

**University of Brighton**  
**Computer Science for Games**

## **CI474 - Introduction to 3D Modelling and Animation** **2021 - 2022**

### **Assessment 2: Portfolio 2**

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## Introduction

This report will cover the process behind creating a 3D model of a volleyball court environment and animating a bird model within this environment. The different stages that will be covered in detail in this report are modelling, texturing, lighting and animation.

On one hand, before starting with the modelling stage it was hugely important to research different types of birds and their anatomy. Therefore, a set of pictures was compiled that were used as a reference for the bird model. The pictures of the birds that were used were from different angles, and some of them had labelled parts of a bird, to help with better understanding of the bird anatomy.



Figure 1 - Front view of a bird (Alberta Wildlife Carving Association, 2011)



Figure 2 - Side view of a bird (The Cornell Lab, 2019)

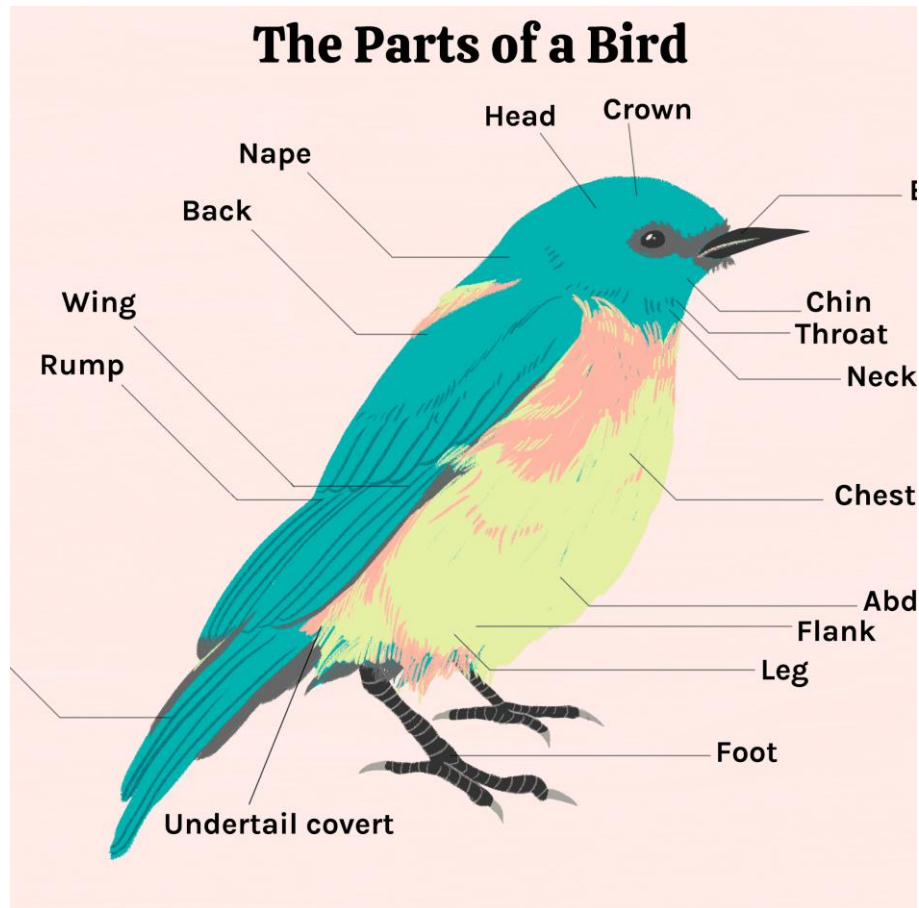


Figure 3 - Bird anatomy (The Spruce, 2020)

## Modelling

Firstly, the modelling process started with adjusting the scale of the volleyball court itself, since it was previously modelled to a centimetre scale, so everything needed to be scaled to a bigger size, for the model to be made to a realistic scale. Afterwards, it was crucial to use planes with textures of side and front drawings of the bird on them, as a reference for the modelling.



Figure 4 - Front view drawing of a bird (drawn by the author)

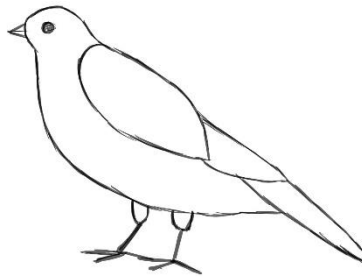


Figure 5 - Side view drawing of a bird (drawn by the author)

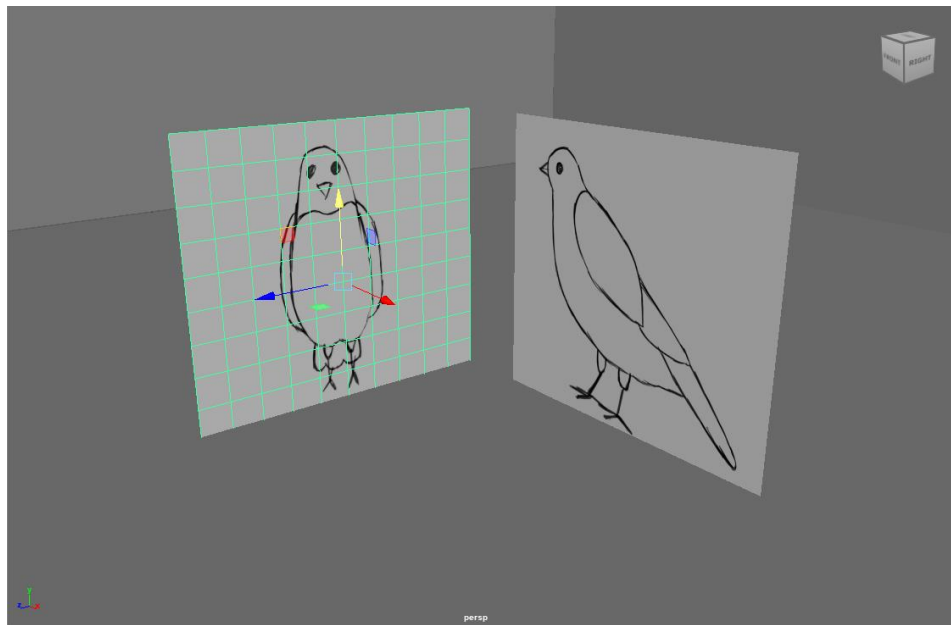


Figure 6 - The reference planes placed in the scene

The next stage in the modelling process was to create a sphere object in the scene, which was supposed to act as the head of the bird. Then, a cylinder was used to create the body of the bird. The cylinder was then scaled against the reference planes using soft select, in order to get it into the

correct size. Furthermore, certain faces and edges were extruded further to get the correct shape of the bird's torso. Since getting the correct shape of the torso was mainly focused on the left side of the bird, the mirror tool was used to create the other side of the bird, then the combine tool was used to make both sides of the body into one object. Finally, target weld was utilised on the whole body object to clean up the mesh in some places, and then the object was converted from a smooth mesh preview to polygons.

