Chapter 5. Unwrapping the Low Resolution Mesh

In this chapter, we will cover the following recipes:

- Preparing the low resolution mesh for unwrapping
- UV unwrapping the mesh
- Editing the UV islands
- Using the Smart UV Project tool
- Modifying the mesh and the UV islands
- Setting up additional UV layers
- Exporting the UV Map layout

Introduction

So, at this point, we have **sculpted** our high resolution character and through the **retopology** process, we have obtained a low resolution *copy*, which is easier to use for rigging, texturing, and animation.

There are several ways to apply textures to a mesh in Blender, as in any other 3D package. In our case, we are going to use **UV Mapping**, which is certainly one of the most commonly used and efficient methods for organic shapes.

Before the unwrapping process, the mesh must be prepared to make the task easier.

Preparing the low resolution mesh for unwrapping

In this recipe, we'll fix the last details such as the position of some of the character's parts (for instance, the **closed mouth**) and in general, anything that is needed to facilitate the unwrapping.

Getting ready

To be more precise, before the unwrapping, we must perform the following tasks in the right order:

1. Join the **teeth** and **talons** to the **body**.
2. Create the vertex group for the **mandible**.
3. Open the **mouth**.
4. Mark the seams to unwrap the **body**.

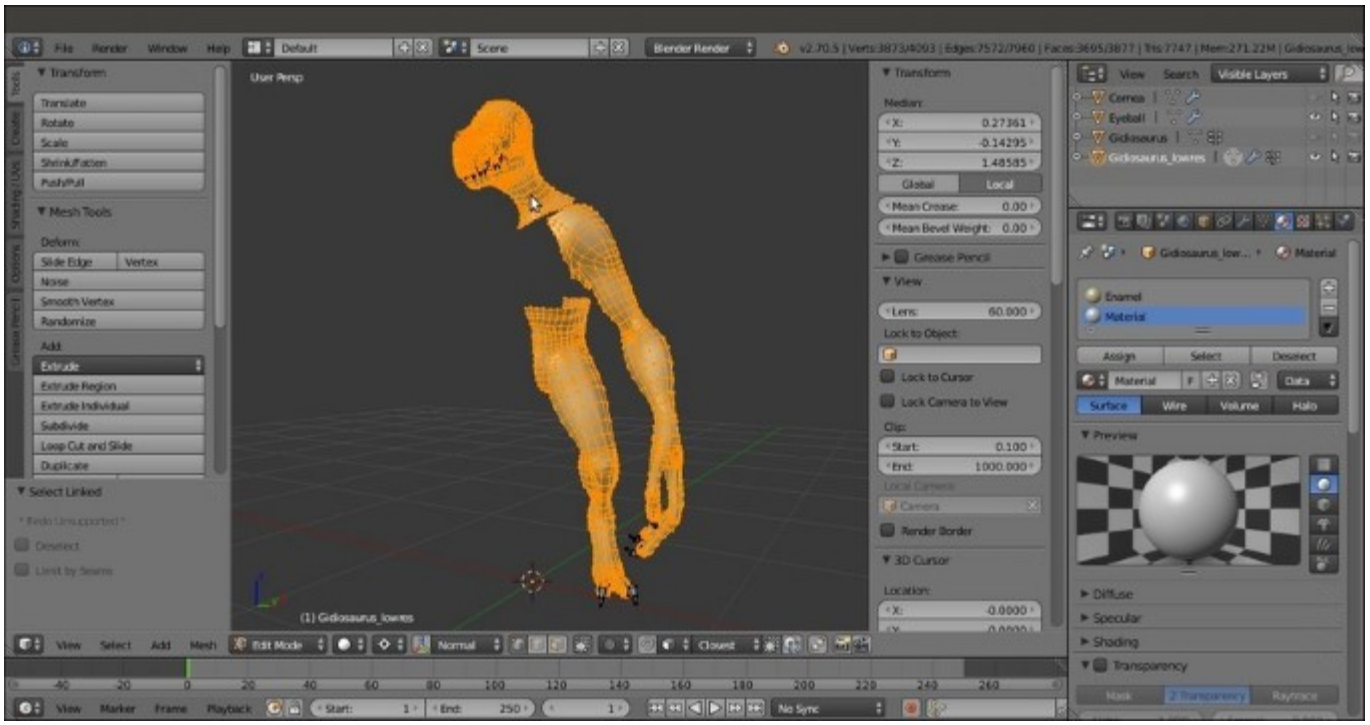
So, open the `Gidiosaurus_retopology.blend` file and deactivate the layer with the **armor** to hide it; select the **Gidiosaurus** object and save the file as `Gidiosaurus_unwrap.blend`.

How to do it…

The simplest of the *four* tasks just so happens to be the first, joining the **body** with the **teeth** and **talons**.

To join the body parts, follow these steps:

1. Select the **Talons** item in the **Outliner**, and then hold *Shift* and select the **Fangs_bottom**, **Fangs_upper**, and **Gidiosaurus_lowres** items.
2. Press *Ctrl* + *J* to join them.
3. Right away we will notice that, because the retopologized mesh didn't have any material assigned, the whole object gets the only material available, which is the `Enamel` material we had assigned to the **talons** and **teeth** earlier.
4. To fix this, assign a new material, or you can also assign the already existing `Body` material, to the retopologized mesh before the joining operation.
5. Alternatively, after the joining, click on the + icon to the side of the material names, and then select the **New** button in the **Material** window to create a new material. Now, enter **Edit Mode**, put the mouse pointer on the **Gidiosaurus** mesh, and press the *L* key to select all the **connected vertices**. Because the **talons** and **teeth** vertices are joined, *but not connected* to the **face** vertices, they don't get selected; for the same reason, you have to repeat the operation three times to select the **head**, **arm**, **hips,** and **leg** vertices:

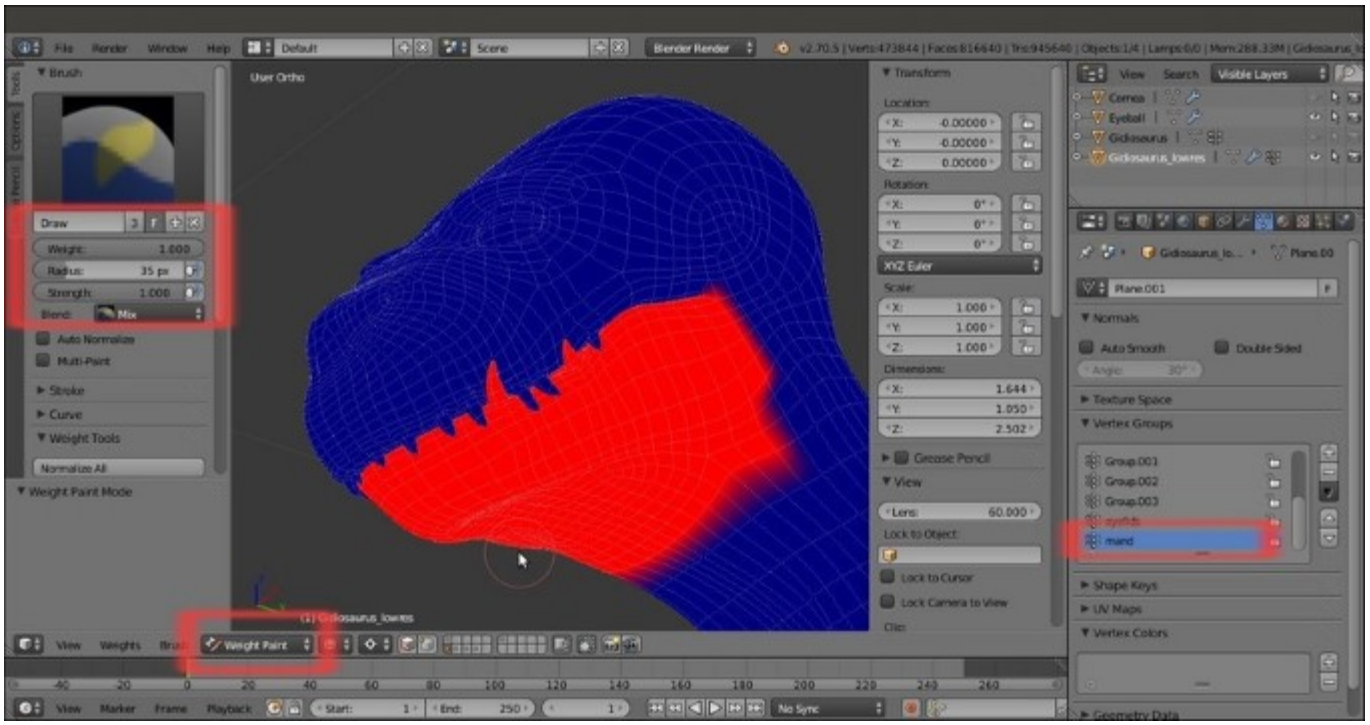


The head, arm and hip/leg vertices selected in Edit Mode

6. Click on the **Assign** button and go out of the **Edit Mode**. Now, edit the name and color of the new material or whatever, or else switch it with the `Body` one.

   The second task is a bit more complex and is covered in more detail in Chapter 7, *Skinning the Low Resolution Mesh*, which is about the **skinning** process. However, we need to explore this subject a little bit now, as it will help us operate on a small portion of the mesh easily.

   To create a **vertex group** to open the **mouth**, follow these steps:
7. Go to the **Side** view and zoom in on the **head** of the character.
8. Go to the **Object Data** window; under the **Vertex Groups** subpanel, add a new group and rename it `mand` (short for **mandible**).
9. Press *Ctrl* + *Tab* to go into **Weight Paint** mode (or left-click on the mode button on the 3D window toolbar to switch from **Edit Mode** to **Weight Paint** mode); press *Z* to go into **Wireframe** viewport shading mode so that you can see the edges of the topology.
10. By using a combination of vertex selection mode, both in **Edit Mode** and by painting with **Weight** and **Strength** as **1.000** in the **Weight Paint** mode, assign vertices to the group of the **mandible** area and the part of the **neck**; obviously, you have to include the vertices of the inner bottom **jaw**, as well as the **tongue** and bottom **teeth**:

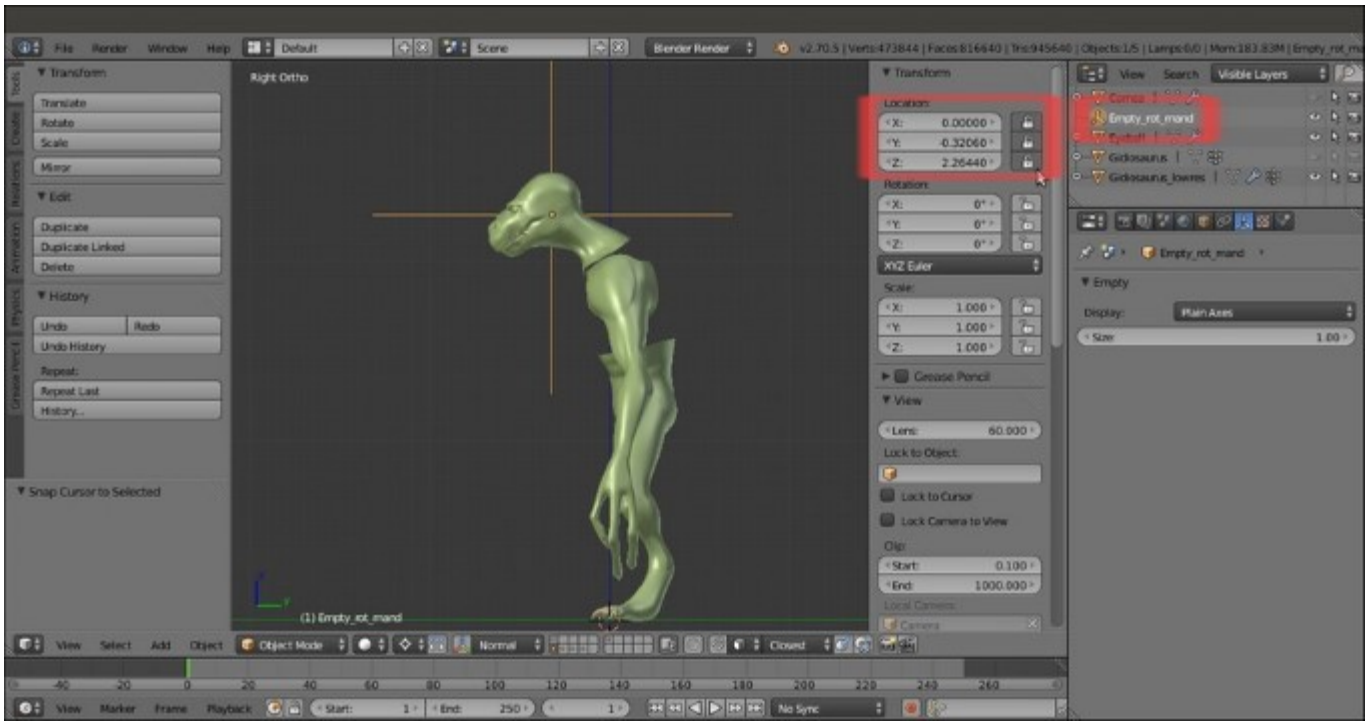


The visualization of the mand vertex group

11. Press *Ctrl* + *Tab* to exit the **Weight Paint** mode.

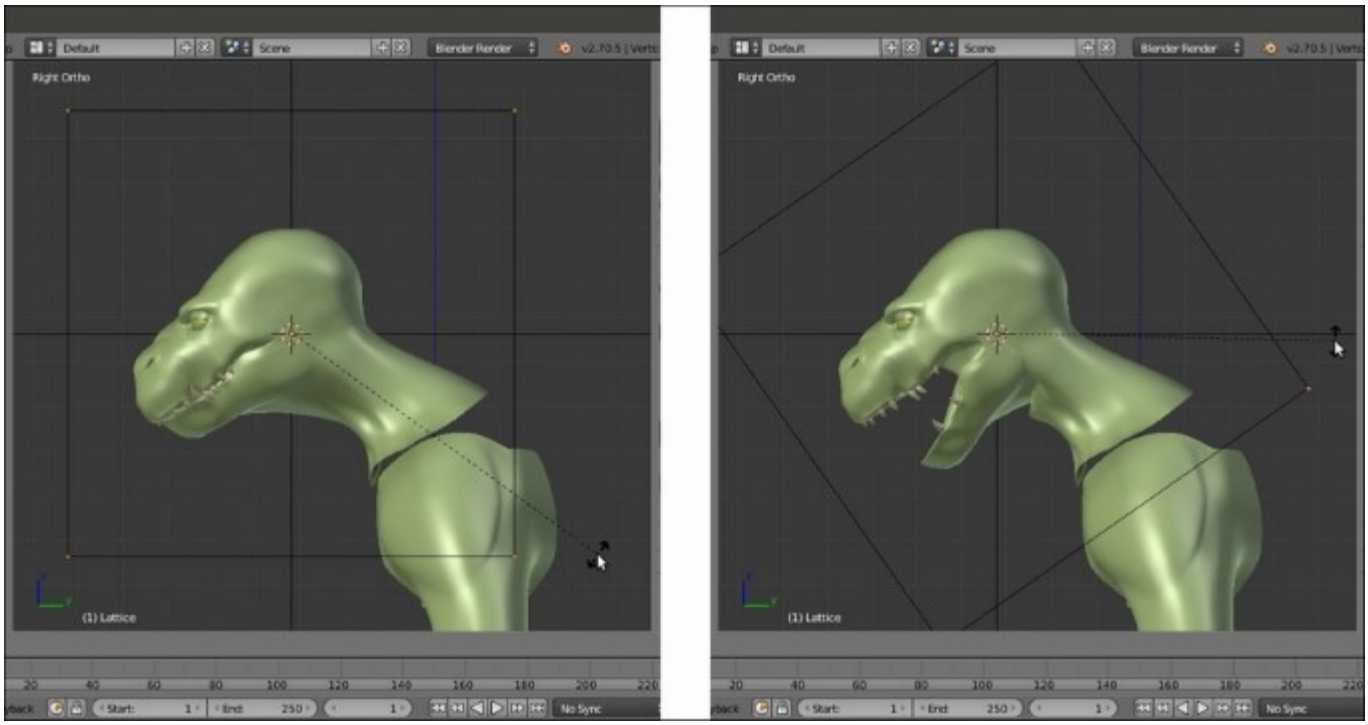
    Note that a vertex group can be edited at a later time, so it will be easier to set the exact amount of weight on the vertices by looking at the **Lattice** modifier feedback, which is the next step.

    So, to open the **mouth**, perform the following steps:
12. Add an **Empty** object to the center of the scene (*Shift* + *A* | **Empty** | **Plain Axes**).
13. Go to the **Side** view (press the *3* key on the numpad). Move the **Empty** to the position where the **mandible** should join the skull (to be precise, I placed it at this location: **X** = **0.0000**, **Y** = **-0.3206**, and **Z** = **2.2644**; go to the **Properties** 3D view sidepanel, and under the **Transform** subpanel, enter the values in the first three slots under the **Location** item).
14. To ensure that the **Empty** cannot be moved anymore, click on the lock icon on the right-hand side of its slot in the **Outliner** and also rename it to `Empty_rot_mand`:



The Empty_rot_mand in place

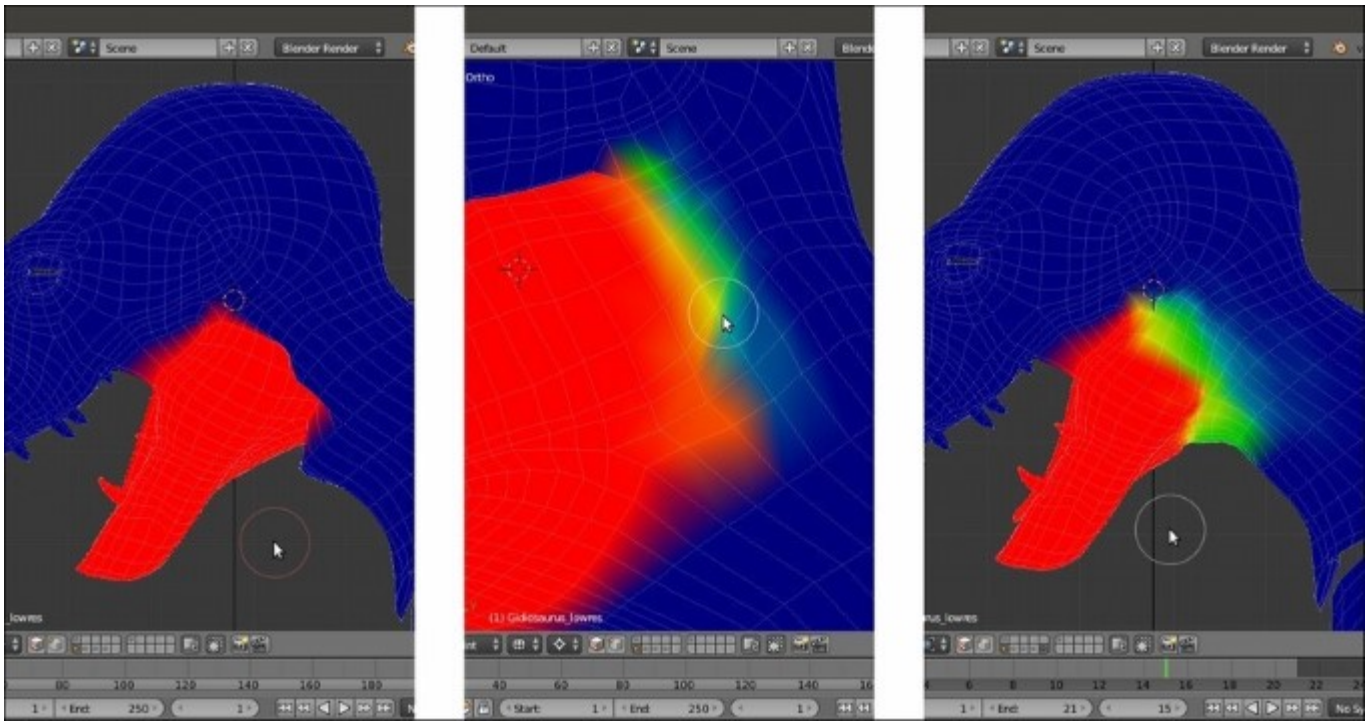
15. With the **Empty** still selected, press *Shift* + *S* | **Cursor to Selected**.
16. Add a **Lattice** object to the scene (*Shift* + *A* | **Lattice**), and in the **Object Data** window, set **Interpolation Type** for **U**, **V**, and **W** to **Linear**; select the **Gidiosaurus** object and go to the **Objects Modifier** window; assign a **Lattice** modifier. Move it before the **Subdivision Surface** modifier.
17. In the **Object** field, select the **Lattice** item; in the **Vertex Group** field, select the **mand** item.
18. In the **Side** view, select the **Lattice** object, go into **Edit Mode**, and select all the vertices and rotate them **35** degrees counterclockwise around the *x* axis:



Rotating the Lattice to open the mouth

As you can see, the **Lattice** only affects the vertices inside the **mand** vertex group; however, there is a clear indentation on the throat where the **mand** vertex group ends abruptly, so now we must blur this boundary to keep the smooth curved transition from the bottom **jaw** to the **neck**, and remove the abrupt edge.

