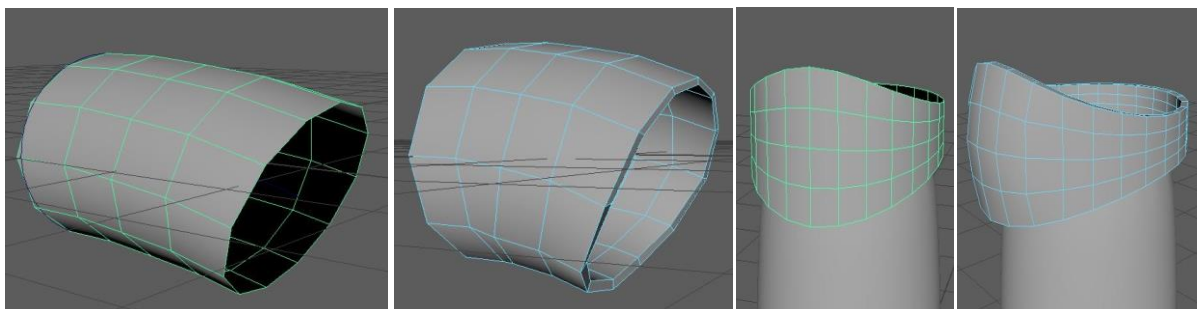
- **Loft**

Using this method, I designed the top layer of the skirt, the knee pads and the blades of the ice skates, by drawing two curves and lofting.
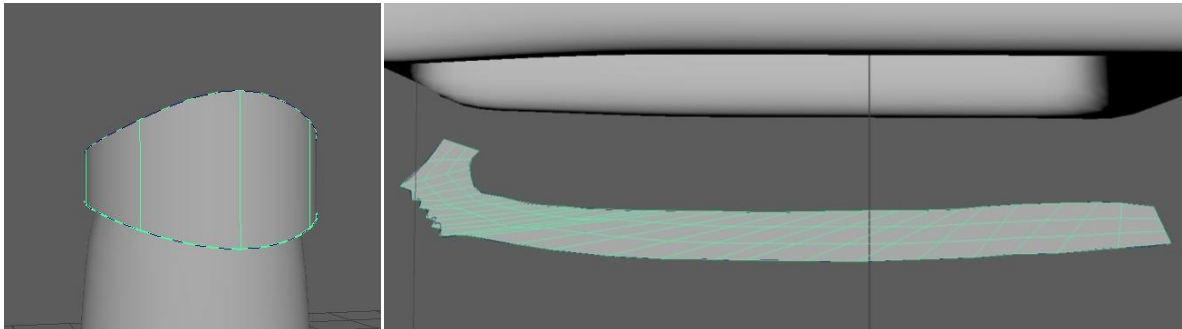

- **Wedges and duplicates**

The use of duplicates allows for time efficiency, thus I created some of the robot parts by altering and reusing already modeled objects. I created the arms by duplicating a chain link, the flowers by duplicating a petal, and then the headdress by duplicating a flower. I also reused the ring I created for the elbow joint in order to create wrist joints and shoulder joints. In order to create the hands, I used a combination of wedges and extruding.

- **Revolve**

In order to create the initial shape of the lower half of the torso, the petals of flowers for the headdress and the elbow pads, I created a curve and revolved it around the axis.
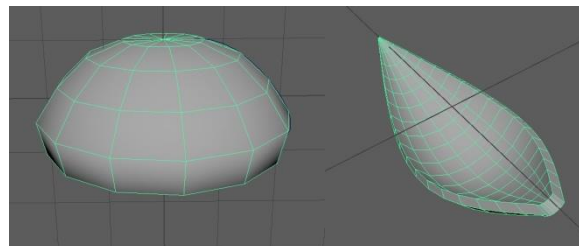