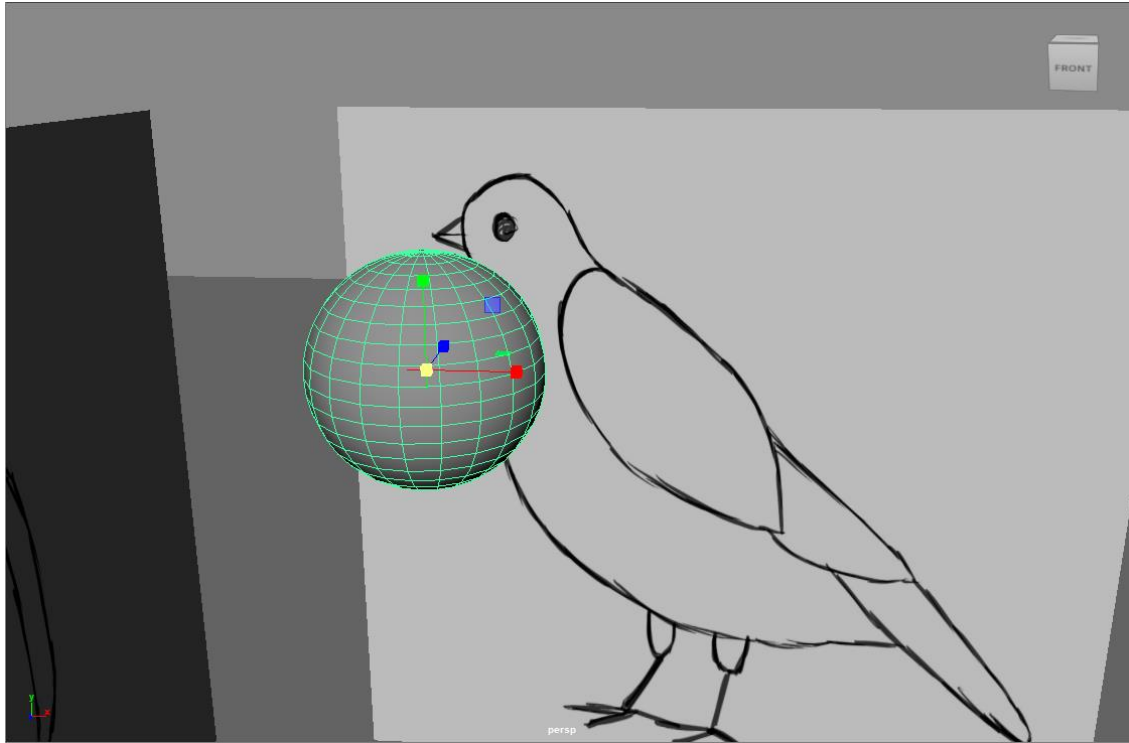


Figure 7 - Sphere created

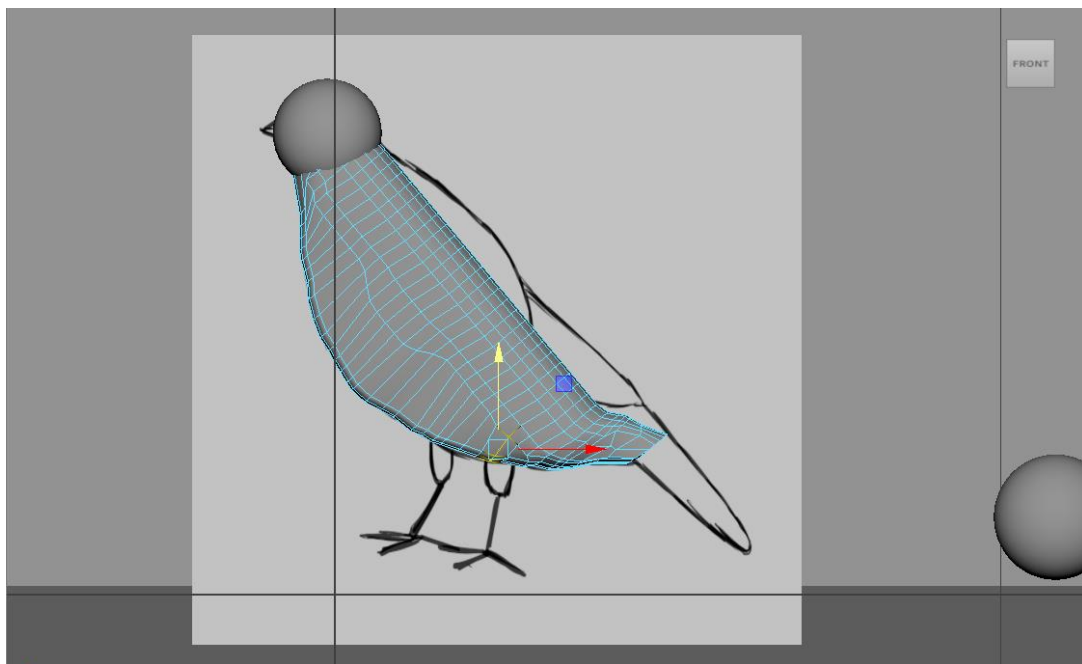


Figure 8 - Modelling of the left side of the body

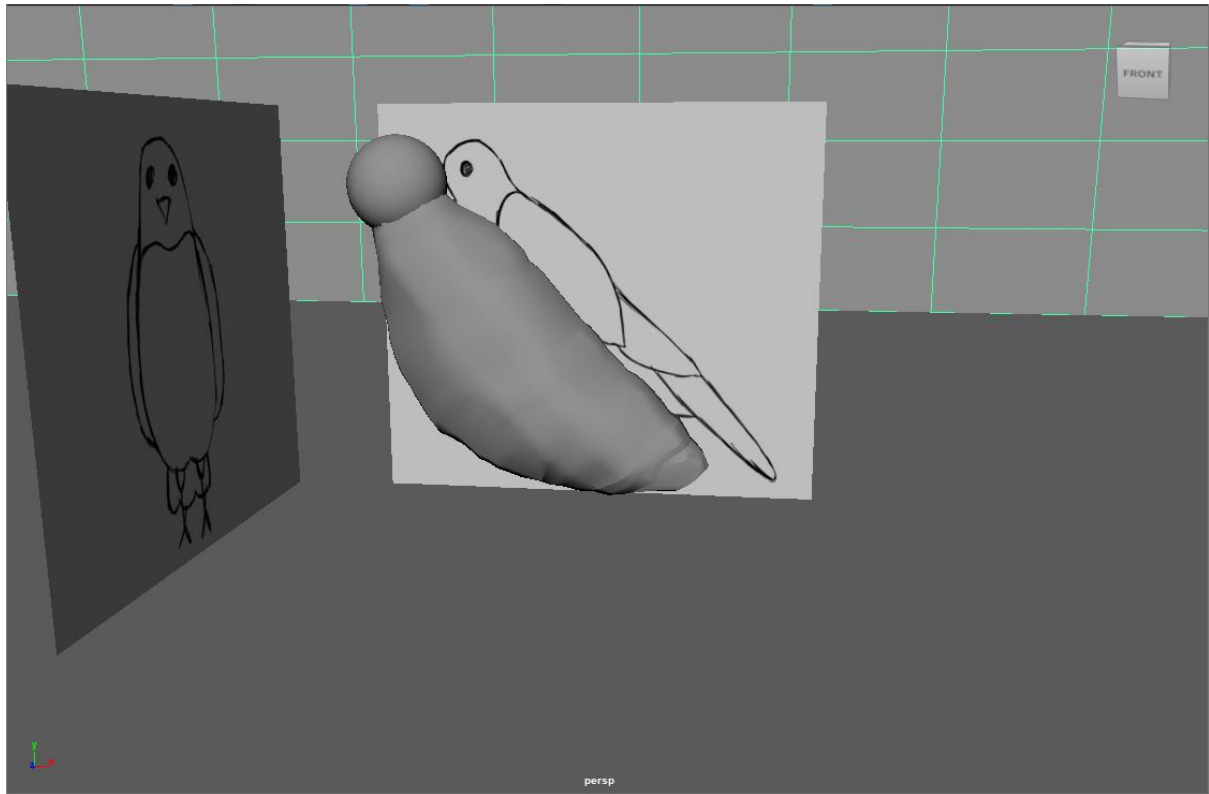


Figure 9 - Modelling of the body complete

Furthermore, after the main body of the bird was finished and had enough detail to it, it was time to proceed onto creating additional part of the head. So, the author decided to proceed with modelling the eyes and the beak. Therefore, the eyes were created using simple poly spheres, and adjusting the size of them, so that they're proportional to the head. And, the beak was made using a poly cone, rotated and size-adjusted into the correct place on the bird's head.