19. Go back into the **Weight Paint** mode (*Ctrl* + *Tab*) and click on the **Brush** icon at the top of the **Tools** tab to switch the **Draw** brush with the **Blur** brush, and then start to blur the boundaries of the **mand** vertex group.
20. Sometimes, blurring the edge weights is not enough, so go back to the **Draw** brush, set the **Strength** to **0.500** (or whatever value you find works best), and paint on the vertices; then refine the transition again with the **Blur** brush:

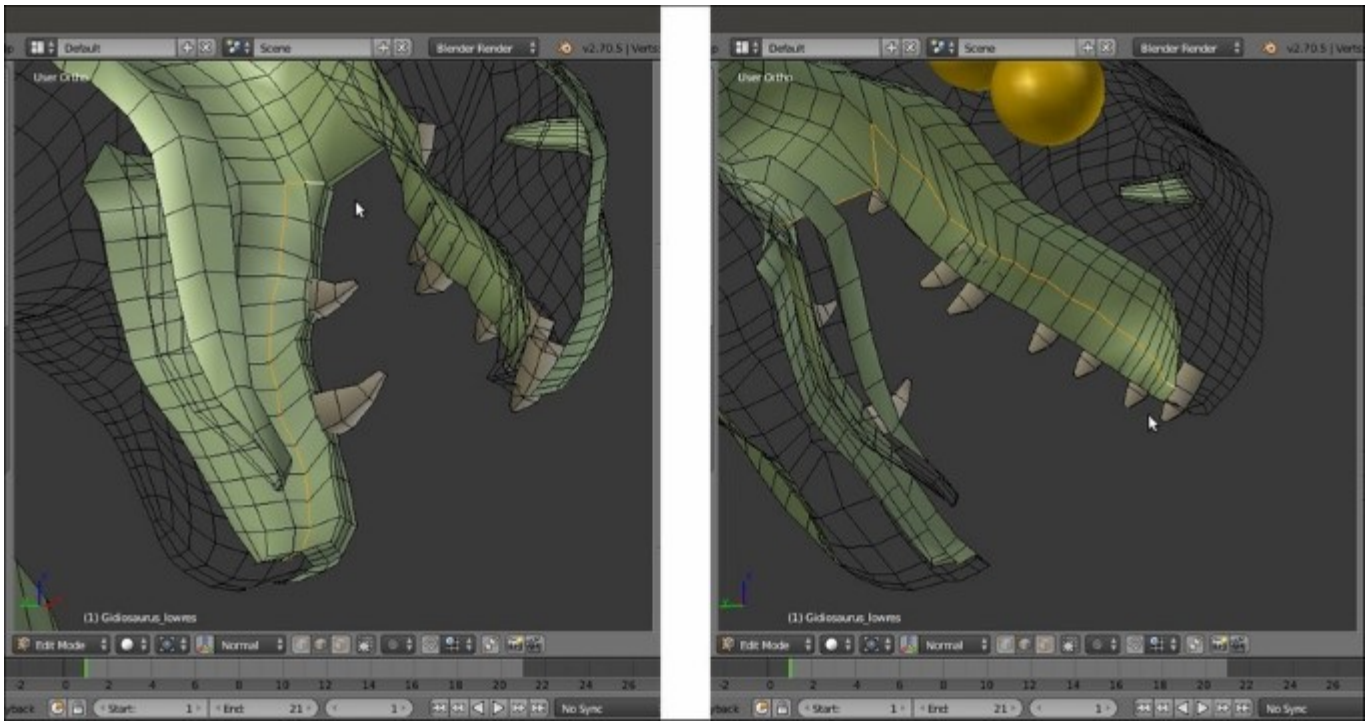


Blurring and painting the weights

21. To make the job easier and faster, you can temporarily disable the **Lattice** modifier, as well as the **Subdivision Surface** modifier.
22. When you are done, go out of the **Weight Paint** mode, apply the **Lattice** modifier, and delete the **Lattice** object.
23. Make sure to keep the **Empty_rot_mand**, which that will turn out to be useful when rigging the character. For now, just hide or move it onto a different layer.

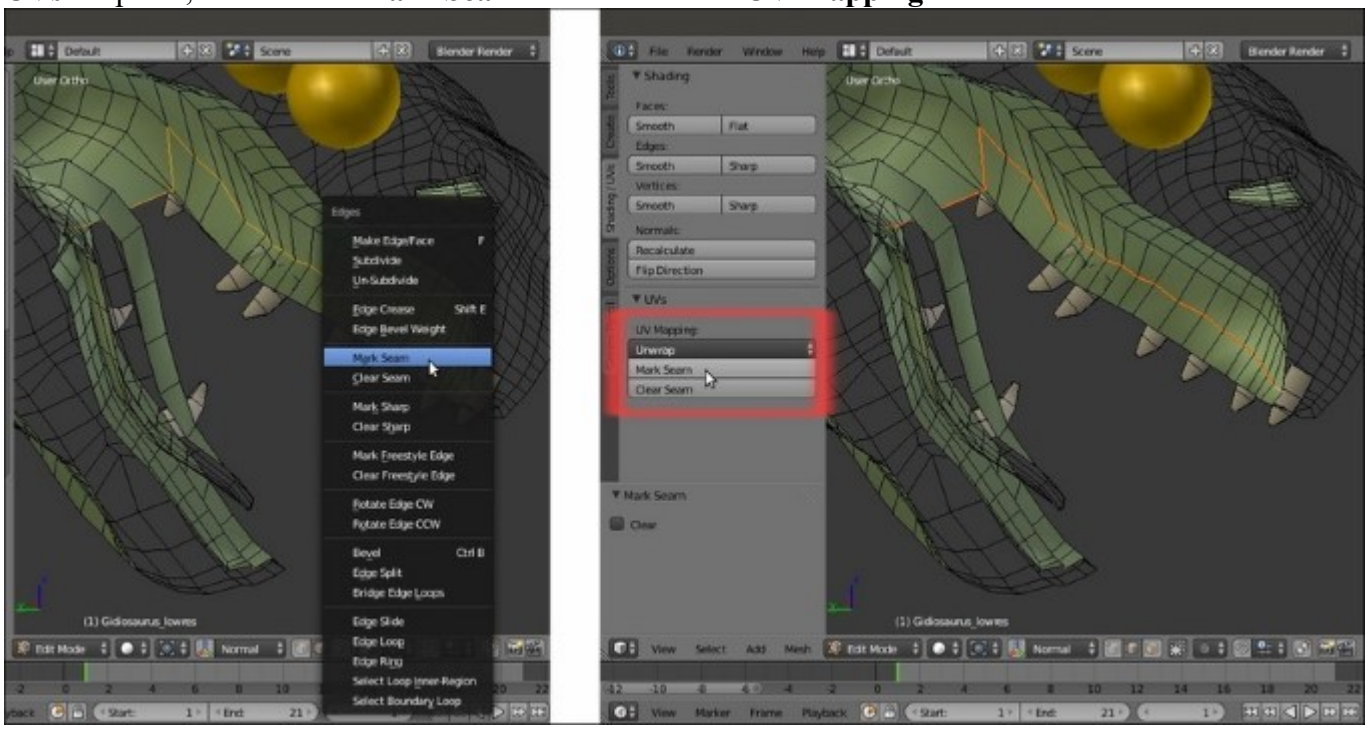
    At this point, we can obviously edit the **throat** area vertices as usual: relaxing and tweaking them and so on. Actually, this is the right moment to tweak all the vertices and any areas that couldn't be done before, such as the inside of the **mouth**, the inner **cheeks**, and so forth, because now we are going to do the last preparation task before the unwrapping.

    To mark seams for the unwrapping of the body, we have to perform the following steps. Because our low resolution mesh is actually still only one half side, we don't need to place seams as median cuts, we only need to divide different areas (for example, the **inside of the mouth** from the **outside of the mouth**) and unroll cylindrical parts such as the **arms**, **fingers**, and **teeth**:
24. Go into **Edit Mode** and zoom in to the character's **head**; press *Ctrl* + *Tab* to call the **Mesh Select Mode** pop-up menu and select the **Edge** item, and then start to select the edge-loop inside the **mouth** (*Alt* + right-click to select an edge-loop); start from the bottom **jaw**, switching direction at the end of the **mouth rim** to go upward, and finish on the inside of the upper **jaw**:



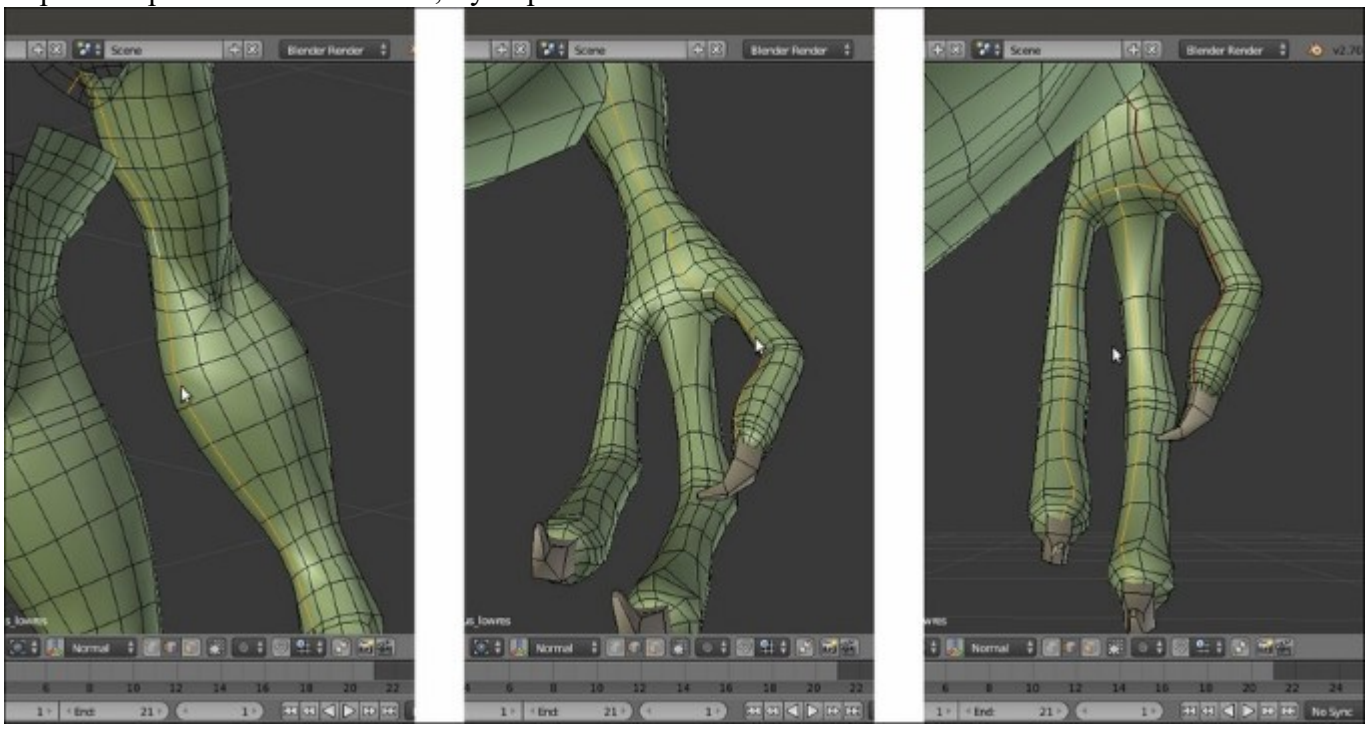
The selected edge-loops inside the mouth

25. Press *Ctrl + E* to open the **Edges** pop-up menu and select the **Mark Seam** item. Alternatively, click on the **Shading / UVs** tab in the **Tool Shelf**, to the left-hand side of the screen, and in the **UVs** subpanel, click on the **Mark Seam** button under the **UV Mapping** item:



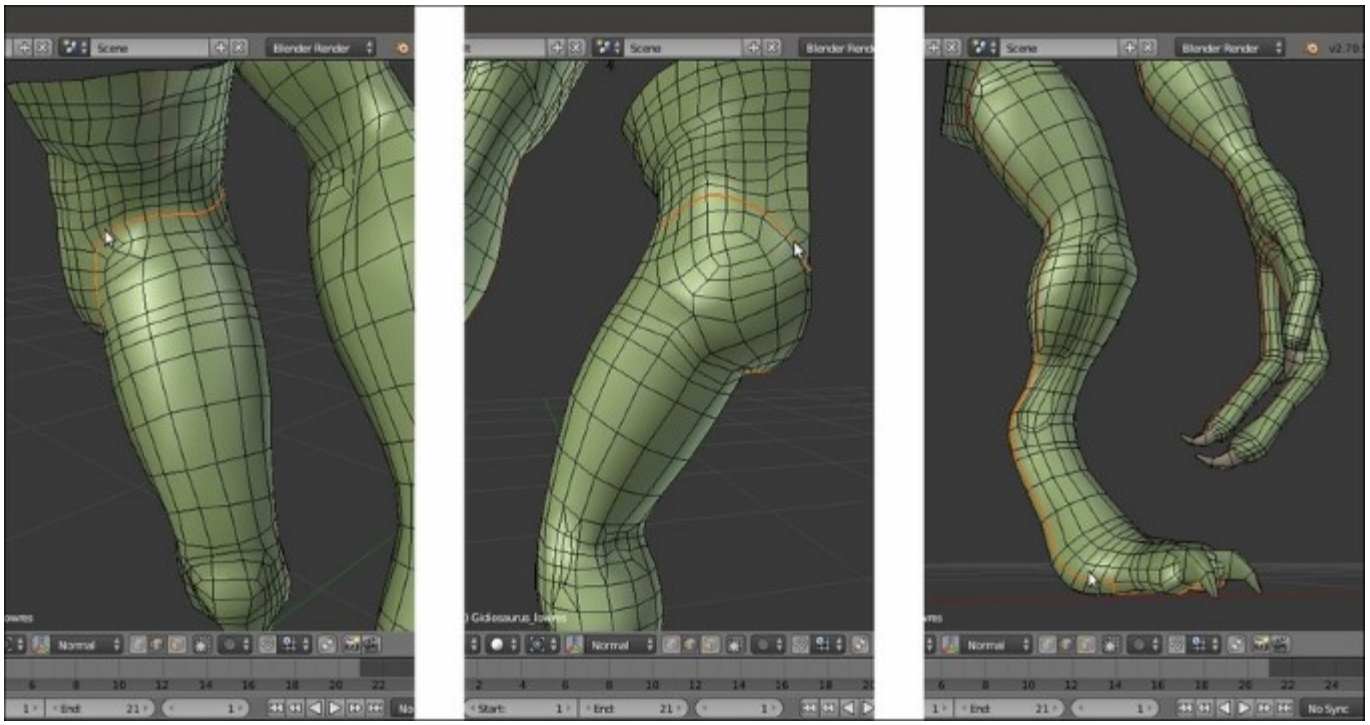
Marking the seams

26. Repeat the procedure for the **arm**; try to place the seams in the less visible areas:



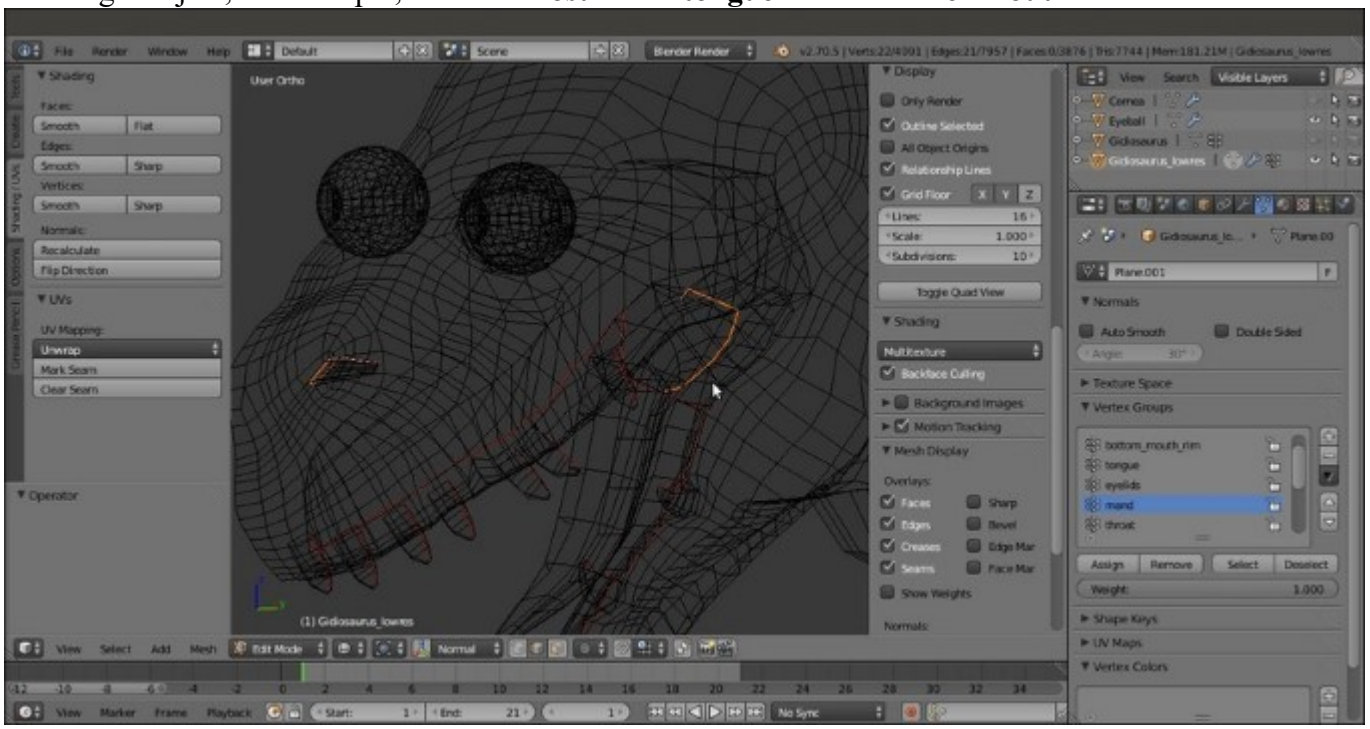
The seams on the arm

27. Do the same for the **pelvis** and **leg**; divide them into two parts with the seams and also try to place the seams inside the natural body folds, if possible:



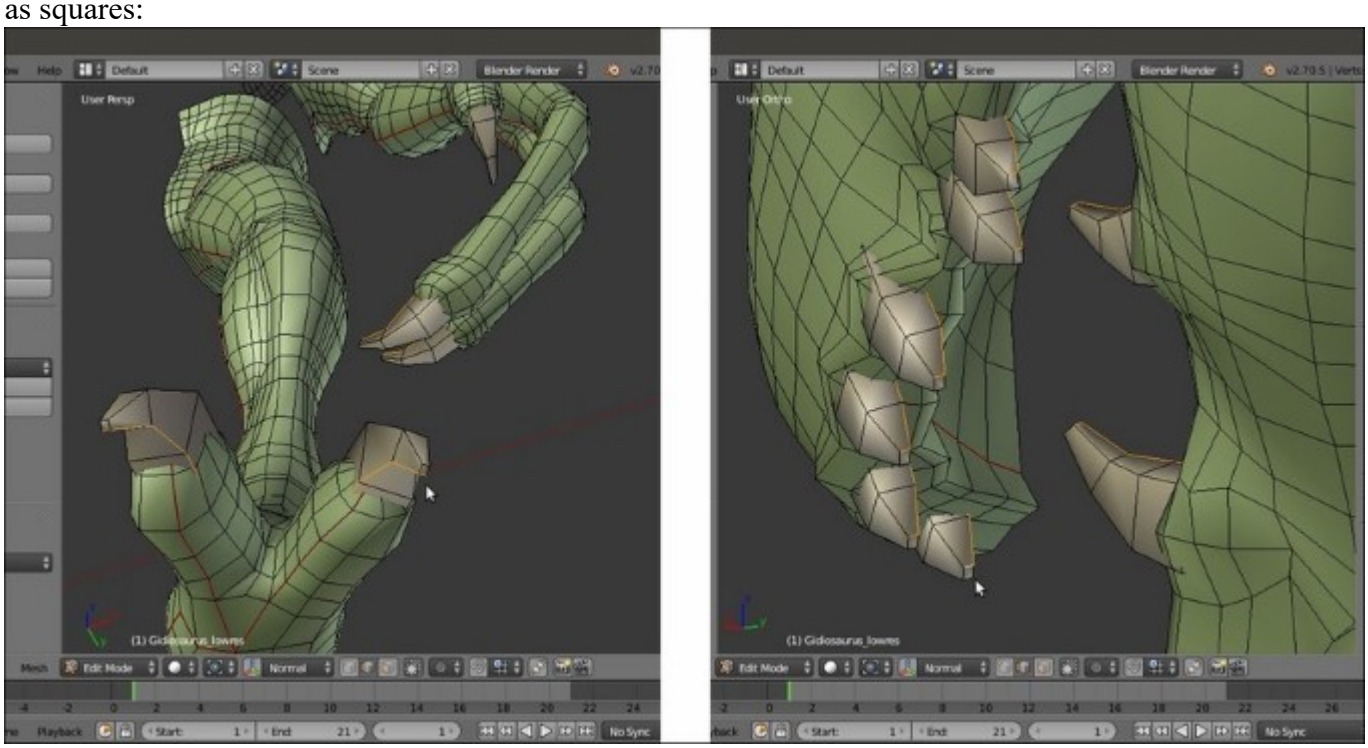
The seams on the pelvis/leg parts

28. It is important to try to place the seams to *divide* parts that would get unwrapped badly if treated as a single object; for example, the inner **nostril** and **tongue** from the **inner mouth**:



The seams inside the head

29. The final seams to add are for the teeth and talons, which would otherwise get badly unwrapped as squares:



The seams of the small parts

30. Save the file.

UV unwrapping the mesh

At this point, everything is ready for the unwrapping.

Getting ready

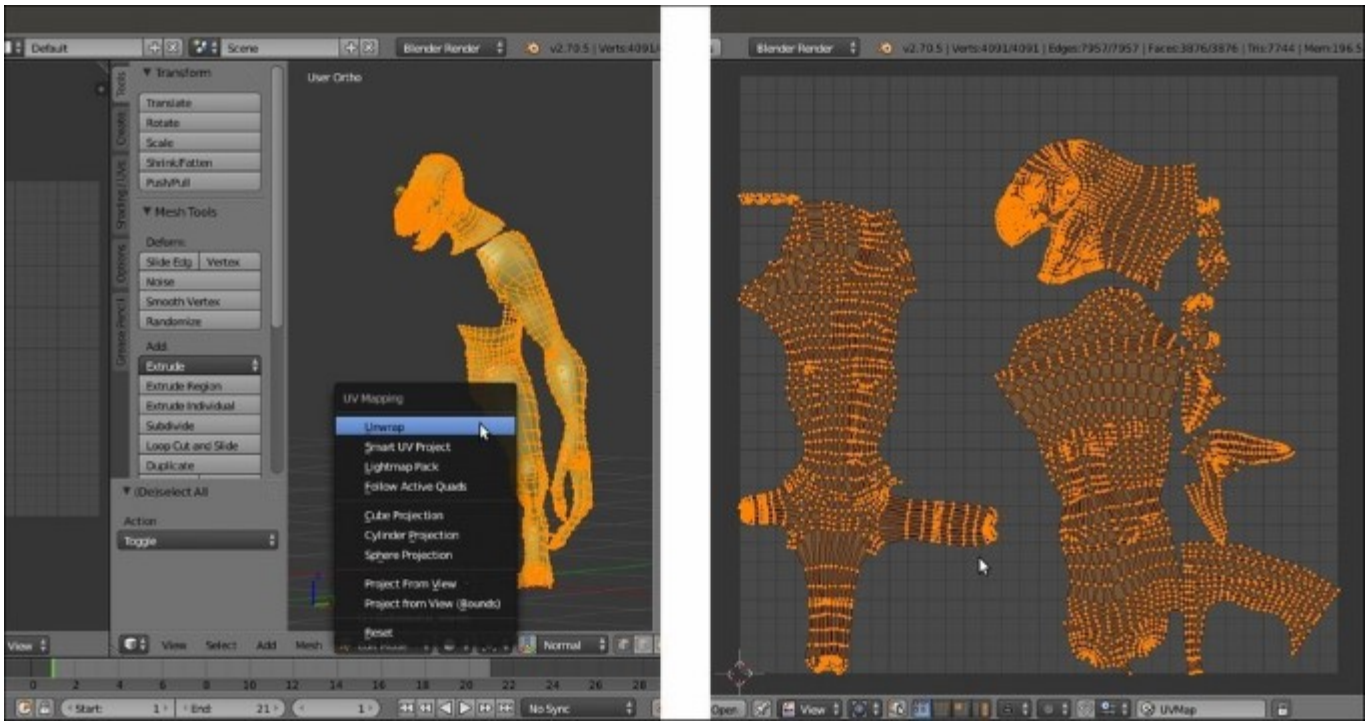
Put the mouse pointer on the bottom or on the top horizontal borders of the 3D window. As the mouse pointer changes to a double-arrow icon, right-click and in the **Area Options** pop-up menu select the **Split Area** item; then, left-click to obtain two windows and switch the left one to **UV/Image Editor**.

The two windows

How to do it…

To unwrap the mesh in Blender, several options are available; however, the one we are going to use now is the basic unwrap, the result of which we will edit and refine later:

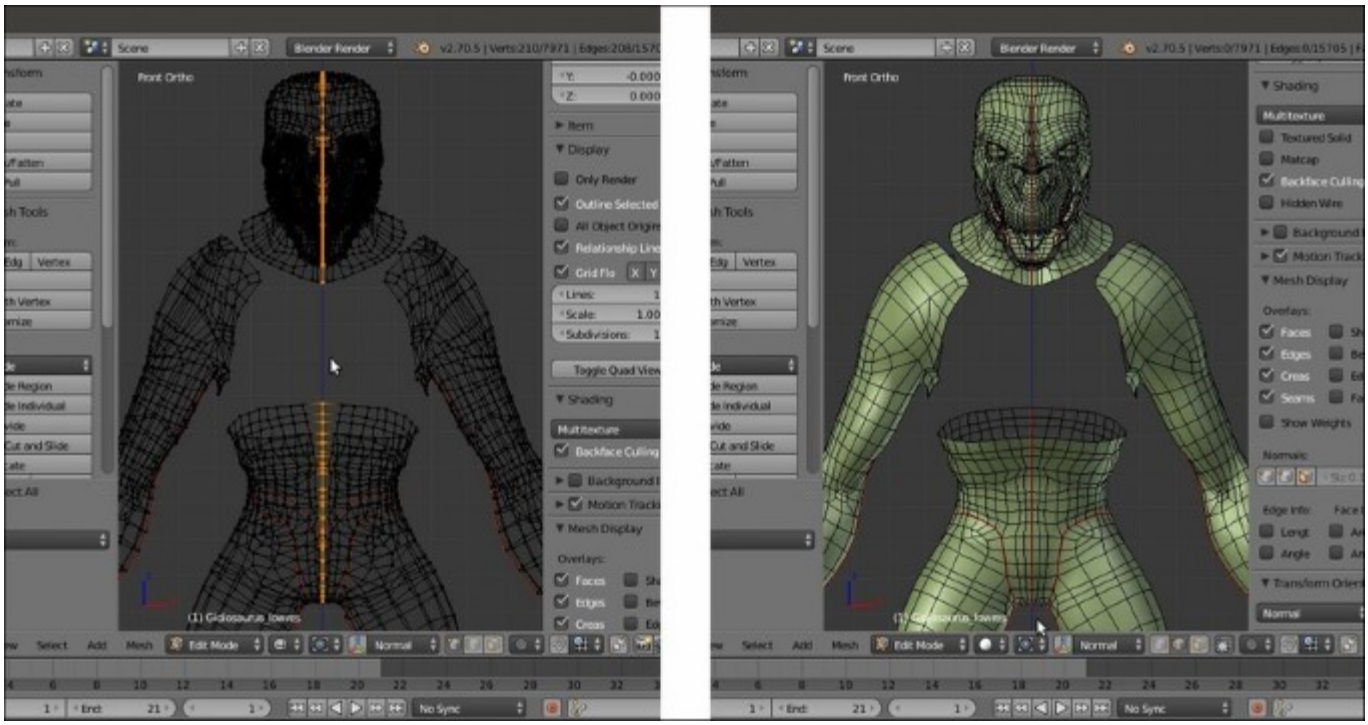
1. Ensure that the **UV/Image Editor** window is not set to **Render Result**, otherwise it won't display the **UV islands**.
2. Select the **Gidiosaurus_lowres** object and enter **Edit Mode**. Select all the vertices (*A* key) and press the *U* key; in the **UV Mapping** pop-up menu, select the first item, **Unwrap**:



Unwrapping the mesh

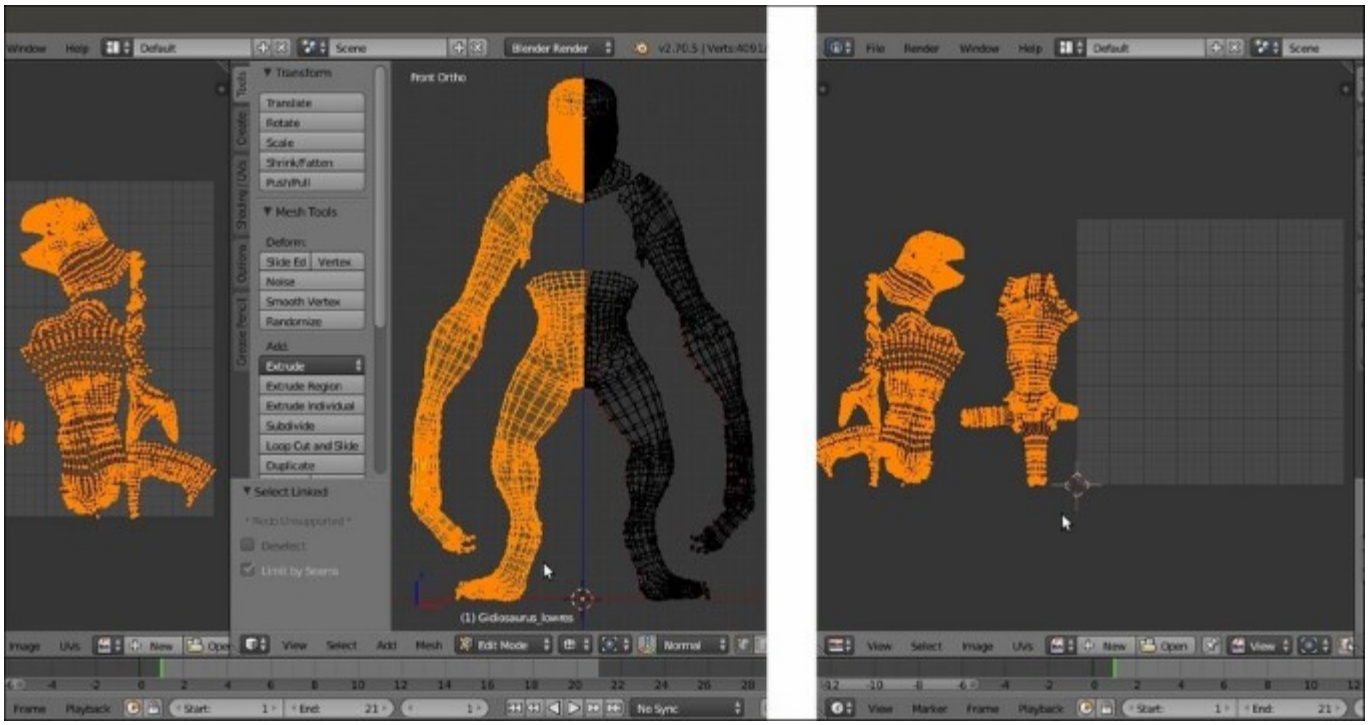
After a while, the **UV layer** of the unwrapped mesh appears in the **UV/Image Editor** window; as you can see, several things can be improved. Moreover, we are still using only half of a mesh.

3. Go out of the **Edit Mode** and go to the **Object Modifiers** window; apply the **Mirror** modifier.
4. Go back into **Edit Mode** and press *1* on the numpad to go to the **Front** view; press *Ctrl + R* and place a median seam through the **head** part of the mesh, as well as through the **pelvis** part:



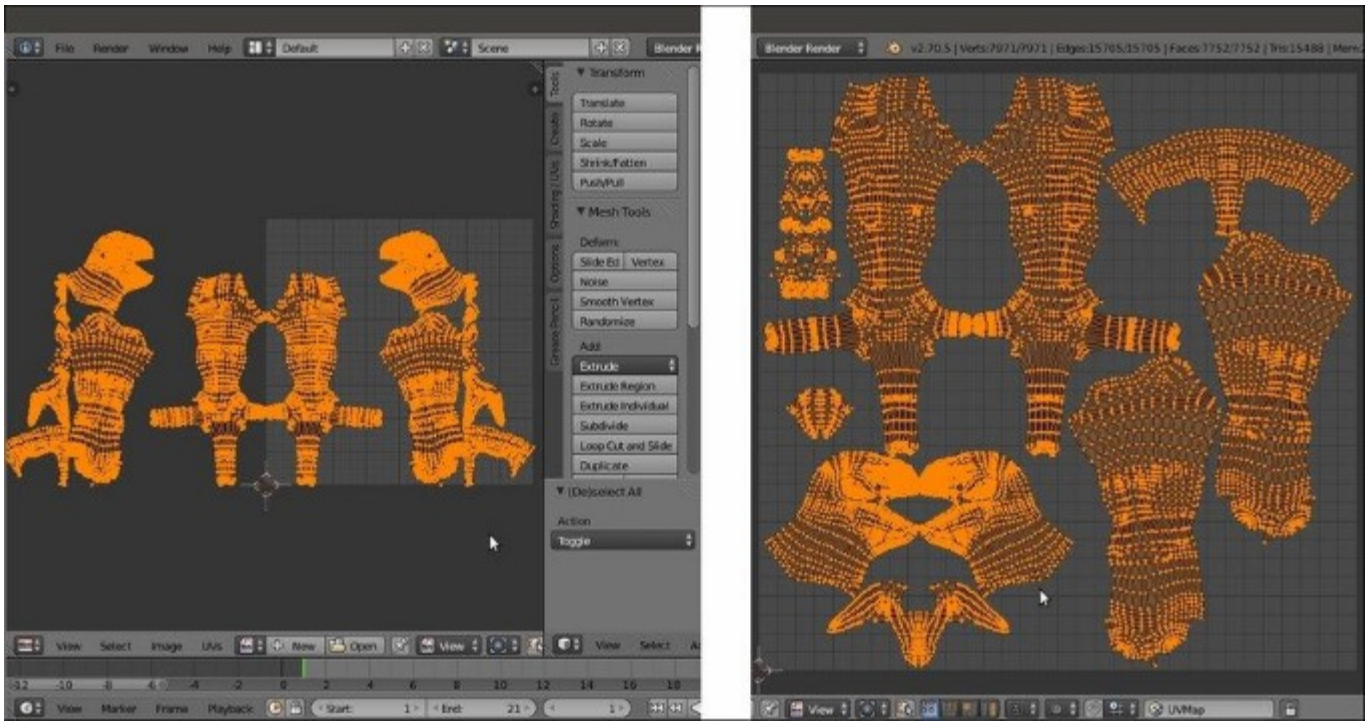
A new loop cut

5. Press *Ctrl* + *Tab* to switch to vertex selection and press *Z* to go into the **Wireframe** viewport shading mode, and then box-select the vertices on the left-hand side of the mesh (which is the side created by the **Mirror** modifier).
6. Go to the **UV/Image Editor** window; if not already selected, press *A* to select all the **UV islands** of the UV layer, and then press *Ctrl* + *M* | *X* | *Enter* to mirror these selected islands.
7. Press *G* to move them (temporarily) outside the default **U0/V0** tile space, as shown in the following screenshot:



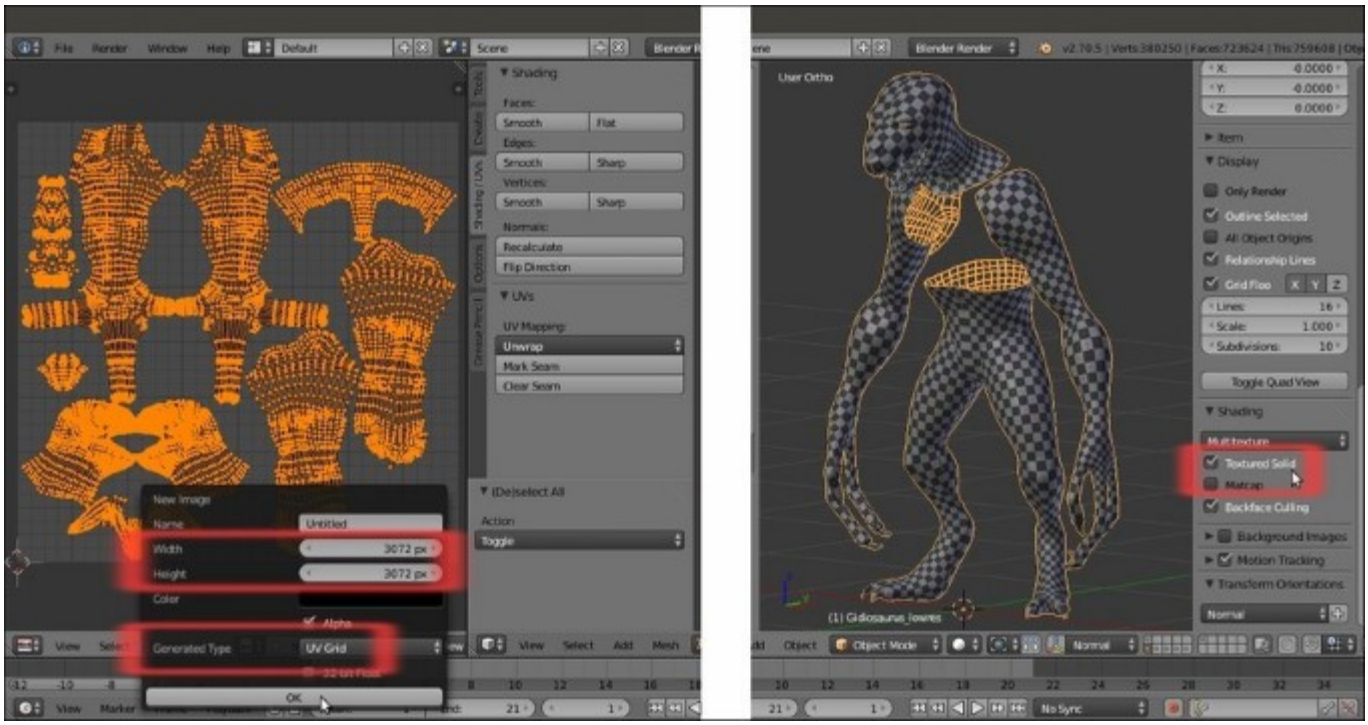
The selected half body vertices and the corresponding UV islands outside the U0/V0 tile space

8. Go to the 3D view and press *A* twice to select all the vertices; go to the **UV/Image Editor** window and press *Ctrl* + *A* to average the size of all the islands reciprocally.
9. Select all the islands and press *Ctrl* + *P* to automatically pack all of them inside the UV tile.
10. If you are not satisfied with the result of the **Pack islands** tool, adjust the position (*G* key), rotation (*R* key), and scale (*S* key) of the islands; group together the similar ones (for example, the **teeth**, **talons**, **arms**, and so on), but try to place them to fill the image tile space as much as possible. To select one island, just put the mouse over it and press *L*, and *Shift* + *L* to multiselect. Use the *X* and *Y* keys to constrain the movements of the islands on the corresponding axis:



Adjusting the UV islands' position

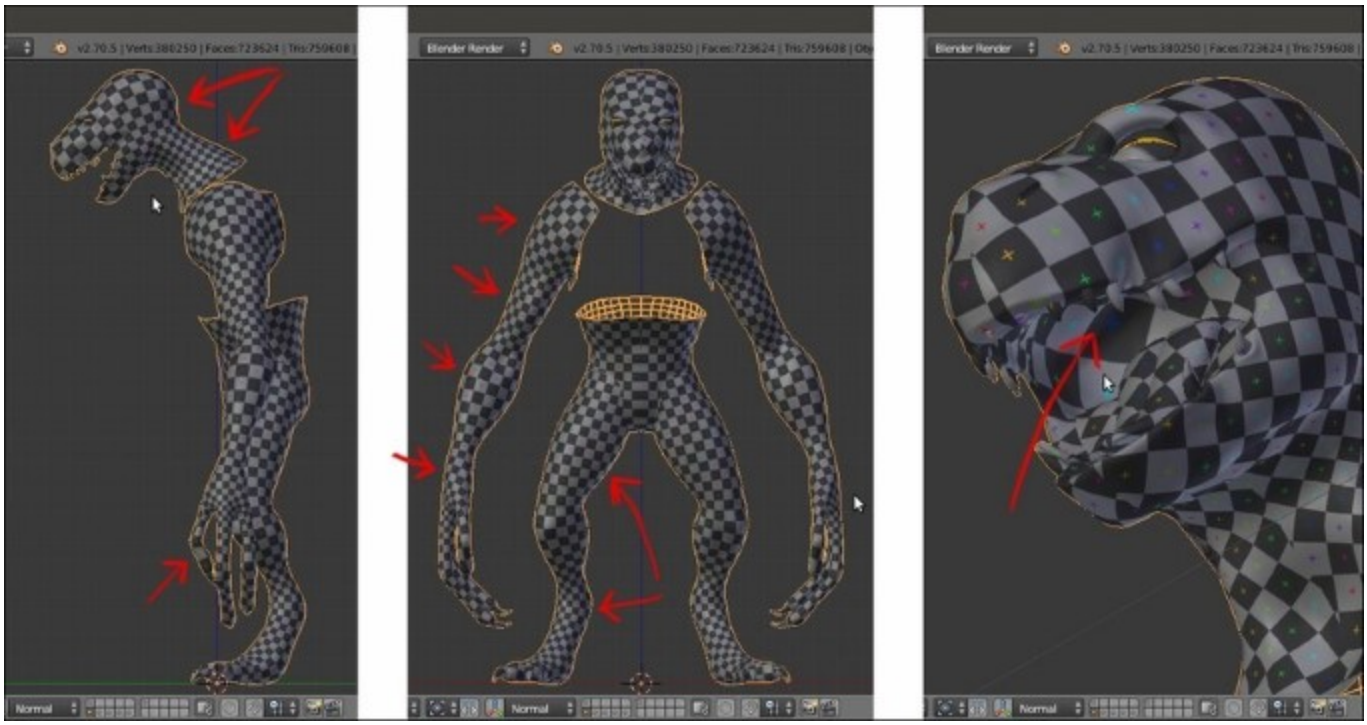
11. When you are done, ensure that all the vertices of all the islands in the **UV/Image Editor** window are selected, and click on the **New** button on the toolbar of the **UV/Image Editor** window; in the **New Image** pop-up panel, set **Width** and **Height** to **3072** pixels, and **Generated Type** should be set to **UV Grid**. Then, click on the **OK** button to confirm.
12. Go to the 3D window and press *Z* to go in the **Solid** viewport shading mode. Then, go to the **Properties** 3D view sidepanel and under the **Shading** subpanel, check the **Textured Solid** item.
13. Go out of the **Edit Mode** and save the file:



Assigning a grid image to the unwrapped UV islands

This should be enough; even if the halves of the mesh are disconnected, Blender can perfectly solve the mesh painting without visible seams.

However, if we look at the character shown in the **Textured Solid** mode in the 3D view, it's clear that the unwrap of some part of the mesh could be better; for example, you can see a difference in the size of the mapped grid in the **head/neck** area, inside the **mouth**, and on the **arms** and **legs** (look at the arrows in the following images):



Differences in the mapped grid image

Although this is not a very big issue, the unwrap can be refined further to avoid distortions as much as possible, as well as potential future problems when we'll paint the character textures; we are going to see this in the next recipe.

Editing the UV islands

We are now going to join the two UV islands' halves together, in order to improve the final look of the texturing; we are also going to modify, if possible, a little of the island proportions in order to obtain a more regular flow of the UV vertices, and fix the *distortions* we have seen in the last image of the previous recipe.

We are going to the use the **pin** tool, which is normally used in conjunction with the **Live Unwrap** tool.

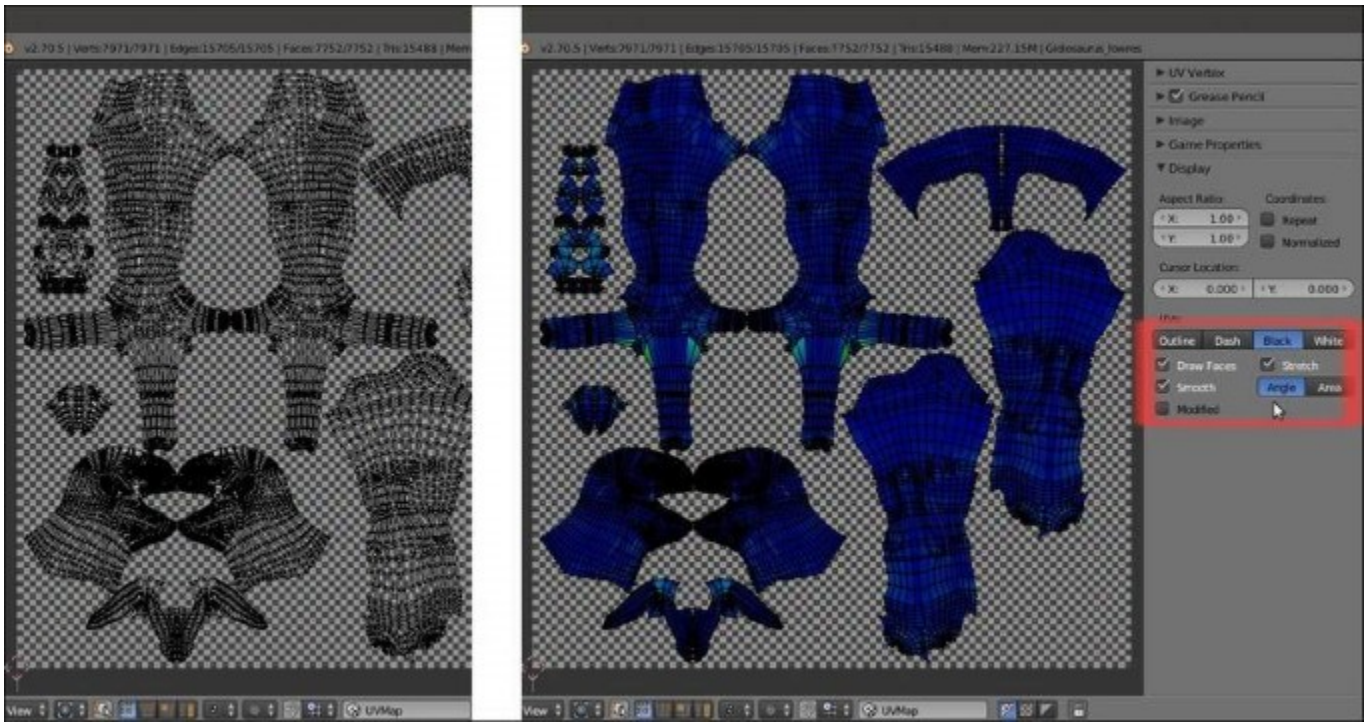
Getting ready

First, we'll try to recalculate the unwrap of some of the islands by modifying the seams of the mesh.

Before we start though, let's see if we can improve some of the visibility of the UV islands in the **UV/Image Editor**:

1. Put the mouse cursor in the **UV/Image Editor** window and press the *N* key.
2. In the **Properties** sidepanel that appears by pressing the *N* key on the right-hand side of the window, go to the **Display** subpanel and click on the **Black** or **White** button (depending on your preference) under the **UV** item. Check also the **Smooth** item box.
3. Also, check the **Stretch** item, which even though it was made for a different purpose, can increase the visibility of the islands a lot.
4. Press *N* again to get rid of the **Properties** sidepanel.

All these options enabled should make the islands more easily readable in the **UV/Image Editor** window:

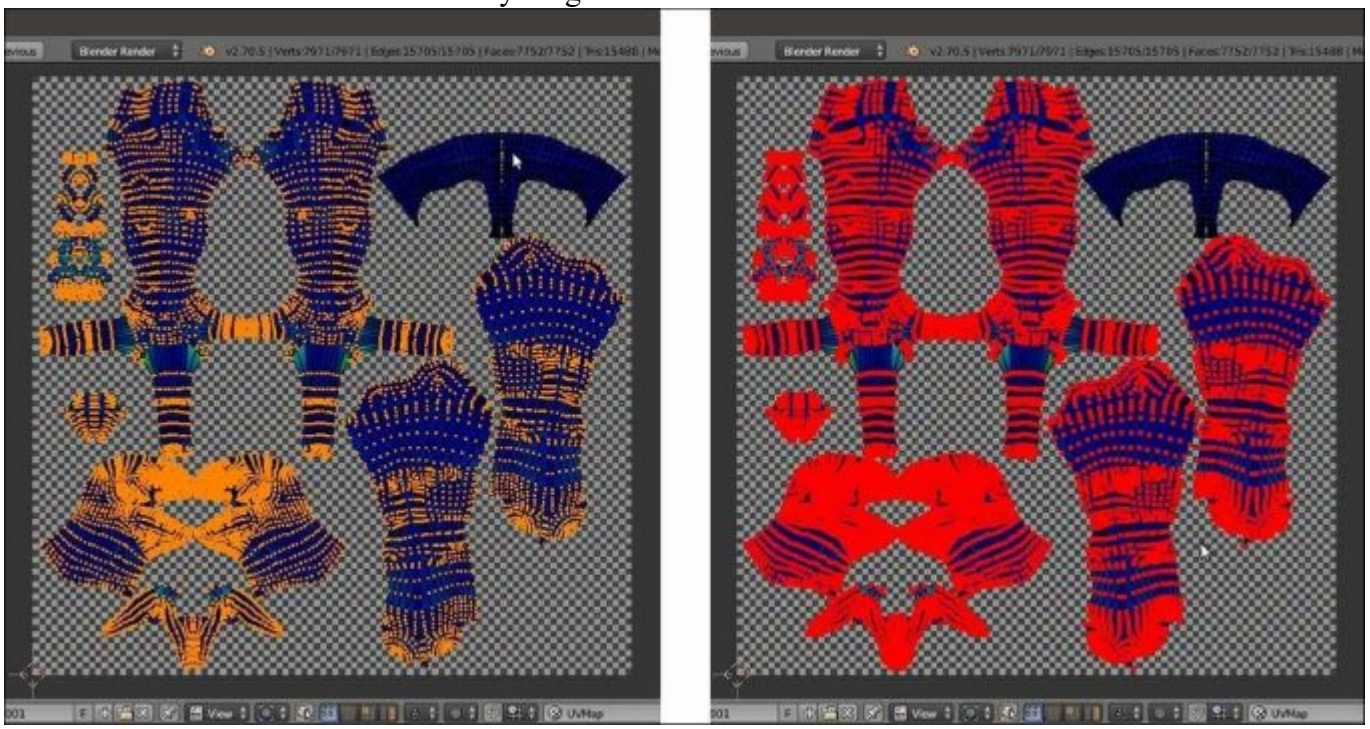


The UV islands made more easily readable by the enabled items

How to do it…

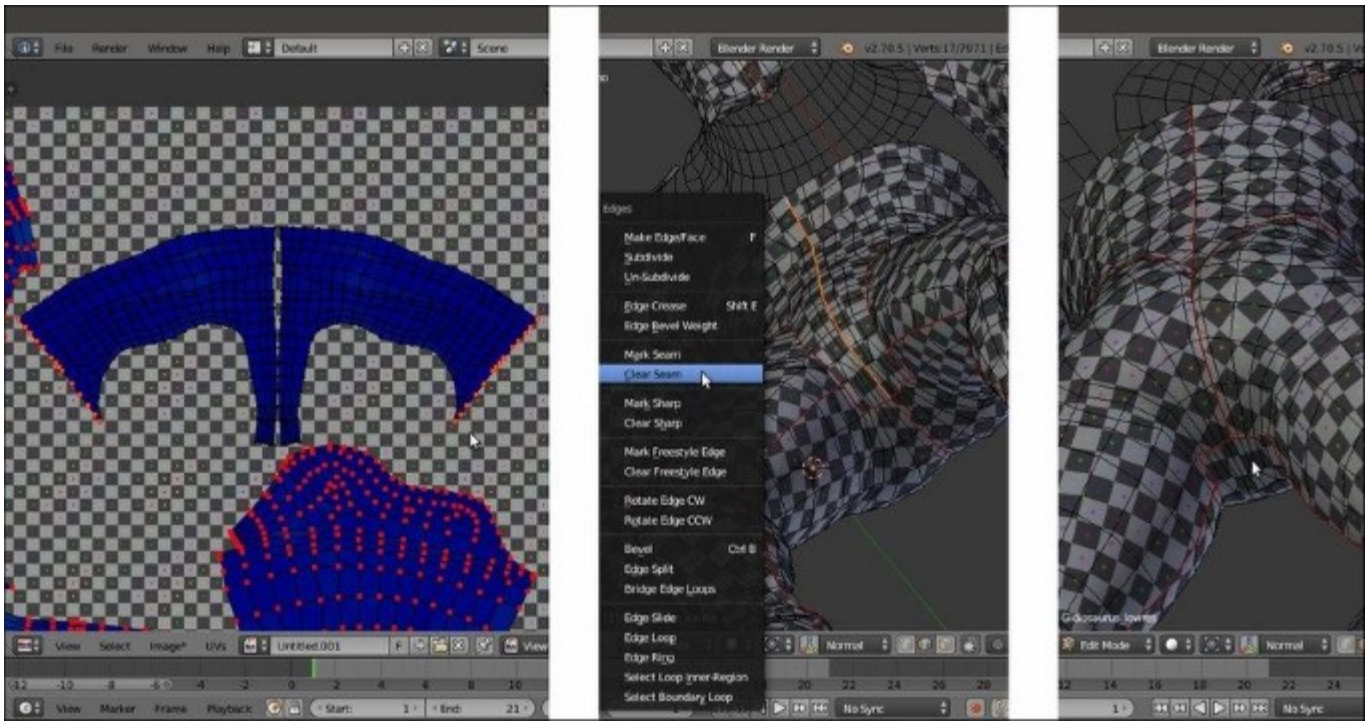
Now we can start with the editing; initially, we are going to freeze the islands that we don't want to modify because their unwrap is either satisfactory, or we will deal with it later. So, perform the following steps:

1. Press *A* to select all the islands, then by putting the mouse pointer on the two **pelvis** island halves and pressing *Shift* + *L*, multi-deselect them; press the *P* key to **pin** the remaining selected UV islands and then *A* to deselect everything:



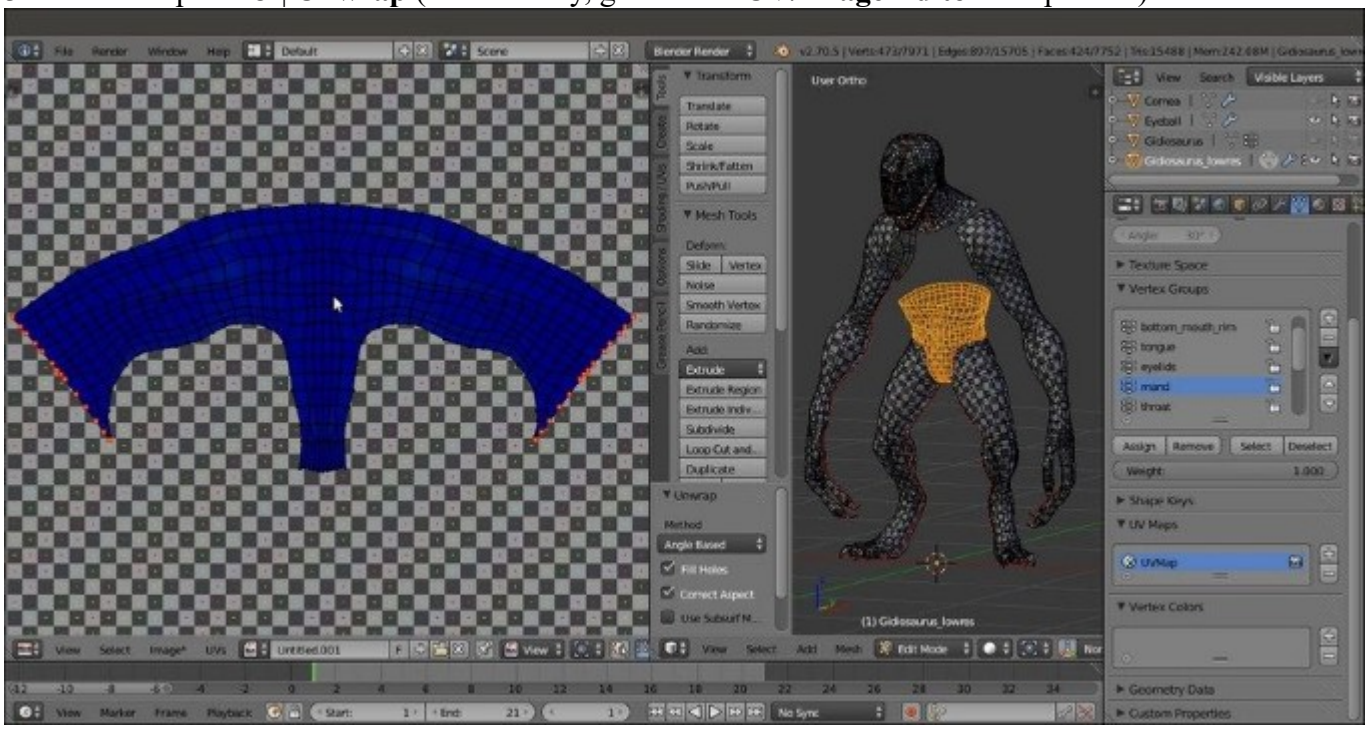
To the right-hand side, the pinned UV islands

2. Zoom in on the islands of the **pelvis**, select both the left and right outer edge-loops, as shown in the following left image, and press *P* to **pin** them.
3. Go to the 3D view and clear only the front part of the median seam on the **pelvis**. To do this, start to clear the seam from the front edges, go down and stop where it crosses the horizontal seam that passes the bottom part of the **groin** and **legs**, and leave the back part of the vertical median seam still marked:



Pinning the extreme vertices in the UV/Image Editor, and editing the seam on the mesh

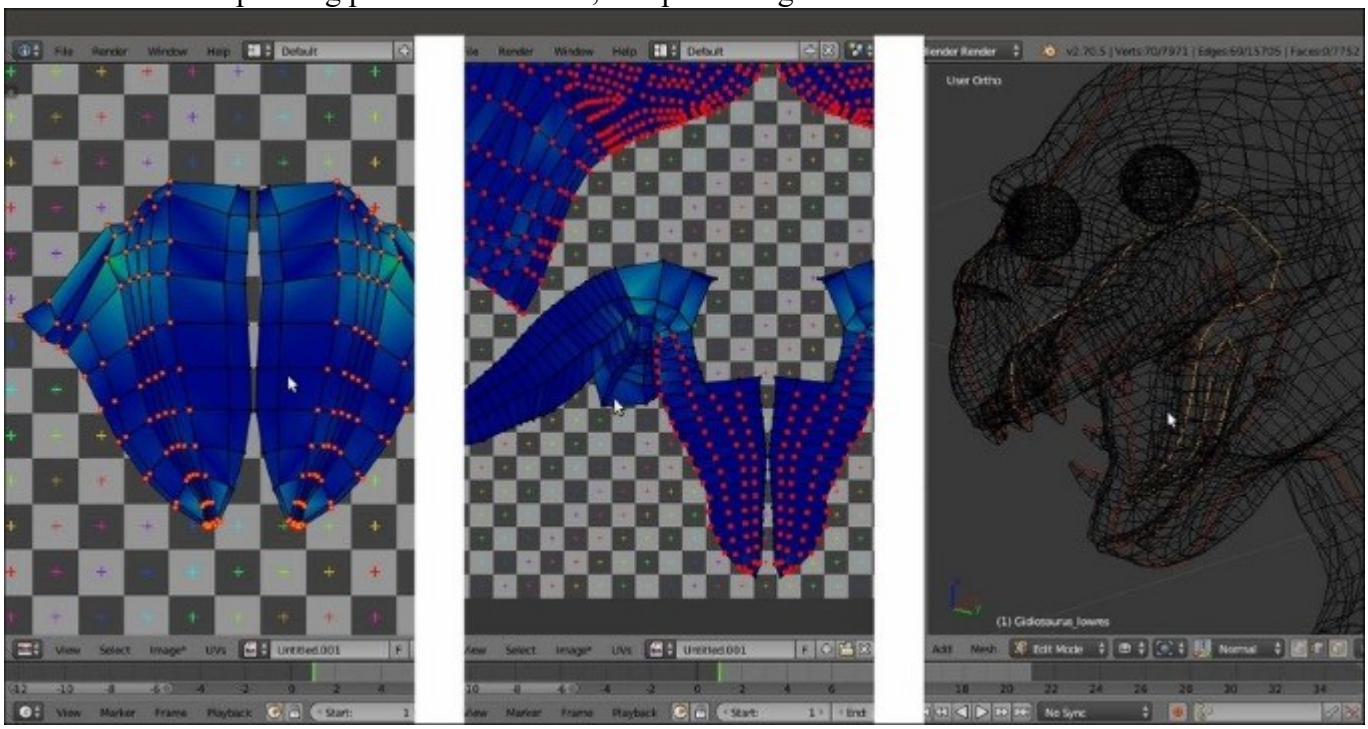
4. Go into **Face** selection mode and select all the faces of the **pelvis**; put the mouse pointer in the 3D view and press *U* | **Unwrap** (alternatively, go into the **UV/Image Editor** and press *E*):



Unwrapping again with the pinning and a different seam

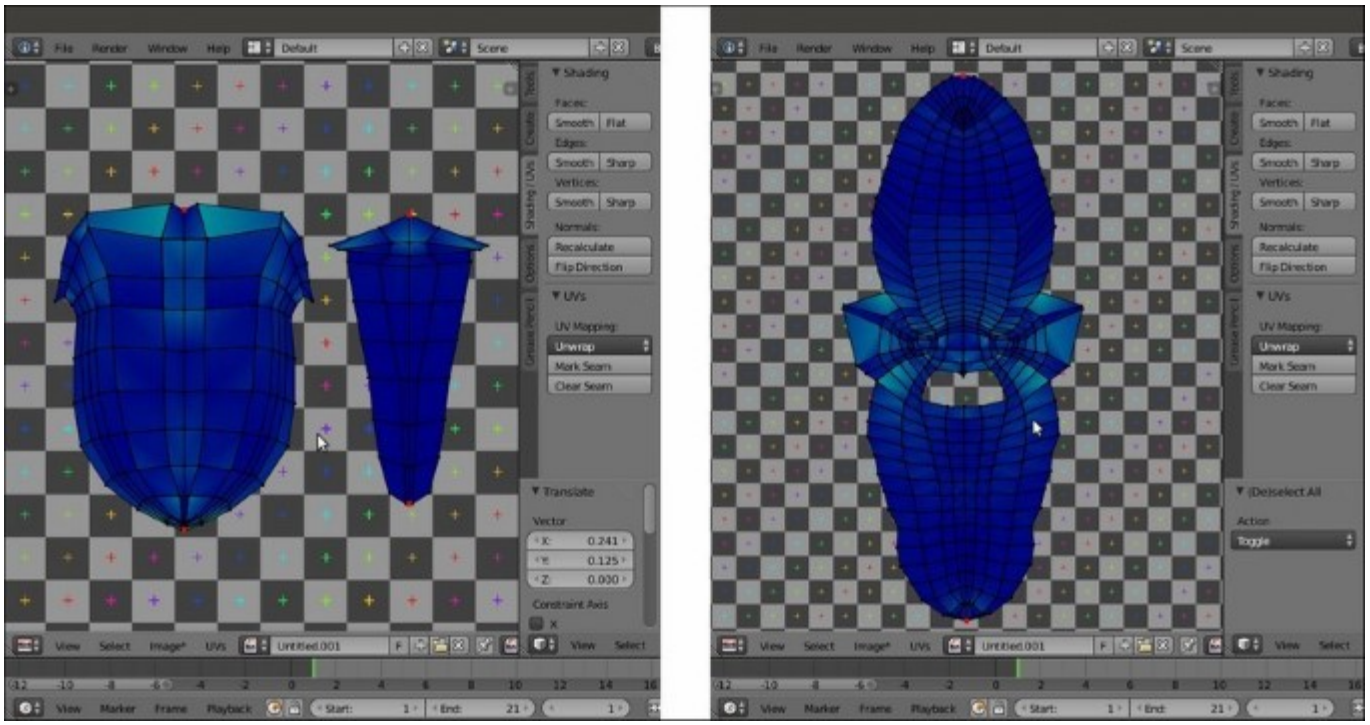
The island will keep the previous position because of the pinned edges, and is now unwrapped as one single piece (with the obvious exception of the seam on the back).

5. We won't modify the **pelvis** island any further, so select all its vertices and press *P* to pin all of them and then deselect them.
6. Press *A* in the 3D view to select all the faces of the mesh and make all the islands visible in the **UV/Image Editor**. Note that they are all pinned at the moment, so just select the vertices you want to **unpin** (*Alt* + *P*) in the islands of the **tongue** and **inner mouth**. Then, clear the median seam in the corresponding pieces on the mesh, and press *E* again:



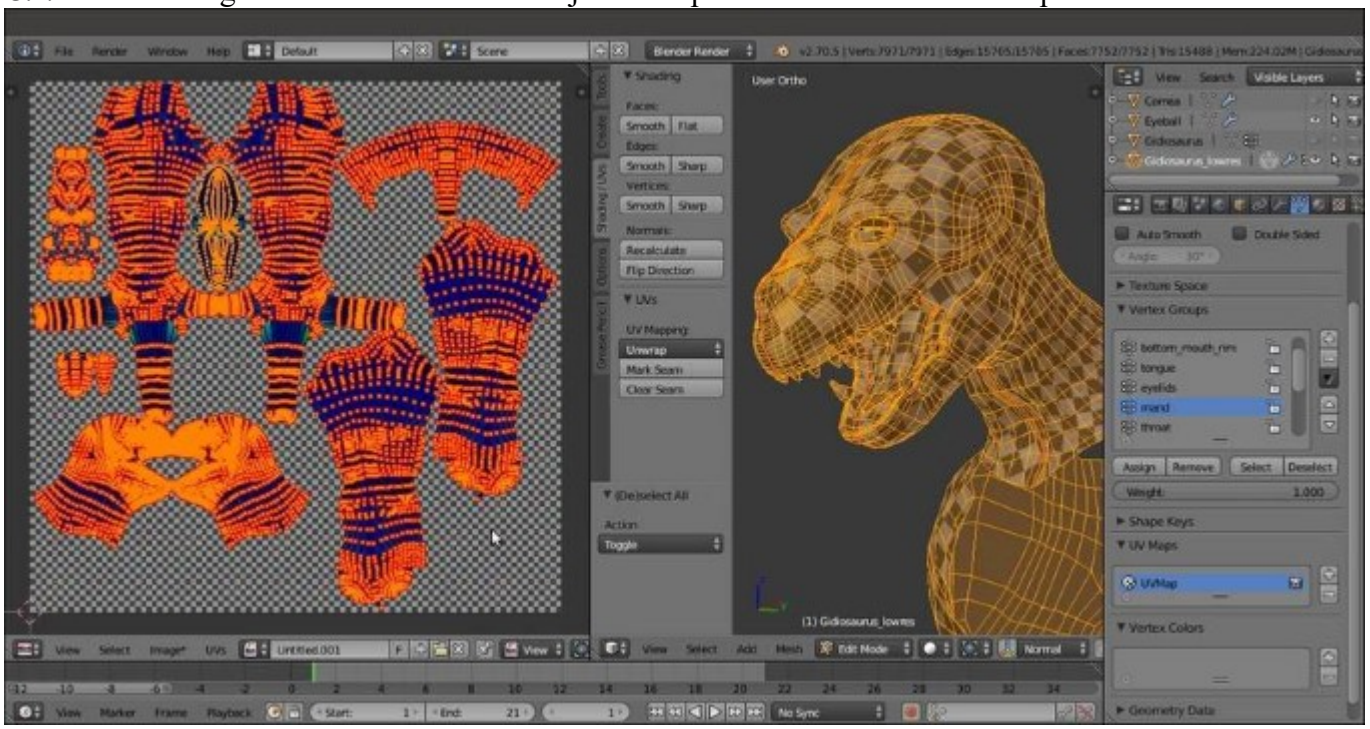
Re-unwrapping the tongue and inner mouth areas

7. Select the UV vertices of the resulting islands and unpin them all; next, pin just one vertex at the top of the islands and one at the bottom, and unwrap again. This will result in a more organically distributed unwrap of the parts:



Re-unwrapping again with a different pinning

8. Select all the faces of the mesh, and then all the islands in the **UV/Image Editor** window. Press *Ctrl + A* to average their relative size and adjust their position in the default tile space:



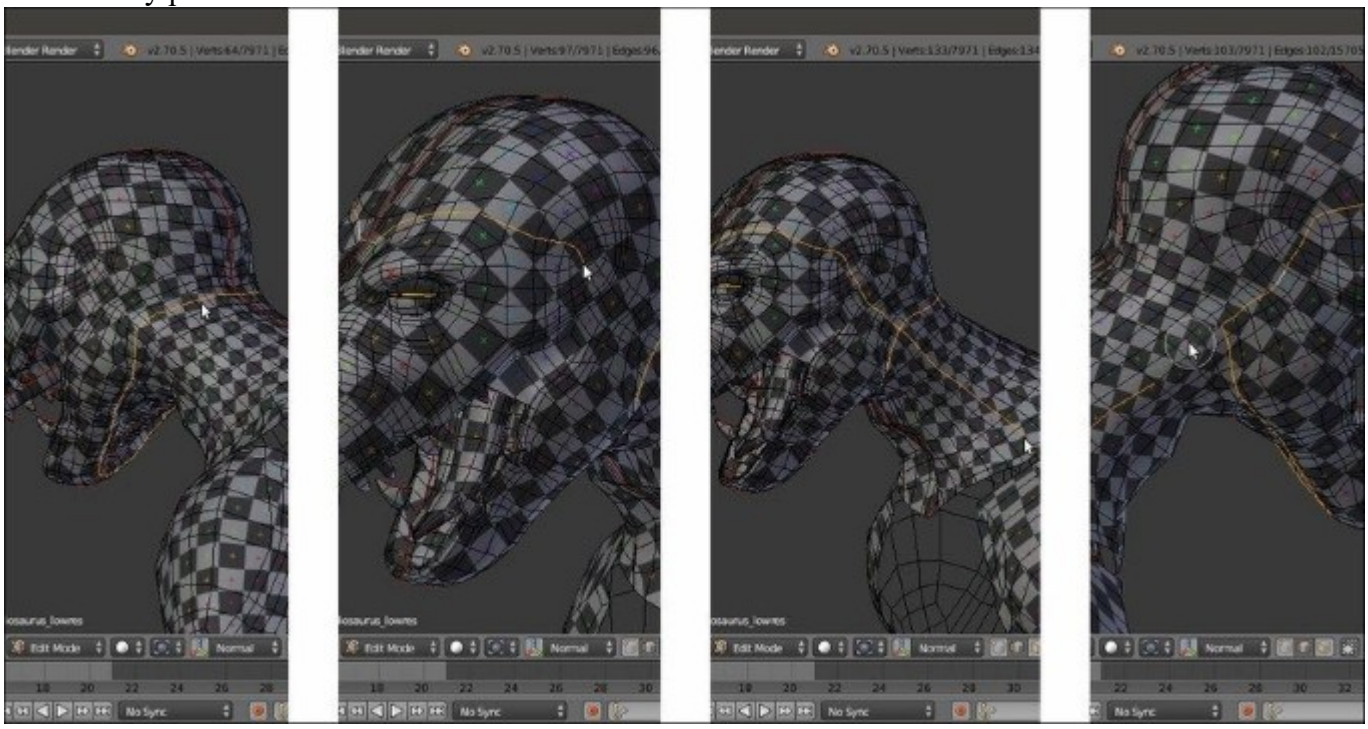
The rearranged UV islands

Now, let's work on the **head** piece that, as in every character, should be the most important and well-finished piece.

At the moment, the **face** is made using two separate islands; although this won't be visible in the final textured rendering of our character, it's always better, if possible, to join them in order to have a single piece, especially in the front mesh faces. Due to the elongated **snout** of the character, if we were to unwrap the **head** as a single piece simply without the median seam, we wouldn't get a nice evenly mapped result, so we must divide the whole **head** into more pieces.

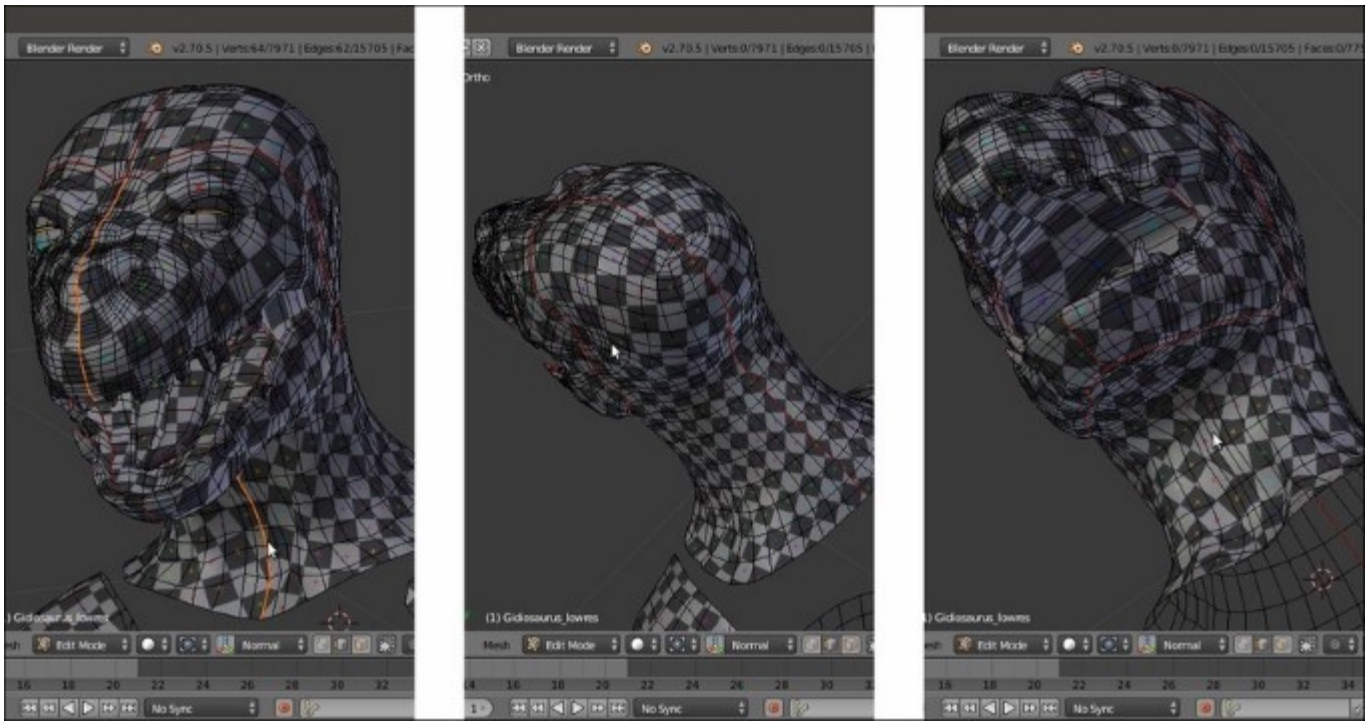
Actually, we can take advantage of the fact that the **Gidiosaurus** is wearing a **helmet** and that most of the **head** will be covered by it; this allows us to easily split the **face** from the rest of the mesh, hiding the seams under the **helmet**.