- **Boolean**

Another method of getting the desired shapes is using Boolean operations. I created the lower part of the body by placing the legs in their position, overlapping the shape I already had for the torso and performing Boolean difference. I used the same technique for the ankles. I also created small mechanical joints by placing two rings together with some faces extruded and using the union operation, which can be seen in the images below.
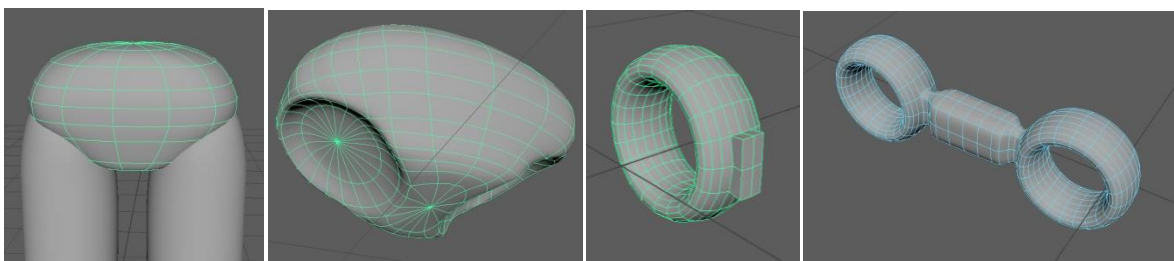
- **Extrude along curve**

In order to create the shoulders and the underskirt layers, I drew a circle and extruded it along a curve, as demonstrated in the following images.
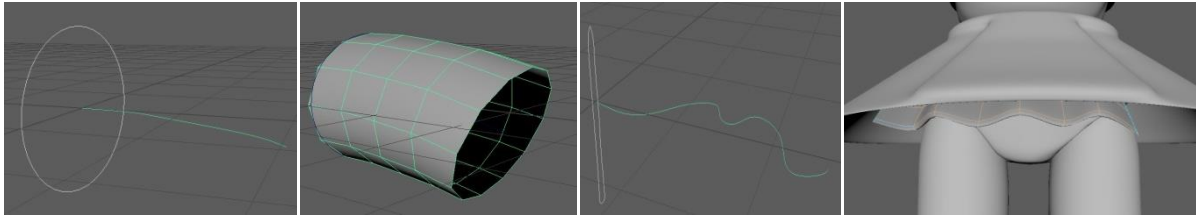
- **Grouping**

For the entire process, I used groups to keep things modular and organized. This allows me to modify one or more elements at the same time. For example, for the head, I have a group which contains the head and the flower crown, the crown itself is a group of flowers, which are in return a group of petals. This allowed me to work either with an entire flower or just one petal, making it easier to give the crown the shape I wanted.

Process and discussion

I started the modeling process by creating the vest. In order to achieve the desired shape, I used a cube, divided it to have more faces that I can manipulate, and extruded some of those faces from the face of the cube, making sure to leave a gap in the middle. Then, I selected the bottom face of the cube, leaving the margins unselected and extruded downwards in order to create the body and distinguish it from the vest. I also circularized the selected faces and made them smaller for the waist. To create the holes for the shoulders, I pulled some vertices in and created new edges. This process was a bit time consuming, and I believe that there were easier ways to achieve the desired result, such as extruding faces inwards, using the Boolean difference operation, though that could cause a messy geometry, or using a completely different approach for doing the entire vest. I also selected a couple of faces from the top of the cube, extruded them, circularized them and resized them in order to create the base of the neck. I then used a cylinder for the neck. The reason I used the extruding method for this part of the body was mostly familiarity, since it's a very intuitive technique, making it easy to get started on the modeling, and because the shapes I needed were easily derivable from a cube.

For the head, I used a sphere and altered the shape a little, then used the same extruding method as before to create the shape of the earmuffs and eyes. For the bandana part of the headdress at first I simply extruded faces from the head, but afterwards I used lofting to create a cleaner circular shape instead. After comparing the two side by side, which can be seen in the image on the right, I decided that

the messier extruded version gave the robot a more interesting and organic look, therefore I used that version. In order to make the flowers, I drew a curve and revolved it around the axis, thus creating a petal, which I then duplicated and re-positioned. Afterwards, I placed duplicates of the flower all around the head to achieve the look I wanted for the headdress.
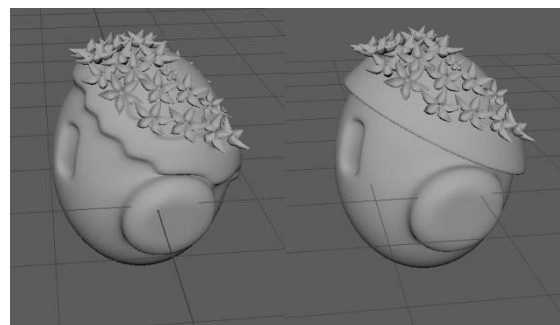
To create the arms, I used a torus and sculpted it, then linked it with a duplicate of itself to create a chain link. I then duplicated the chain link to make the arm as long as I wanted. In order to achieve the shape I needed for the elbow joints, I reshaped a torus, extruded some of the faces on one side,