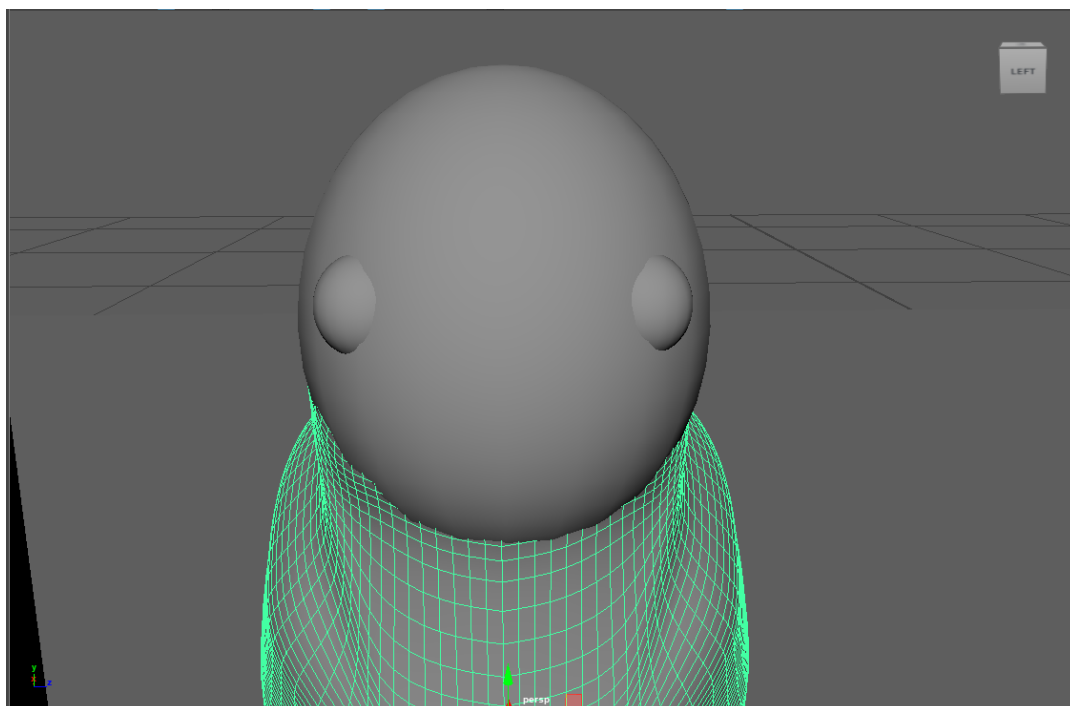


Figure 10 - Modelling of the eyes complete

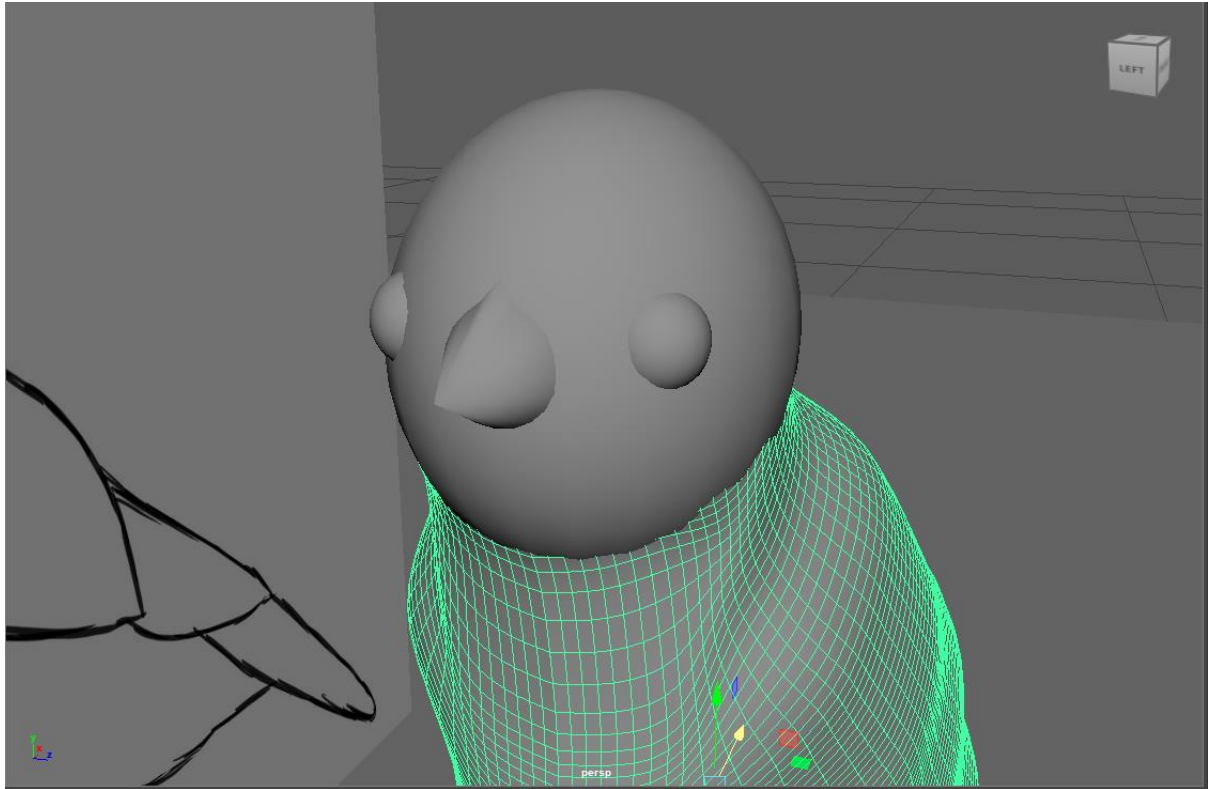


Figure 11 - Modelling of the beak complete

On the other hand, after both the body and the head were finished to a good standard, the bird also required its legs to be modelled. Consequently, the legs were created using cylinders and applying smooth mesh preview to them, and finally transforming the smooth mesh into polygons.