9. Go into **Edge** selection mode and mark the seams, dividing the **face** from the **cranium** and **neck** as shown in the following screenshots. Select the crossing edge-loops, and then clear the unnecessary parts:



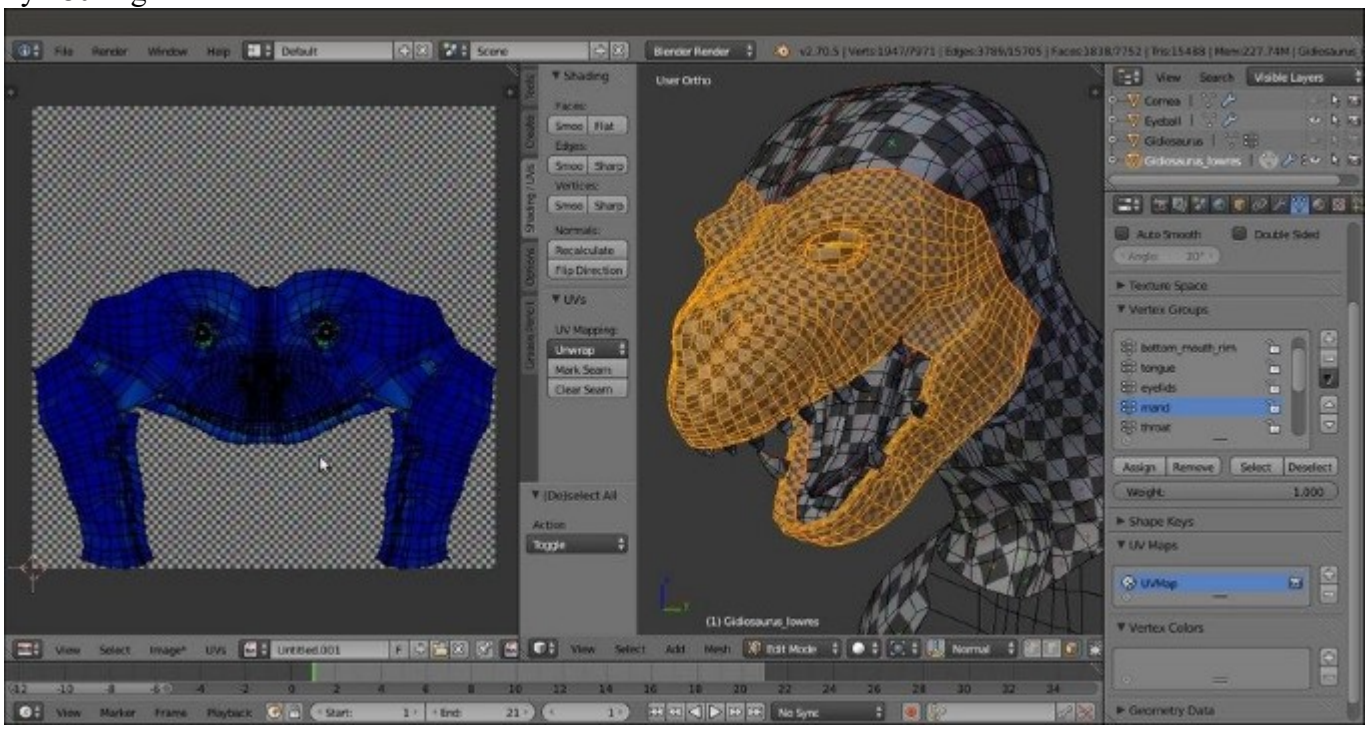
New seams for the character's head part 1

10. Also clear the median seam in the upper **face** part, and under the seam on the bottom **jaw**, leaving it only on the front **mandible** and on the back of the **cranium** and **neck**:



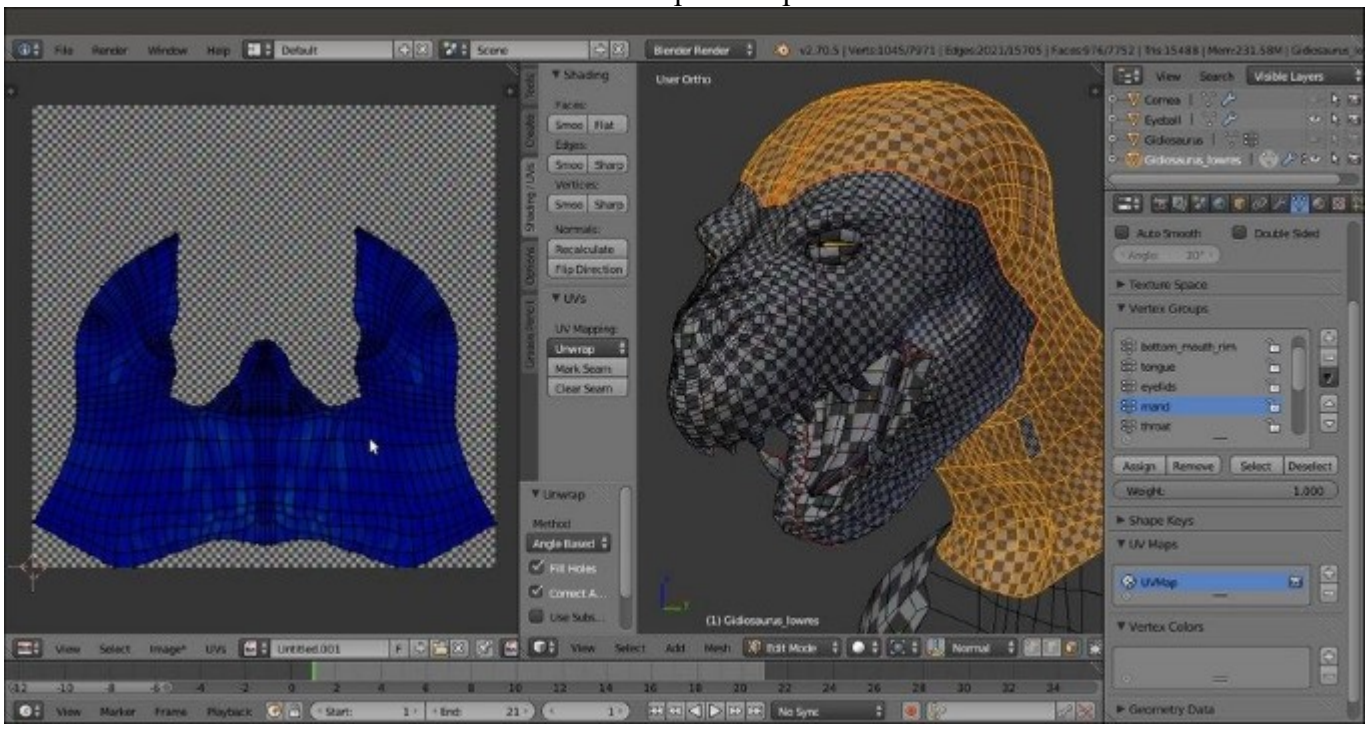
New seams for the character's head part 2

11. Go in the **Face** selection mode and select only the **face** section of the mesh, and then press *E* to unwrap. The new unwrap comes upside down, so select all the UV vertices and rotate the island by **180** degrees:



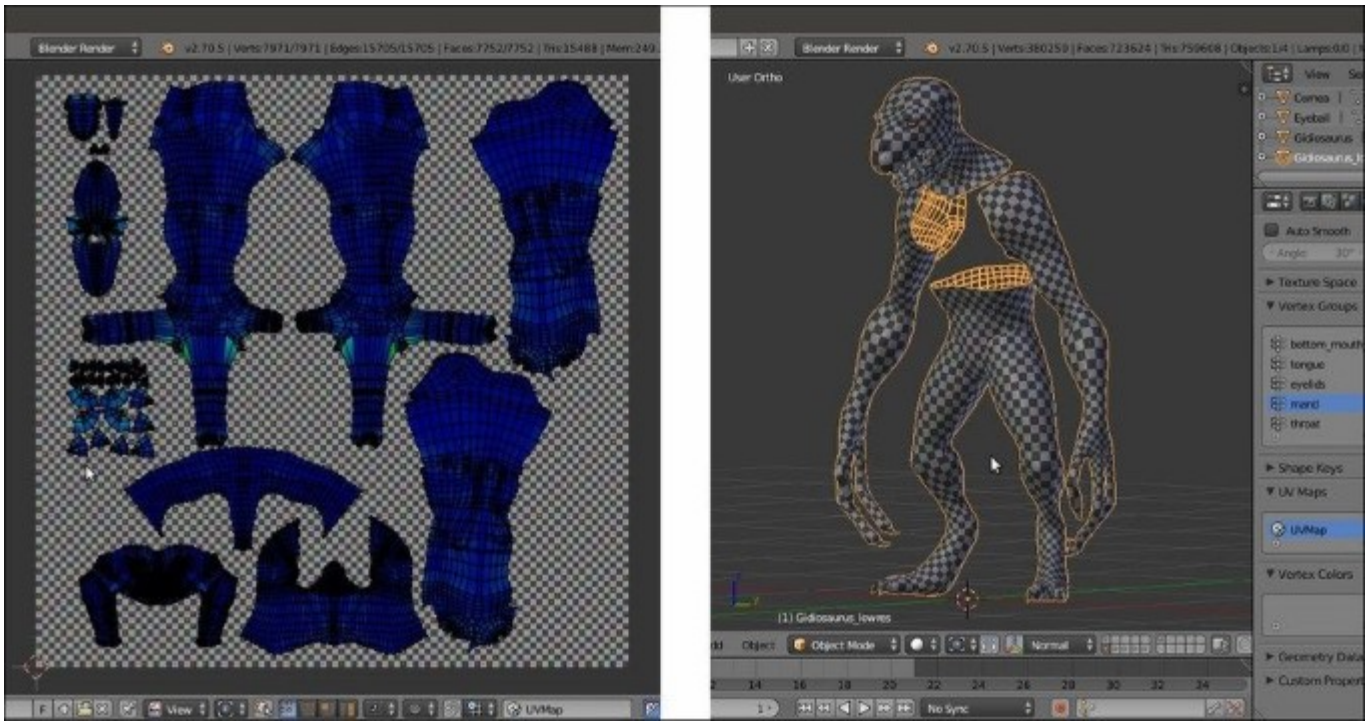
The character's face unwrapped

12. Select the **cranium/neck** section on the mesh and repeat the process:



The rest of the head mesh unwrapped as a whole piece

13. Now, select all the faces of the mesh and all the islands in the **UV/Image Editor**, and press *Ctrl + A* to average their reciprocal size.
14. Once again, adjust the position of the islands inside the UV tile (*Ctrl + P* to automatically pack them inside the available space, and then tweak their position, rotation, and scale):



The character's UV islands packed inside the default U0/V0 tile space

How it works…

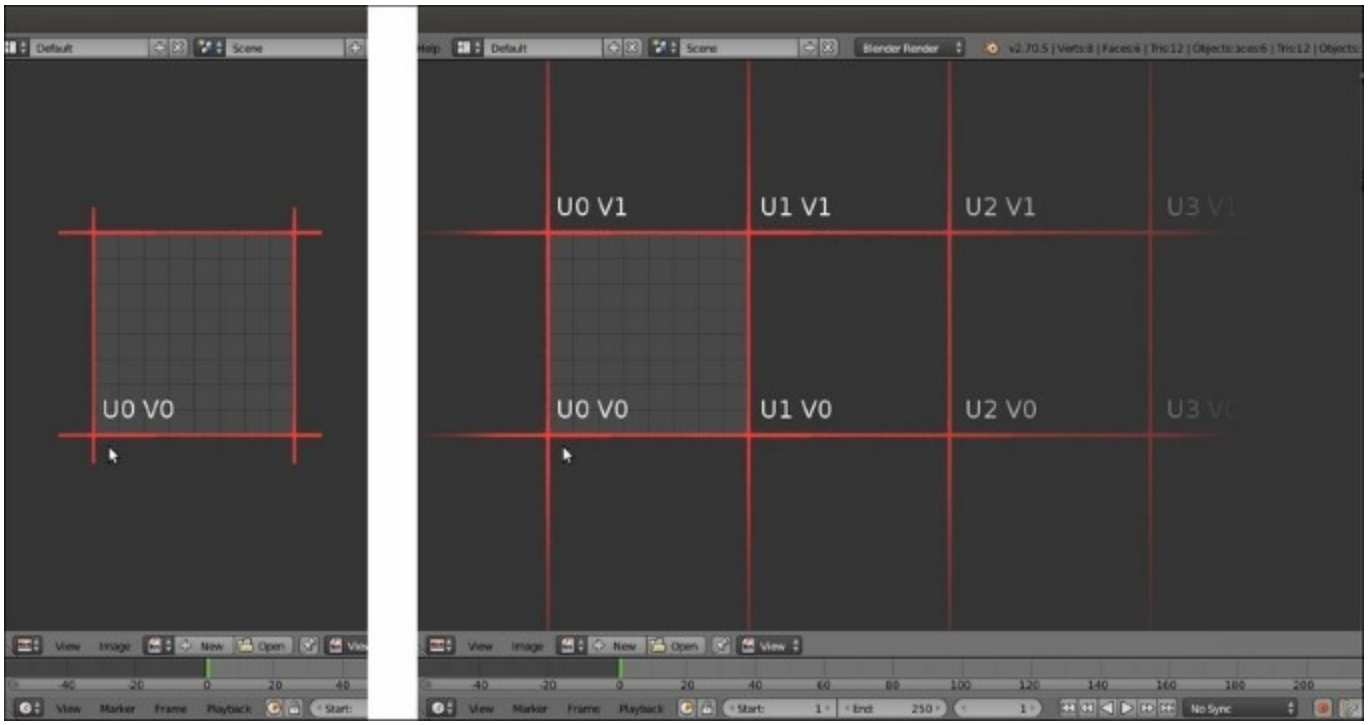
Starting from the UV unwrap in the previous recipe, we improved some of the islands by joining together the halves representing common mesh parts. When doing this, we tried to retain the already good parts of the unwrap by **pinning** the UV vertices that we didn't want to modify; this way, the new unwrap process was forced to calculate the position of the unpinned vertices using the constraints of the pinned ones (**pelvis**, **tongue**, and **inner mouth**). In other cases, we totally cleared the old seams on the model and marked new ones, in order to have a completely new unwrap of the mesh part (the **head**), we also used the character furniture (such as the **armor**) to hide the seams (which in any case, won't be visible at all).

There's more…

At this point, looking at the **UV/Image Editor** window containing the islands, it's evident that if we want to keep several parts in proportion to each other, some of the islands are a little too small to give a good amount of detail when texturing; for example, the Gidiosaurus's face.

A technique for a good unwrap that is the current standard in the industry is **UDIM UV Mapping**, which means **U-Dimension**; basically, after the usual unwrap, the islands are scaled bigger and placed outside the default **U0/V0** tile space.

Look at the following screenshots, showing the Blender **UV/Image Editor** window:

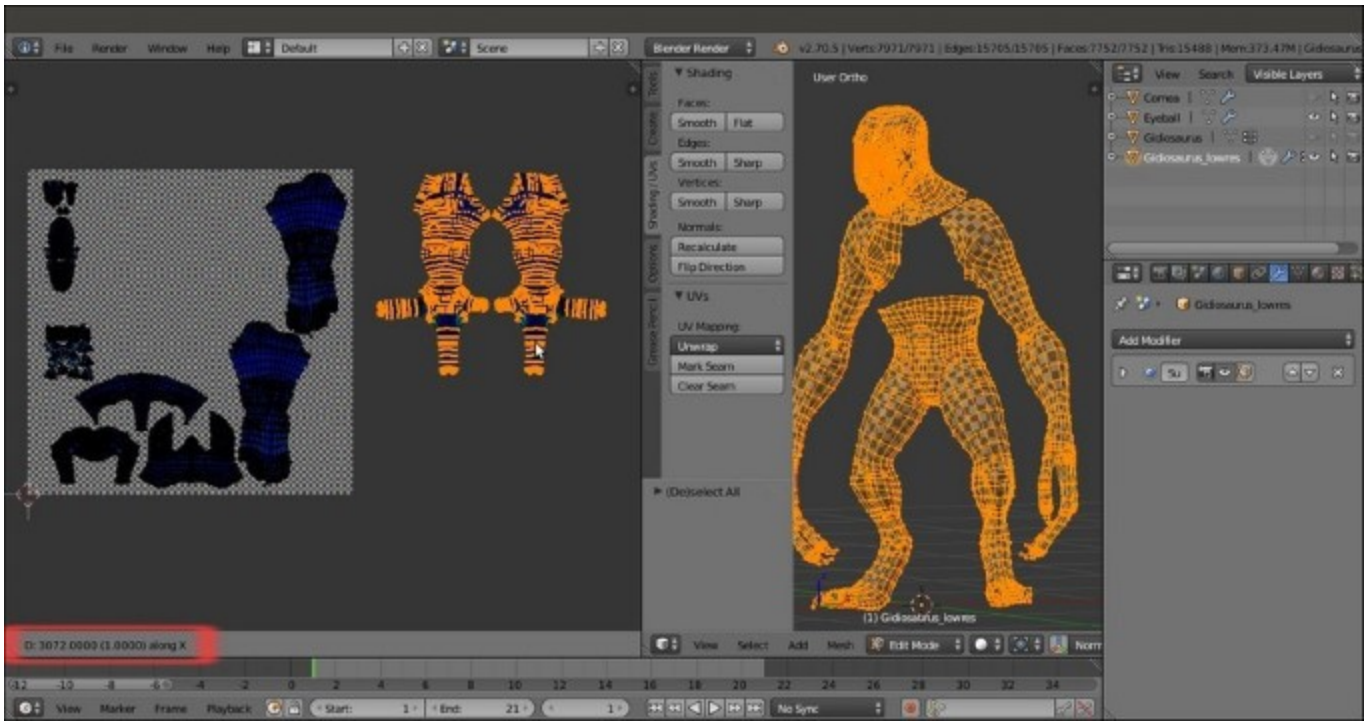


The default U0/V0 tile space and the possible consecutive other tile spaces

On the left-hand side, you can see, highlighted with red lines, the single UV tile that at present is the standard for Blender, which is identified by the **UV** coordinates **0** and **0**: that is, **U** (horizontal) = **0** and **V** (vertical) = **0**.

Although not visible in the **UV/Image Editor** window, all the other possible consecutive tiles can be identified by the corresponding UV coordinates, as shown on the right-hand side of the preceding screenshot (again, highlighted with red lines). So, adjacent to the tile **U0/V0**, we can have the row with the tiles **U1/V0**, **U2/V0**, and so on, but we can also go upwards: **U0/V1**, **U1/V1**, **U2/V1**, and so on.