and flattened them into a rectangle. Afterwards, I extruded the rectangle, duplicated and mirrored the object and used the Boolean union operation to join the two shapes together. I have since realized that it might have been easier to combine the two objects and use the Bridge instruction. This method would probably have maintained the clean geometry and therefore it would not have required any time spent on fixing it. I also used the ring made for the joints to create the wrist. From the wrist, I created the mechanical claws using wedges and extrude.

In order to create the shoulders, I created a circle and extruded it along a curve. I then gave it 3 dimensions by extruding. For the joint, I used a sphere and extruded a circle at the bottom, leaving a cavity in the middle, where a ring connects to it. This ring then connects to the arm, as shown in the images below.
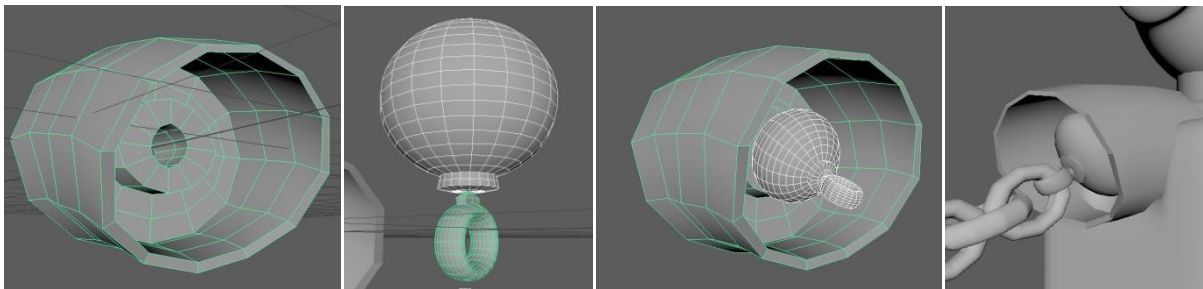

To achieve the shape I wanted for the feet, I started with a cube and extruded it into an "L" shape. Then I sculpted it by moving faces and edges in order to give it a more rounded look. I also created indents on each side by extruding faces inwards. Another alteration I made was to extrude faces on the bottom of the foot inwards to create a compartment, so that the blades of the ice skates can be retractable. For the legs of the robot, I altered two cylinders and created a hole in the lower one by putting the foot in its place and performing Boolean difference. This makes the movement of the foot easier, which is demonstrated in the pictures on the right. I also decided to give the legs the impression of wearing socks, by extruding.
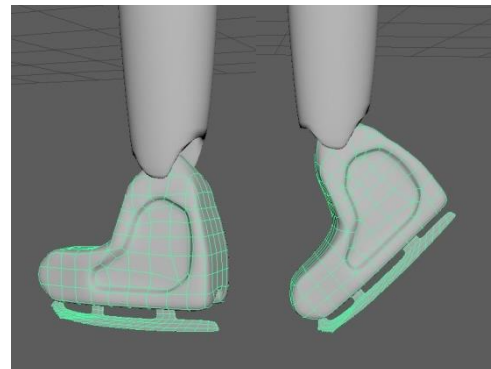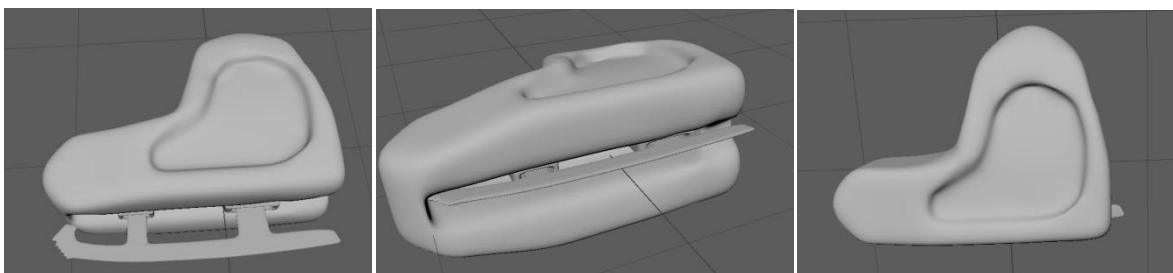