Furthermore, the feet were also made using cylinders, however their shape was adjusted a little bit, by moving the edges on the cylinders up, to make them look more curved. And, after both legs were done, it was also important to change the hierarchy and naming of all the parts of the legs, so that it would be easier to animate them in the future.

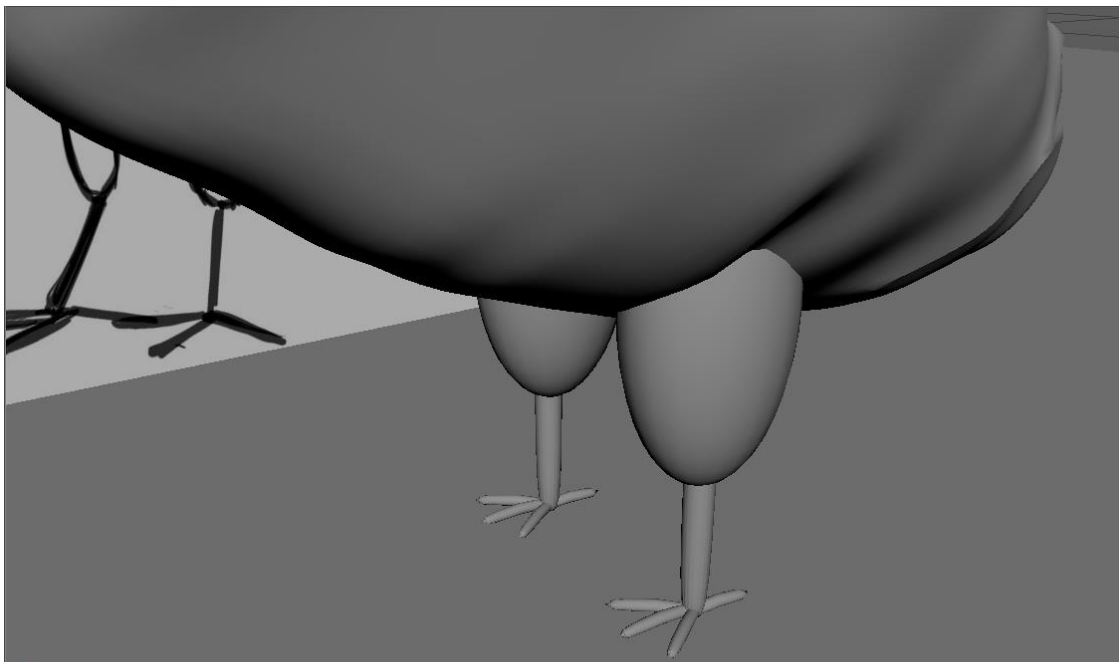
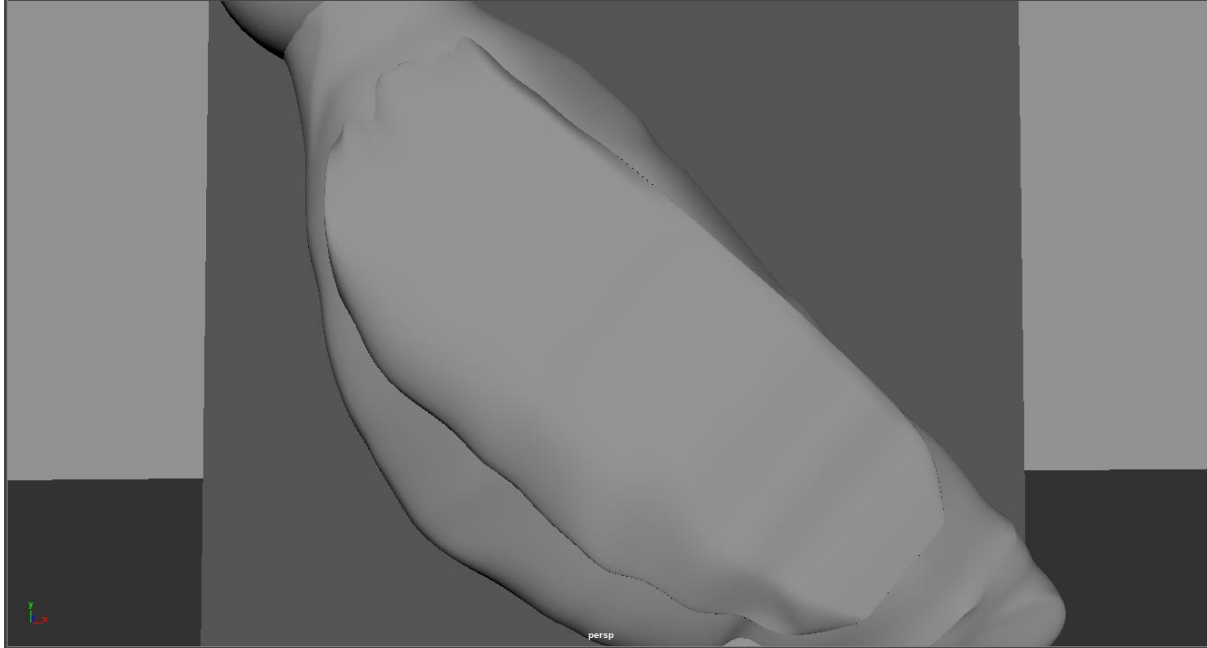