To help you identify the tiles, Blender will show you the amount of pixels and also the number of tiles you are moving the islands in the toolbar of the **UV/Image Editor** window. In the following screenshot, the **arm** islands have been moved horizontally (on the negative *x* axis) by **-3072.000** pixels; this is correct because that's exactly the X size of the grid image we loaded in the previous recipes. In fact, in the toolbar of the **UV/Image Editor** window, while moving the islands we can read **D: -3072.000** (pixels) and (inside brackets) **1.0000** (tile) **along X**; effectively, **3072** pixels = **1** tile.



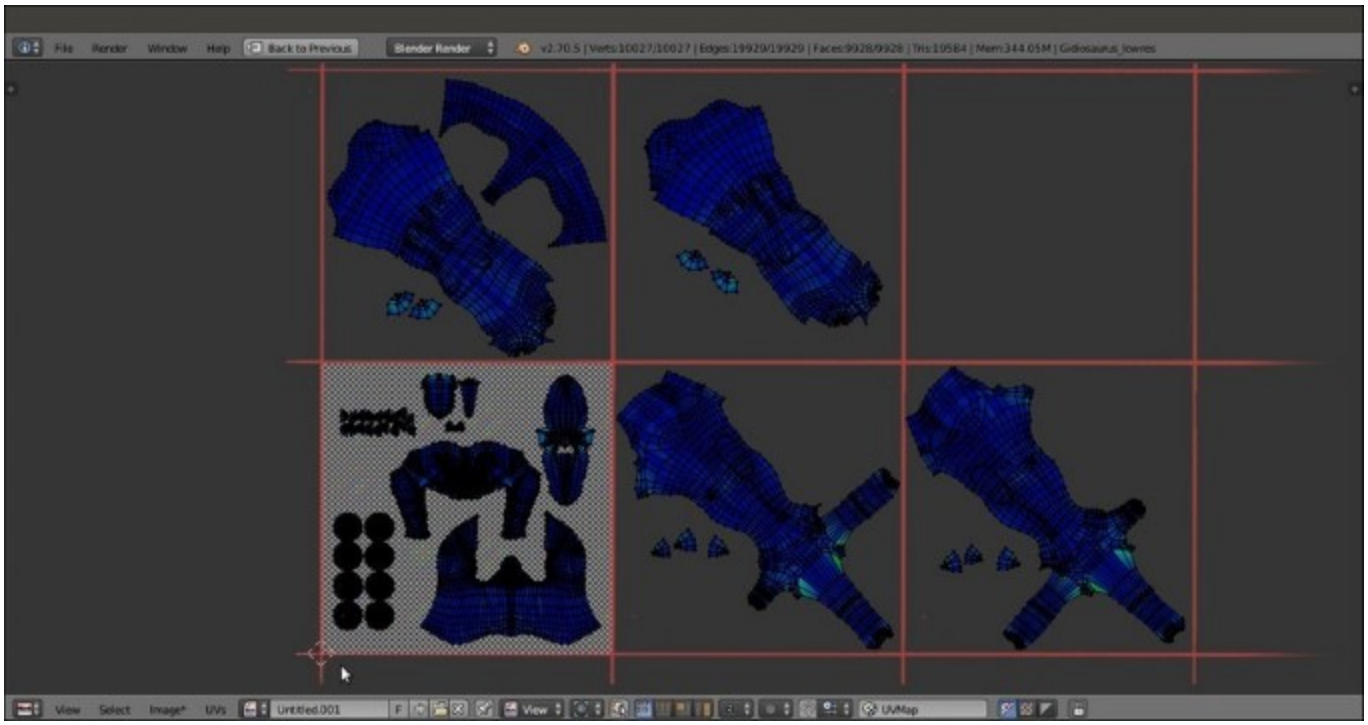
Moving the arm islands to the U1/V0 tile space

When moving UV islands from tile to tile, remember to check that the **Constrain to Image Bounds** item in the **UVs** menu on the toolbar of the **UV/Image Editor** window is disabled; also, enabling the **Normalized** item inside the **Display** subpanel under the *N* key *Properties* sidepanel of the same editor window will display the UV coordinates from **0.0** to **1.0**, rather than in pixels. More, pressing the *Ctrl* key while moving the islands will constrain the movement to intervals, making it easy to translate them to exactly 1 tile space.

Because at the moment Blender doesn't support the **UDIM UV Mapping** standard, simply moving an island outside the default **U0/V0** tile, for example to **U1/V0**, will *repeat the image* you loaded in the **U0/V0** tile and on the faces associated with the moved islands. To solve this, it's necessary, after moving the islands, to *assign a different material, if necessary with its own different image textures*, to each group of vertices/faces associated with each tile space. So, if you shared your islands over **4** tiles, you need to assign **4** different materials to your object, and each material must load the proper image texture.

The goal of this process is obviously to obtain bigger islands mapped with bigger texture images, by selecting all the islands, scaling them bigger *together* using the largest ones as a guide, and then tweaking their position and distribution.

One last thing: it is also better to unwrap the **corneas** and **eyes** (which are separate objects from the **Gidiosaurus** body mesh) and add their islands to the tiles where you put the **face**, **mouth**, **teeth**, and so on (use the **Draw Other Objects** tool in the **View** menu of the **UV/Image Editor** window to also show the UV islands of the other *nonjoined* unwrapped objects):



UV islands unwrapped, following the UDIM UV Mapping standard

In our case, we assigned the **Gidiosaurus** body islands to **5** different tiles, **U0/V0**, **U1/V0**, **U2/V0**, **U0/V1**, and **U1/V1**, so we'll have to assign **5** different materials. However, we will cover this in a later recipe.

Note that for exposition purposes only, in the preceding screenshot, you can see the cornea and eye islands together with the **Gidiosaurus** body islands because I temporarily joined the objects; however, it's usually better to maintain the eyes and corneas as separate objects from the main body.

Using the Smart UV Project tool

Now, we are going to use a much easier and faster method to do the unwrapping of the **Armor**: the **Smart UV Project** tool.

Getting ready

The first thing to do is to prepare the **armor** pieces for the unwrap process, so perform the following steps:

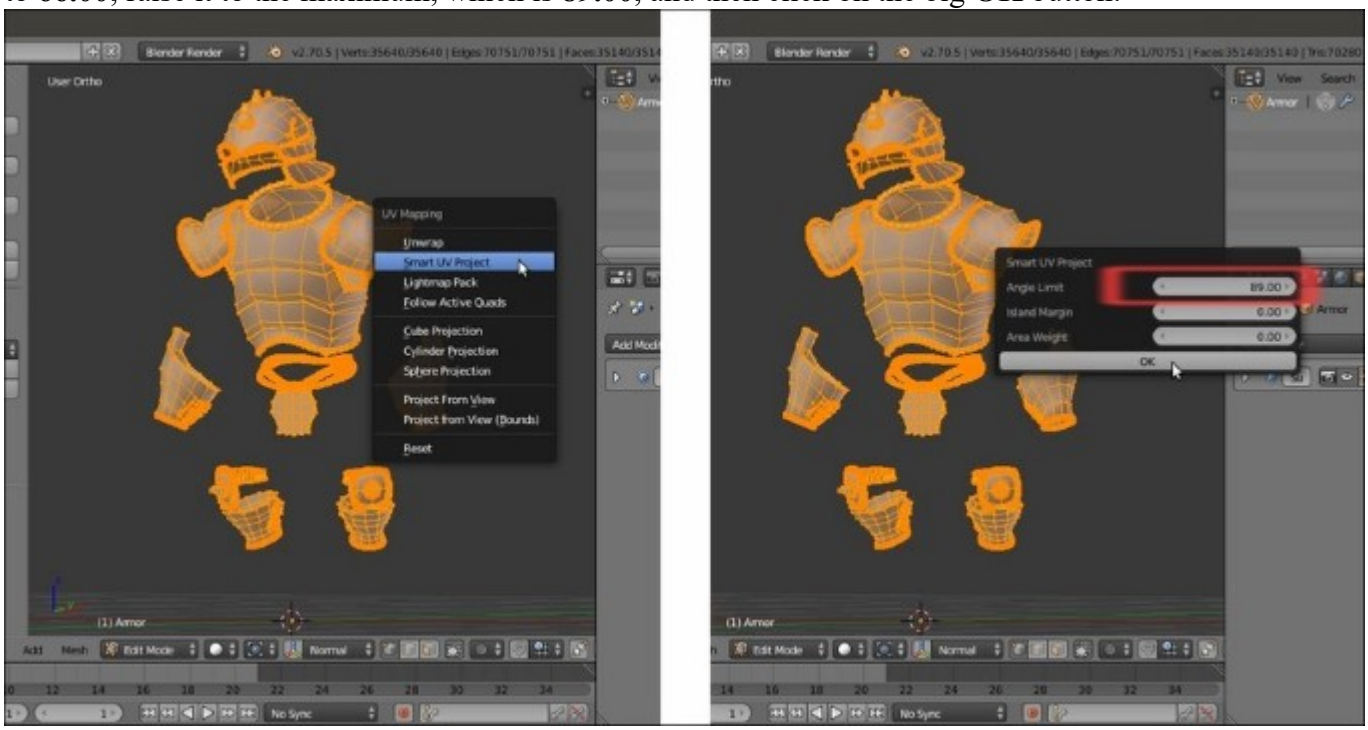
1. Starting from the last `Gidiosaurus_unwrap.blend` file you saved, click on the **13th** scene layer to reveal the **armor** and at the same time, hide the **Gidiosaurus_lowres** object.
2. Go to the **Outliner** and select the first item, the **Breastplate**; then, use *Shift* to multiselect all the other visible objects.
3. Press *Ctrl* + *J* to join them into a single object, and then in the **Outliner**, rename the result as `Armor`.
4. Go to the **Object Modifiers** window and expand the **Mirror** modifier subpanel; be sure that the **Clipping** item is activated and click on the **Apply** button:

The Armor as a single object and the Mirror modifier

How to do it…

Here is the unwrap process:

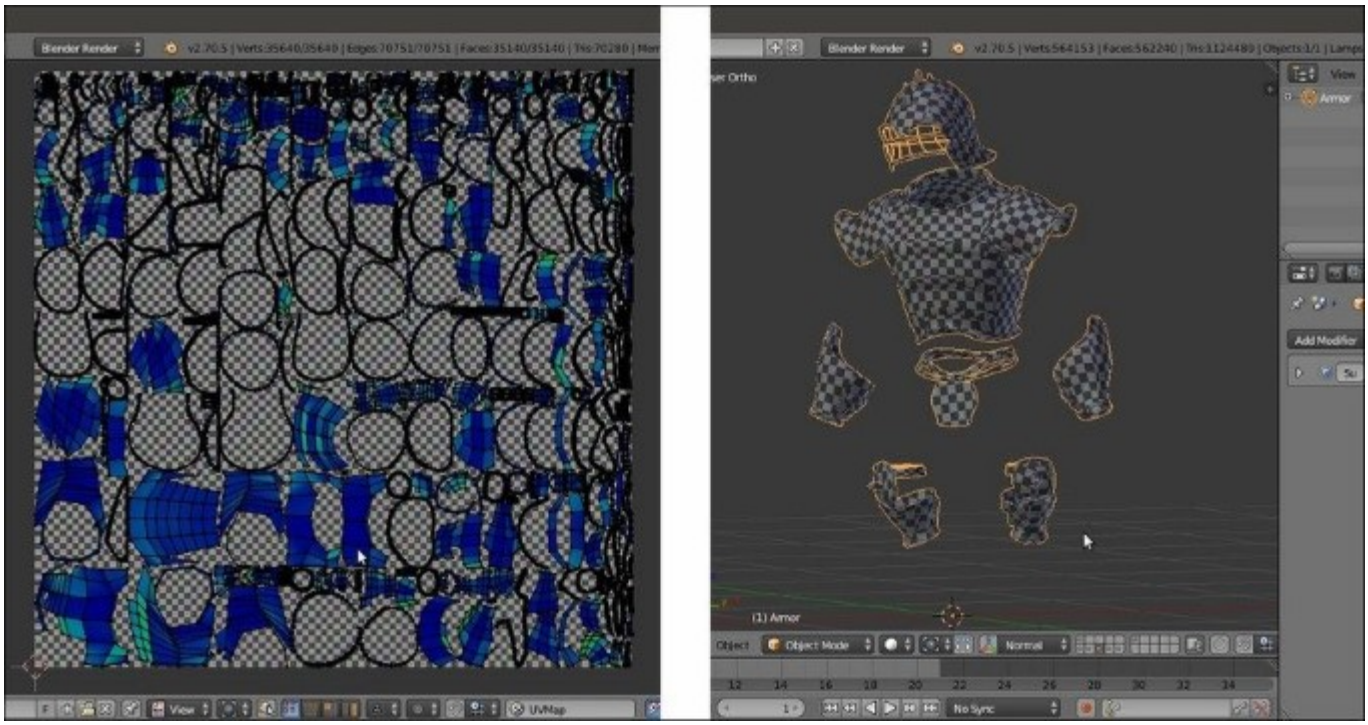
1. Press *Tab* to go into **Edit Mode** and press the *A* key to select all the vertices of the **Armor**.
2. With the mouse cursor in the 3D view, press the *U* key, and in the **UV Mapping** pop-up menu that just appeared, select the second item from the top, **Smart UV Project**.
3. A second pop-up appears with some options that you can leave as they are, besides **Angle Limit** (the maximum angle in the mesh used by the tool to separate the islands), which by default is set to **66.00**; raise it to the maximum, which is **89.00**, and then click on the big **OK** button:



The Smart UV Project tool

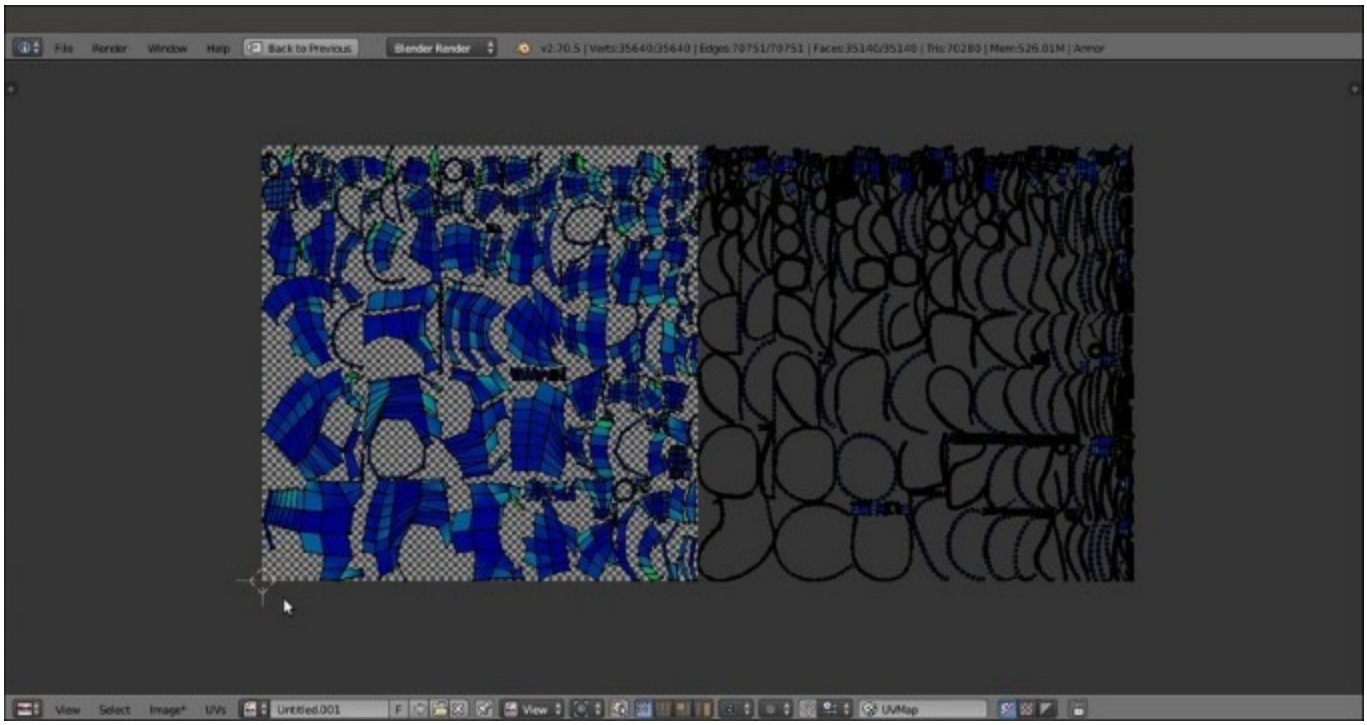
The mesh has been divided into several smaller unwrapped parts and is automatically packed inside the **U0/V0** UV tile.

4. Select all the islands in the **UV/Image Editor** window, click on the small double-arrow icon on the toolbar, close to the **New** and **Open** buttons, and select the **Untitled.001** image (the same grid image we used for the **Gidiosaurus** unwrap).
5. Press *Tab* to go out of **Edit Mode**:



The unwrapped Armor

Considering the amount of tiny islands that the tool created, it's better to separate the big **armor** parts (basically, the **plates**) from the smaller ones (**belts**, **borders**, and so on) and re-unwrap them with the **Smart UV Project** tool, as we did for the **Gidiosaurus** body in the previous recipe; then, place them into two adjacent tiles:



The Armor islands inside the U0/V0 and U1/V0 tiles

Modifying the mesh and the UV islands

At this point, when we look at the **Gidiosaurus** mesh, we realize that some detail in the model is still missing; for example, the **lower teeth**. In fact, we modeled the **mouth** closed and the **lower teeth**, enclosed in the **upper mouth rim**, weren't visible.

It's now time to add them; in fact, even though we have already done the unwrapping stage, it's still possible to modify the mesh further and also update the UV islands accordingly.