In order to create the knee pad, I drew two circles, modified them, and then lofted. I converted the lofted surface into a 3D object by extruding and resizing the object. I decided to change this shape later during the modeling process, by deleting half of the shape, extruding some of the faces and attaching it to a sphere. To achieve this, I combined the knee pad with the sphere and used the Bridge command, as it is illustrated in the following images. The reason I wanted the sphere as the knee was to make bending the leg easier. I also used the shape of the knee pad to create the elbow pad.
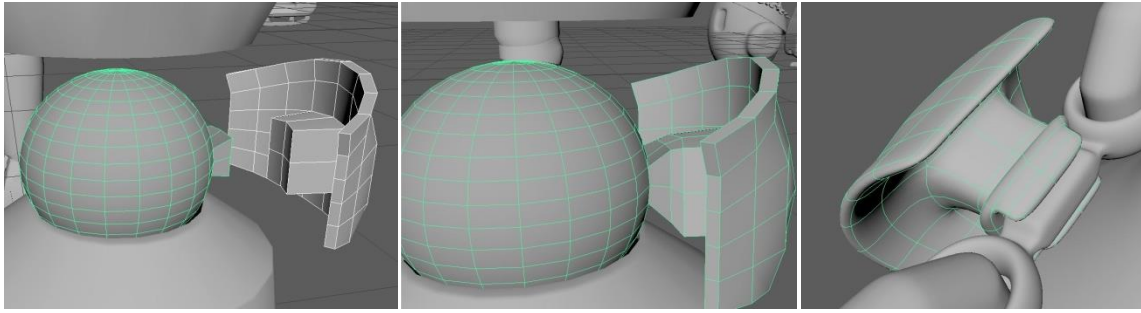
For the lower half of the body, I used a curve and revolved around it to get an initial shape. I altered it a little, then overlapped it with the legs and performed Boolean difference to get the holes where the legs would be. I created the skirt by aligning two circles, lofting and extruding. For the apron, I extruded some of the faces from the skirt. I then decided to add more layers to it. I created those layers by extruding along a curve. After getting the initial shape, I duplicated it, combined the two pieces of geometry together and bridged them to get a layer. Then I duplicated the layer to give it more depth. This process can be seen in the images below.
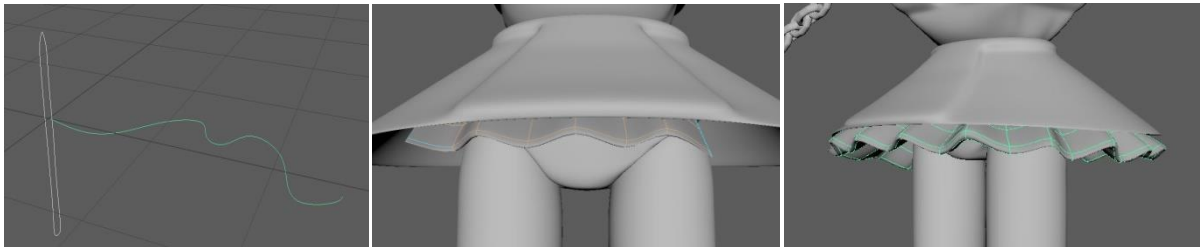
In order to create the ice blades, I used an image plane as reference. Then I drew two curves around the lines of the image and lofted them. I extruded the created surface to add a little thickness to it and made some alterations to better define the shape I wanted. I then extruded some faces to create the parts that connect to the feet. I also used cubes, divided them and extruded inwards to create small compartments for the blades to retract in. The following images showcase how the blades can retract inside to foot.

Appendix

HEADDRESS IDEAS

FLOWERS

SOME TRADITIONAL ROMANIAN PATTERNS

CREATE PETAL AND DUPLICATE TO CREATE FLOWER

TO CREATE PETAL, REVOLVE AROUND CURVE

HANDS - IDEAS

MAYBE USE WEDGES

IT CAN TURN INTO MORE OF A FLAT SHAPE SO THAT THE ROBOT CAN STAND ON ITS HANDS (USEFUL FOR GYMNASTICS)

HANDS DESIGNED TO HAVE A GOOD GRIP ON THE BAR AND MAKE SPINNING EASIER

persp