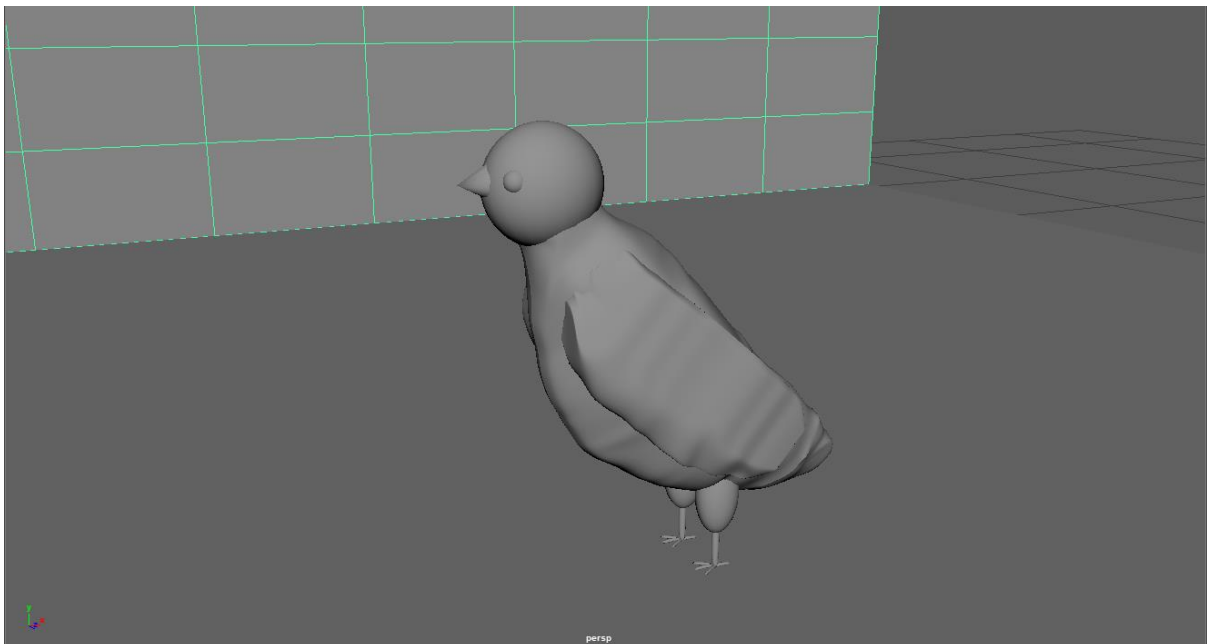
Figure 12 - Modelling of the legs complete



On the other hand, the most important parts of the bird have not been modelled yet and have been left last: the wings. So, the wings were made originally out of a cube, which has then been deformed by moving the edges of the object to create the correct shape. Also, one of the wings was converted from a smooth mesh preview to polygons, and then the mirror function was used to create the other wing on the other side of the bird's body.



**Figure 13 - Modelling of the wing complete**



**Figure 14 - Modelling of the bird complete**

Finally, when the bird was fully finished, another object that needed to be modelled was the volleyball. To make it easier for the texturing process, the volleyball needed to be divided into

different pieces, by extracting them and then separating the pieces from the whole object, and then grouping them all under the volleyball group, to create a whole volleyball.

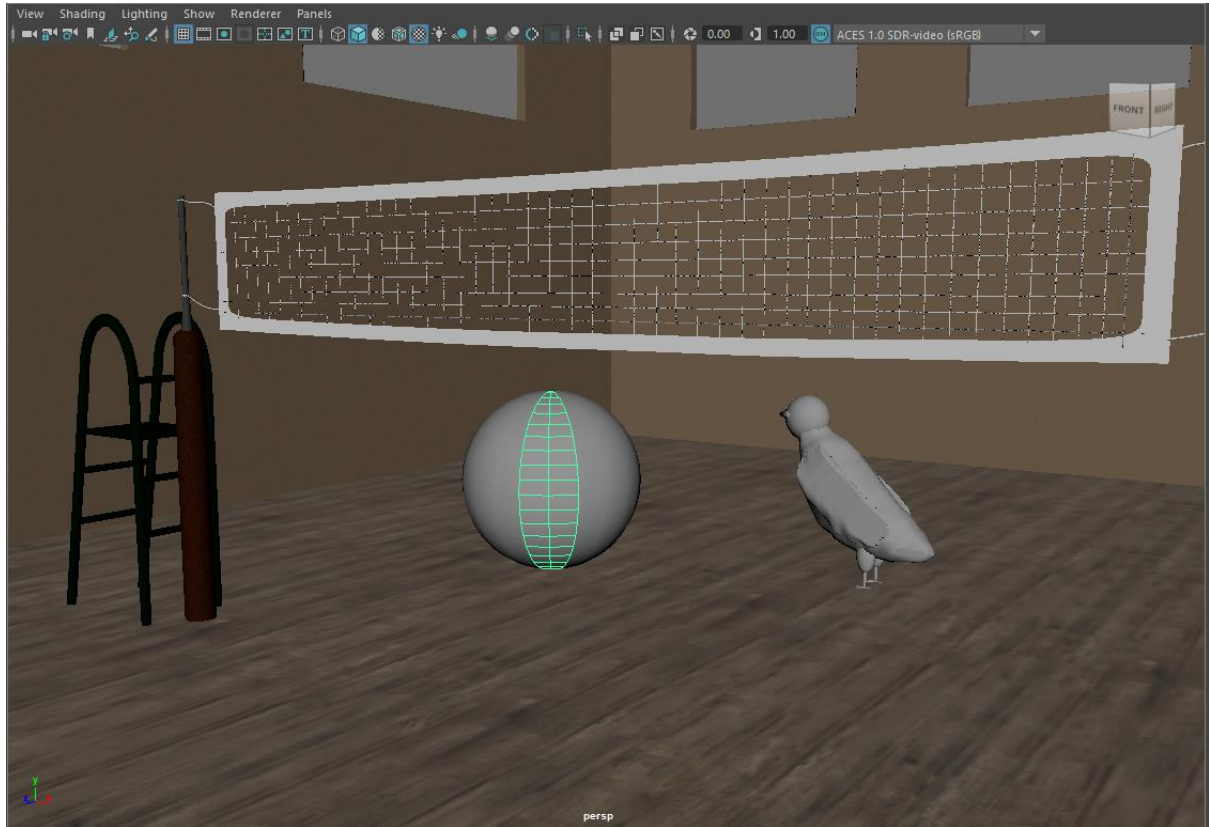


Figure 15 - The volleyball being split into separate fragments

At the end of the modelling process, it was crucial that everything was scaled properly, and since the bird was originally modelled to a way larger scale due to it being easier to model that way, it was necessary to scale it down at the end of its modelling. It was compared in size to the volleyball, so that it was ready for the animation process down the line. It was also decided that it would be better to create a ceiling to the sports hall as well, since it would make it more realistic if there were no trees above the character in the final animation.

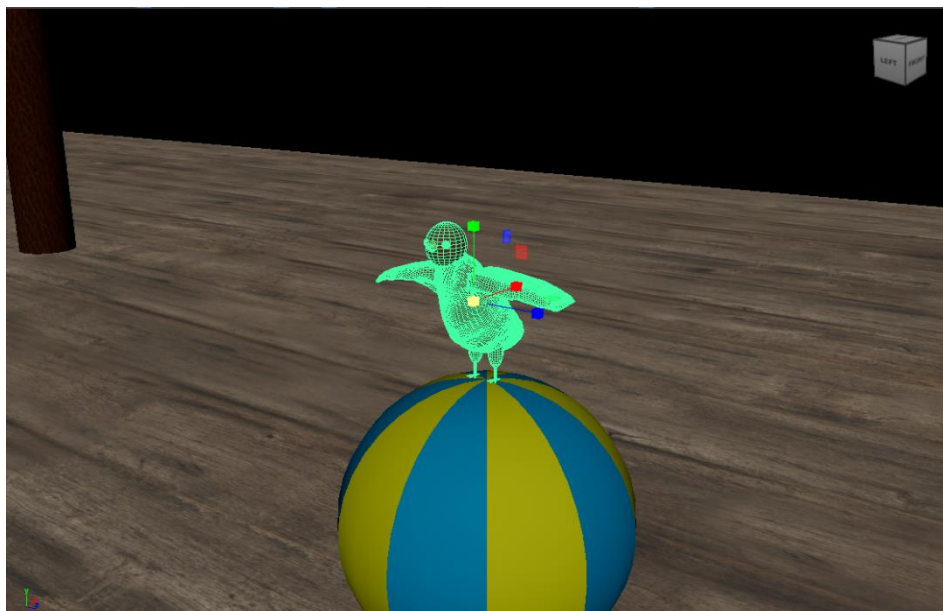


Figure 16 - The bird model scaled compared to the volleyball

## Texturing

The next part of the project was to texture and add colour to all the objects in the scene. Therefore, it was decided that the best approach would be to start with texturing the sports hall, and so a wooden texture was used for the floor of the sports hall. The texture was added to a Blinn material to make it look shiny during rendering, and its incandescence was increased to make the colour a bit lighter and brighter. Furthermore, a Lambert material was also created for the walls, so that they weren't shiny and contrasted with the floor. The texture for this material was a beige concrete, giving the walls a light shade of brown.



Figure 17 - Change to the incandescence value

When the sports hall was fully textured, the author moved on to texturing the referee stand. Consequently, following an Autodesk tutorial about materials (Autodesk, 2020), a metallic material was created for the referee stand, by applying a standard surface to it, decreasing its roughness to 0, and both the metalness and weight to 0.8.

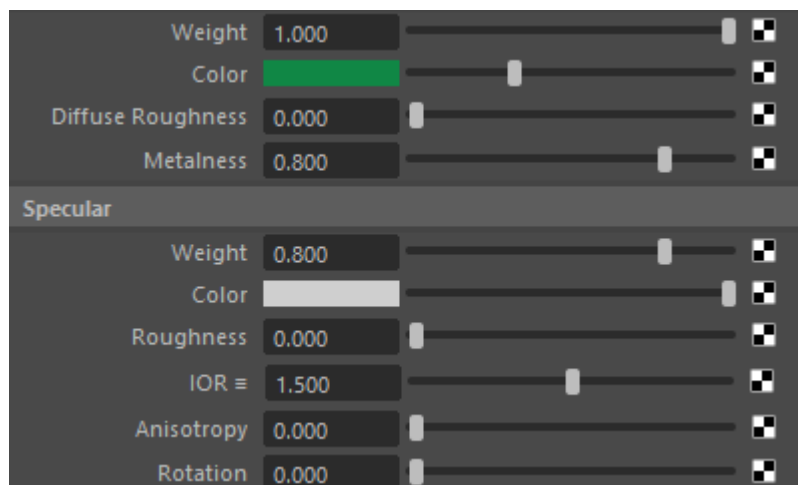


Figure 18 - A metallic texture created

Moreover, after the referee stand was textured, it was important to texture the padding on the volleyball net as well. Therefore, a leather material was added to the net poles, and its UV maps were adjusted so that the top and bottom of the padding matched the rest of it. Furthermore, the metallic material that was added to the poles was made in the same way as the referee stand, however the metalness value was changed to a 0.6 instead, and the colour was silver instead of green.

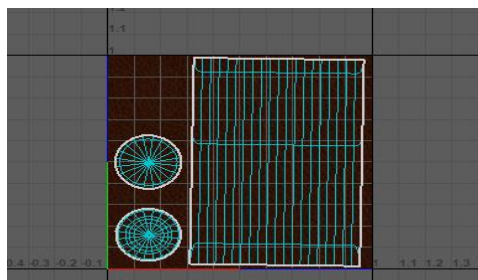


Figure 19 - the UV maps adjusted

Afterwards, the net texture was made by applying a white lambert to it, to give it a bright colour that wouldn't reflect light from the scene. Similarly, the volleyball was textured by applying an alternate lambert materials to its separate pieces, to match the colours of a volleyball found in the real world.



Figure 20 - Volleyball texture complete

On the other hand, the only untextured object left in the scene was the bird. And so, the base colour of the bird was made using a brown lambert material. This was done in order to avoid having to use a feather image as a repeated texture, since that kind of level of detail was unnecessary for this project. Additionally, the eyes, beak, and the legs were textured using solid colour, but using a Phong material instead, to add a little bit of shine to them.



Figure 21 - The bird texture completed



## Lighting

The following part of the object required the addition of lighting to the scene, so that the object in the scene could be visible during rendering. Firstly, a sky dome was created, so that there was an overall light in the scene along with a directional light in the middle of the sport hall, to add some ambient light effect to the scene. Besides, a picture was added to the sky dome as a texture, to make the lighting in the scene warmer and have a realistic background outside of the windows of the sports hall.

Next, some additional lighting was added, such as the area lights in front of the windows, to add a greater effect of a natural light from the outside. Moreover, the back wall of the sports hall was removed from the scene, since it wouldn't be visible in the scene anyway, and it would add a nice extra lighting and shadows as a result.



Figure 22 - Rendered fully textured scene

## Animation

Finally, the last part of this project was creating the end animation based in the scene environment. Therefore, the first part of the animation process was to decide whether rigging the objects to be animated was needed. Therefore, for this specific project it was decided that the rigging the characters would not be necessary, and instead the only aspect needing adjusting was moving all the pivot points to the correct places within the objects. For example, this was done to make it easier to control the bird during animation and make its centre of mass seem more believable.

Another crucial aspect that needed to be taken care of before being able to start animating the scene was editing the hierarchy of all the objects in the scene, especially the volleyball hierarchy. The volleyball was contained within a rotation group, which then was contained within a translation

group. This was done in order to not deform the volleyball and its controls when it was being rotated and translated during animation.

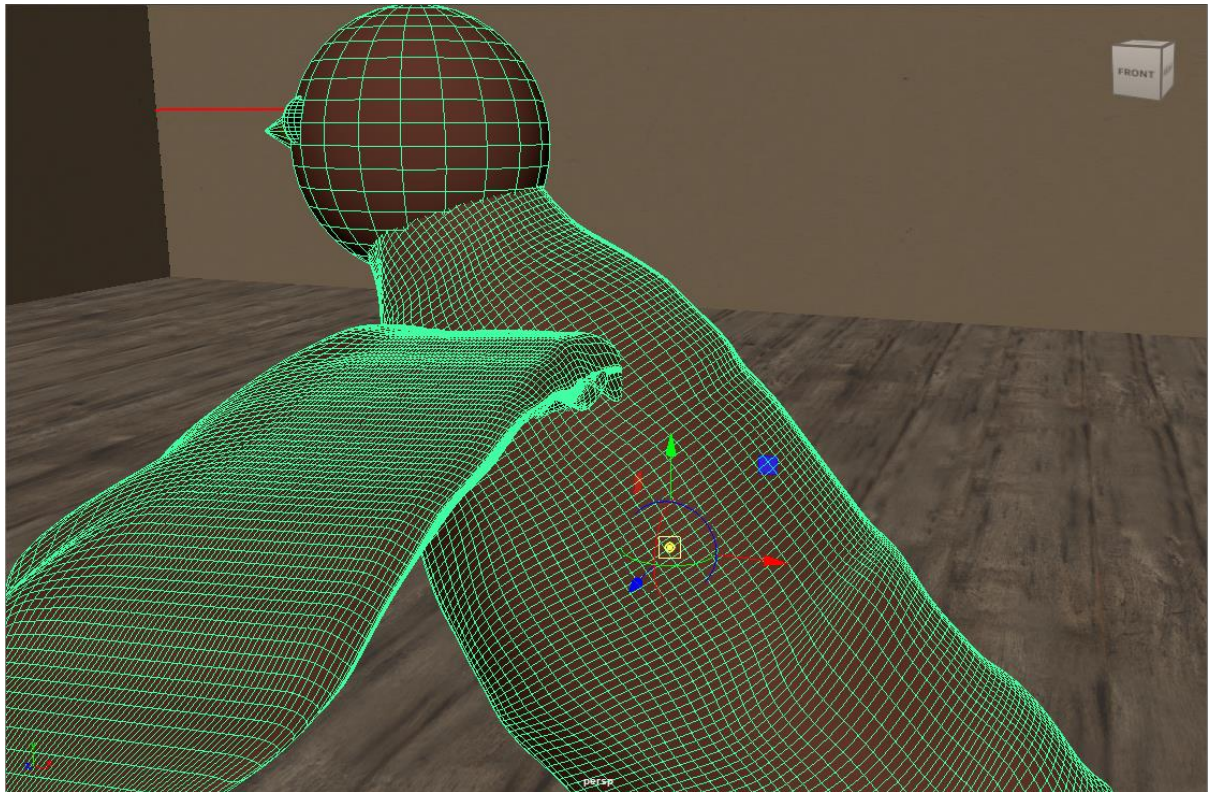


Figure 23 - The pivot point of the bird being adjusted

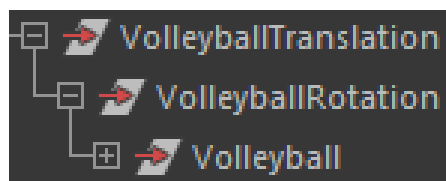


Figure 24 - The hierarchy of the volleyball being rearranged

During the animation stage, in the first fifteen seconds the volleyball was being animated as if it was being picket up by the character. To make this movement more realistic the graph editor was used to increase the time that the translation was happening over, and to also create some pauses in between the movement, so it doesn't all happen continuously.

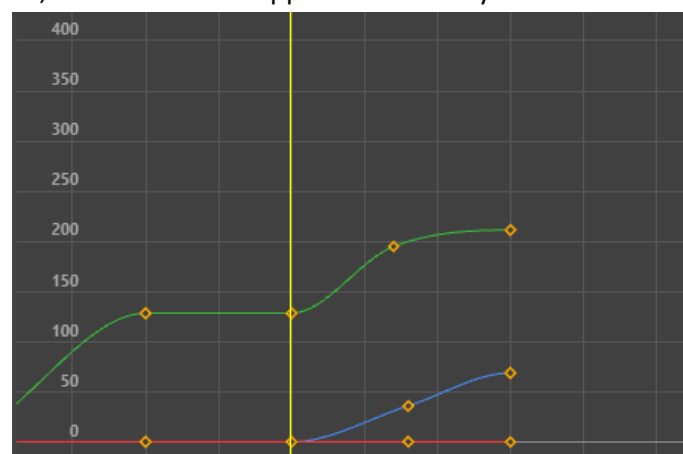


Figure 25 - Graph editor being used to enhance the movement of the volleyball

Then from 25 seconds to 40 seconds the animation is supposed to portray the character bringing the ball above their head preparing to throw it. After that animation of the movement, from 55 to 75 seconds the translation is supposed to show how the character throws the ball above their head, and after the 75 seconds the character hits the ball, and it ends up flying above the net and falling to the ground. On top of that, to add a smoother transition to the rise and fall of the ball above the net, more keyframes were added to the animation.

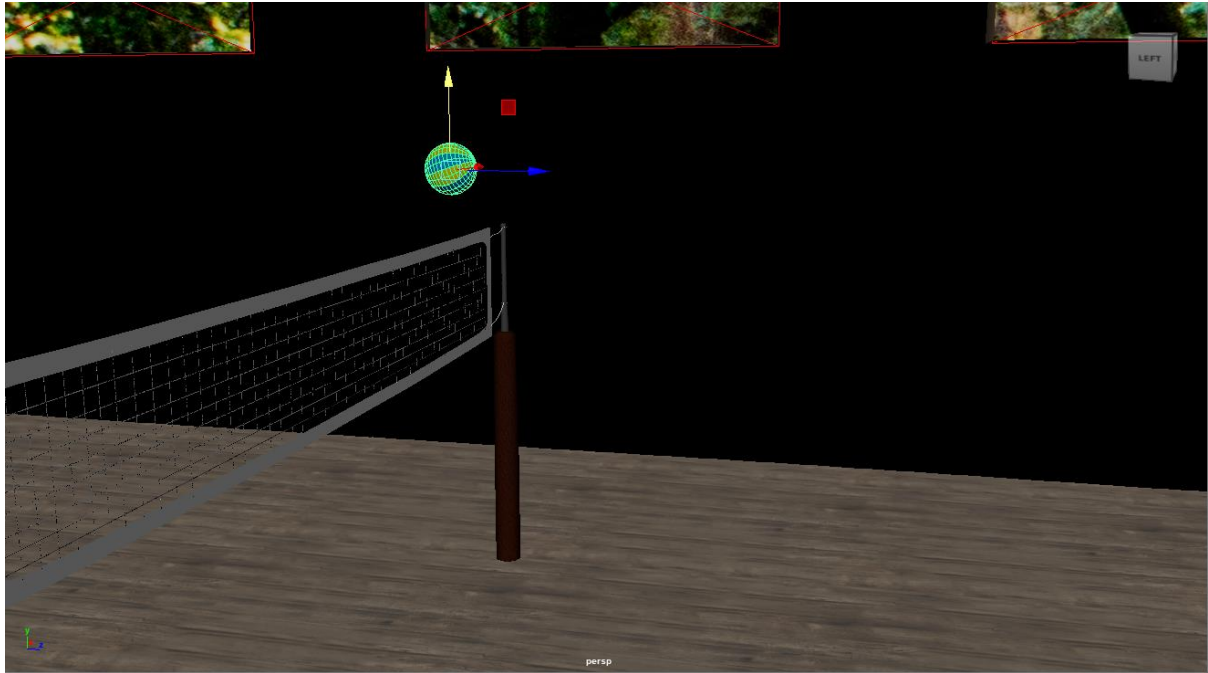


Figure 26 - The ball being hit above the volleyball net

On the other hand, a new camera needed to be created in the scene, in order to make the animation seem like it's from the point of view of the character. So, when creating the camera, an aim was also created along with it, and it was grouped under the volleyball, which means that the camera is going to follow the volleyball throughout the animation.

Finally, the last object to be animated was the bird flying through the scene. This was done by starting off with the bird being in the flying position, with its wings spread out. And then, as the bird approaches the volleyball, all its parameters were going to be reset to zero, making this movement seem as if the bird was going to sit on the volleyball. Then, at the end of the animation, the head of the bird is being rotated to the side, to create an illusion of the bird tilting its head at the character with curiosity.



Figure 27 - The animation of the bird flying through the scene

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