Getting ready

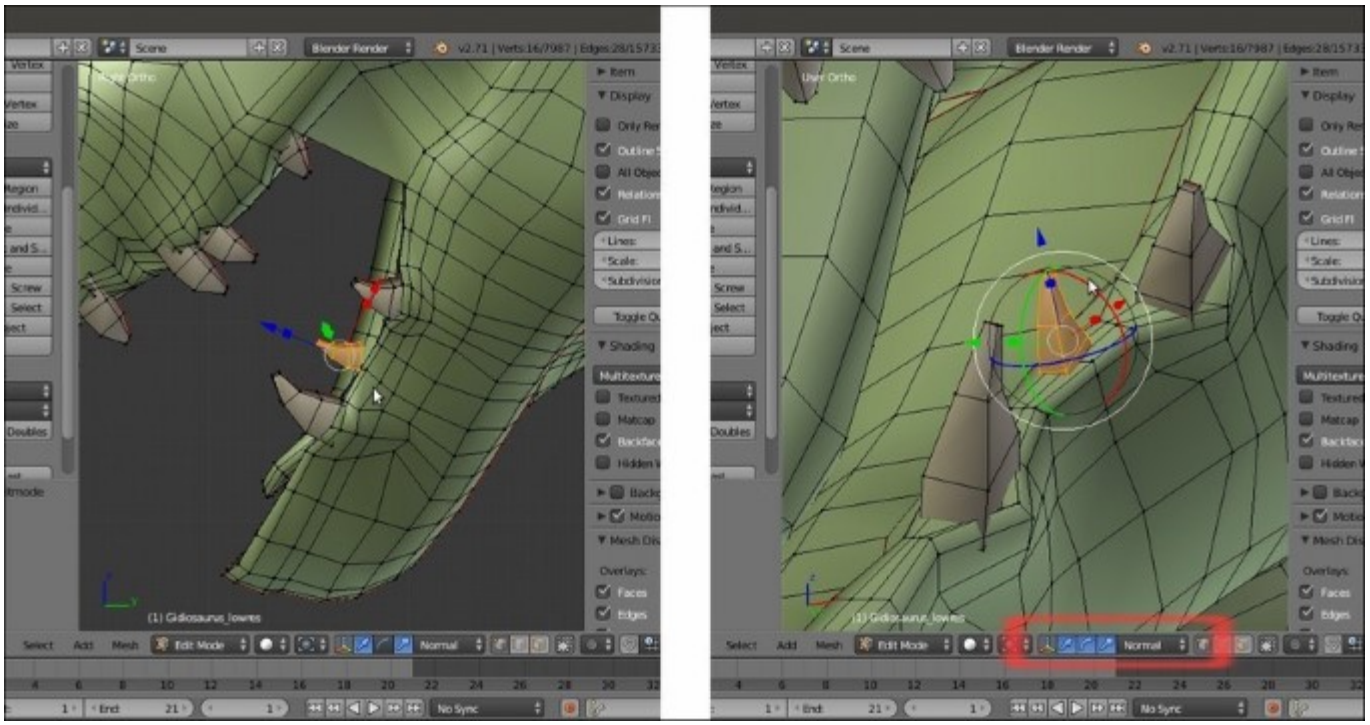
Start from the last `Gidiosaurus_unwrap.blend` file you saved:

1. Press *N* to open the **Properties** 3D view sidepanel, and disable the **Textured Solid** item under the **Shading** subpanel.
2. Click on the **11th** scene layer button to reveal the **Gidiosaurus_lowres** object and select it; go into the **Side** view, zoom in to the **head**, and enter **Edit Mode**. Press the *A* key to select all the vertices of the mesh.
3. Put the mouse pointer inside the **UV/Image Editor**, select all the UV vertices (again the *A* key), and pin them by pressing the *P* key; then deselect everything (the *A* key once more).

How to do it…

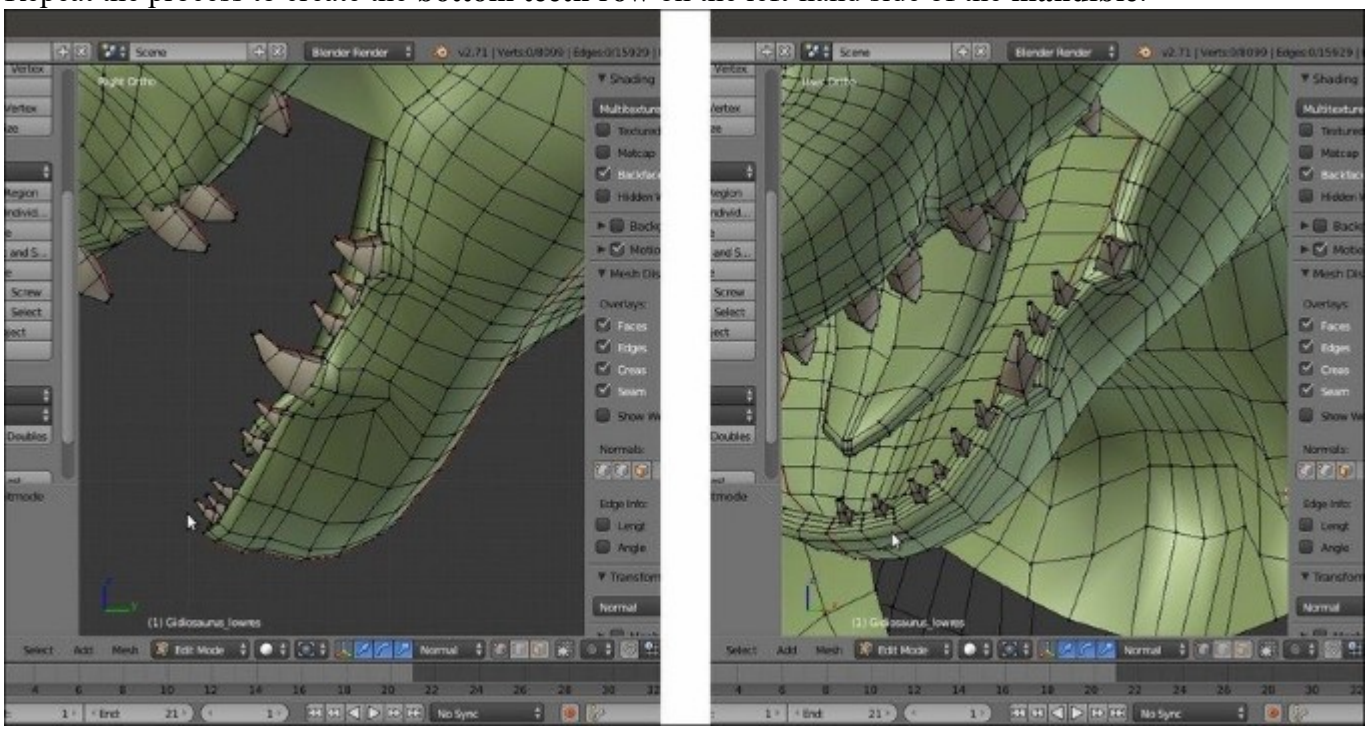
We can now start to add new **teeth**:

1. Select the vertices of one **lower tooth** and press *Shift* + *D* to duplicate it; using the **Transform Orientation** widget set to **Normal**, scale it smaller, rotate and modify it a bit, and then move it in a new position along the **mandible rim**:



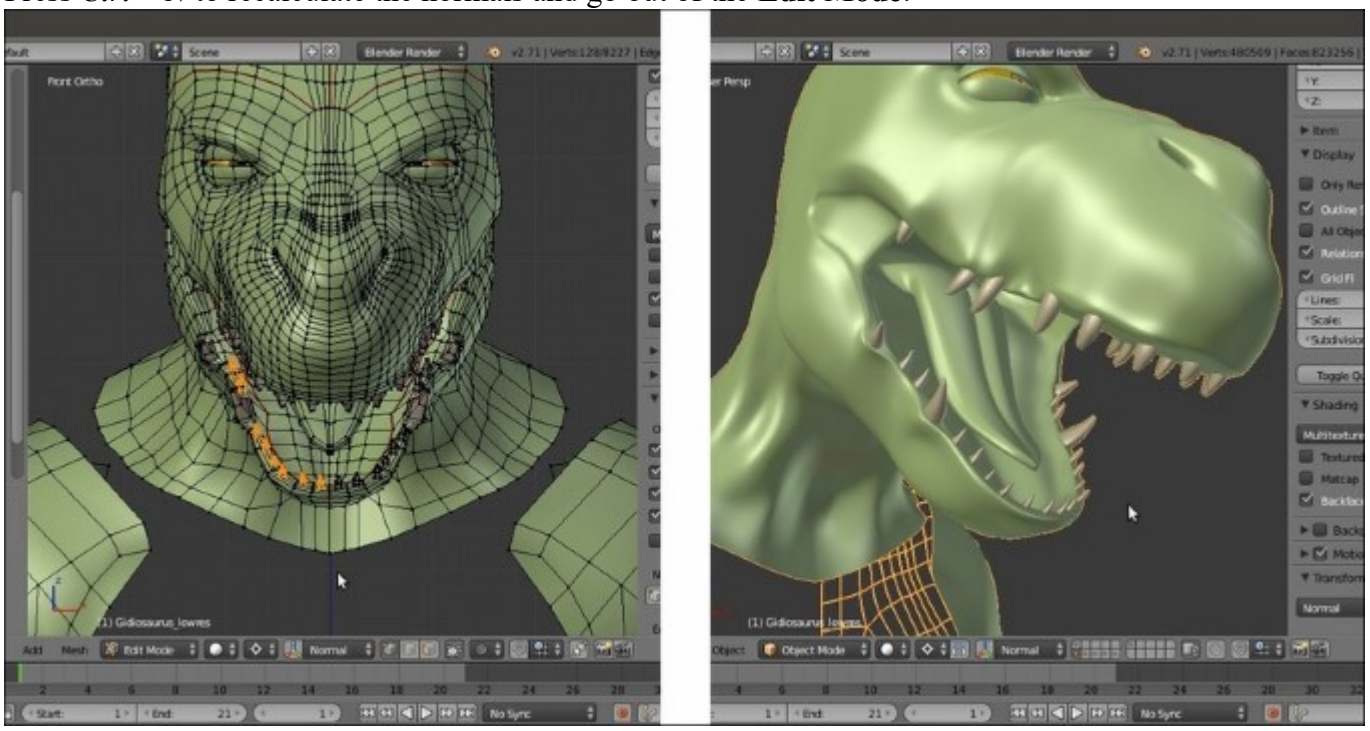
The new added tooth

2. Repeat the process to create the **bottom teeth row** on the left-hand side of the **mandible**:



Adding the missing teeth

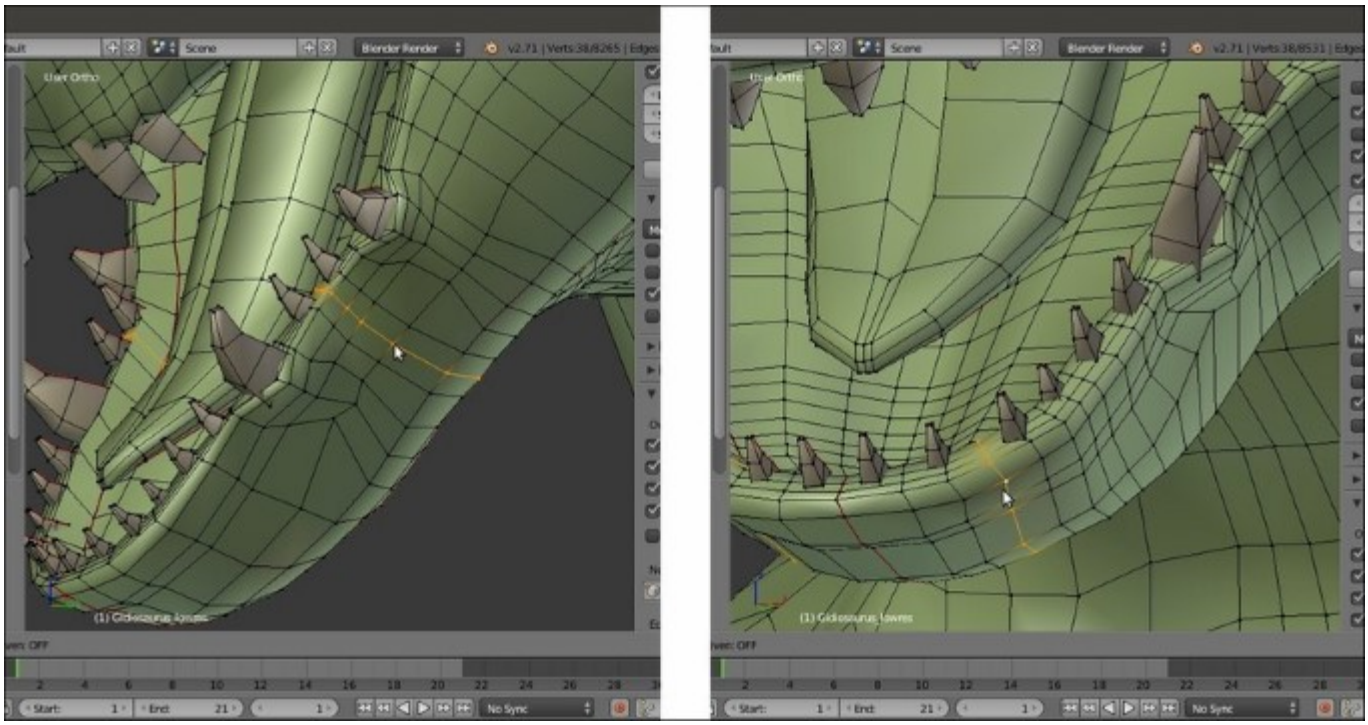
3. Go out of the **Edit Mode** and put the **3D Cursor** at the pivot point of the mesh (coincidentally, at the center of the scene), and then press the period key (.) to set the **Pivot Point** around the **3D Cursor**.
4. Press *1* on the numpad to go in the **Front** view, enter **Edit Mode** again, and select all the new **teeth**; press *Shift* + *D* to duplicate them, and then right-click; then, press *Ctrl* + *M* | *X* | *Enter* to mirror them on the *x* axis to the right-hand side of the **mandible**.
5. Press *Ctrl* + *N* to recalculate the normals and go out of the **Edit Mode**:



The new teeth mirrored on the x axis

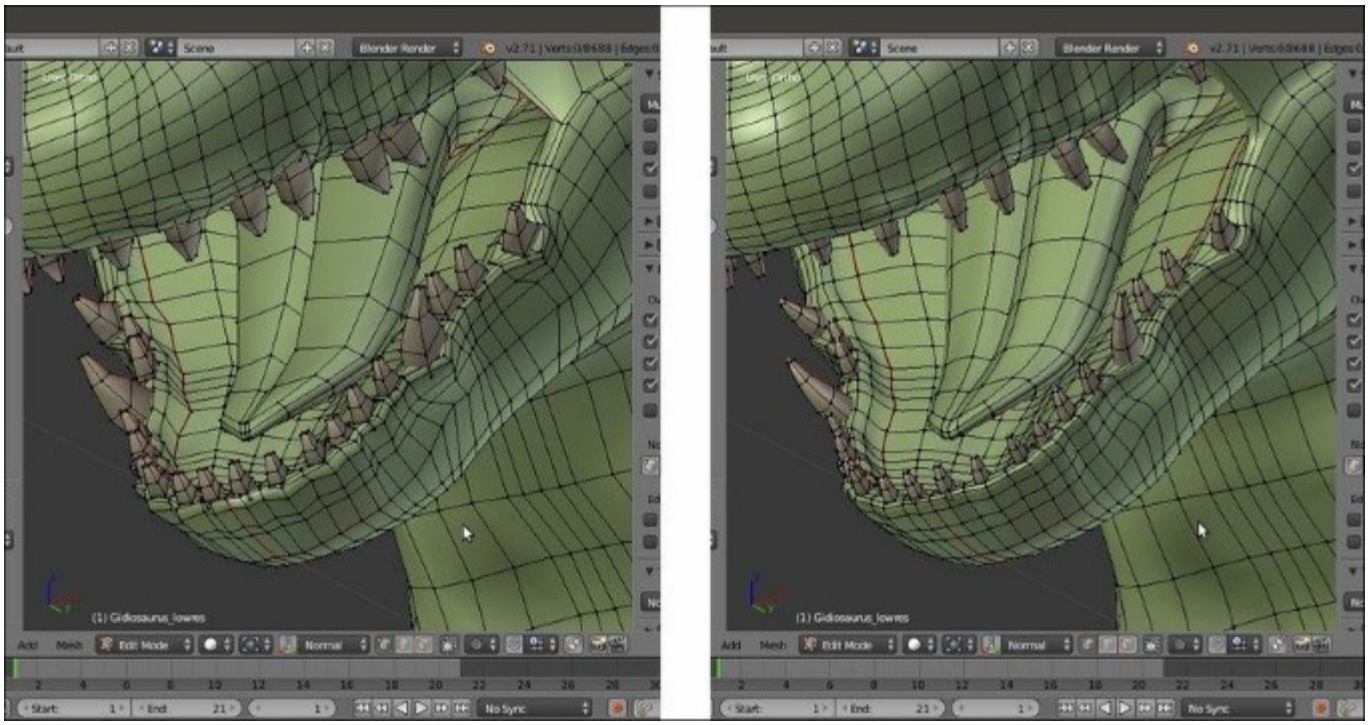
Now, we must adjust the **rim** of the **mandible** where we added the new **teeth**, in order to create the **alveoli**.

6. Go back into the **Edit Mode** and start to add vertical edge-loops on the **lower mouth rim**, in order to create more geometry for the **alveoli**:



Adding new edge-loops

7. Click on the **Options** tab under the **Tool Shelf** to the left-hand side of the 3D window and enable the **X Mirror** item under the **Mesh Options** subpanel.
8. Tweak the vertices to create the **alveoli** around the **new teeth**; enable the **Subdivision Surface** modifier visibility during **Edit Mode** in order to have better feedback:

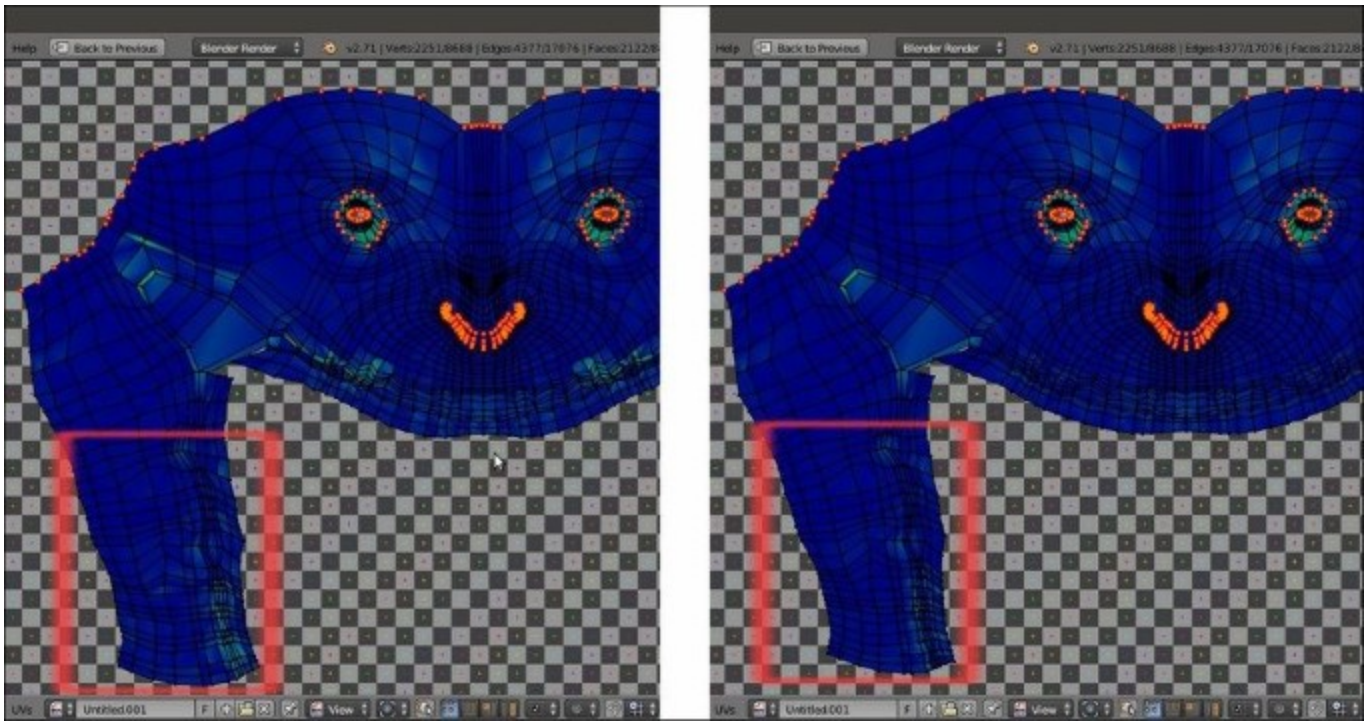


Modeling the alveoli

9. Press *Alt* + *S* to scale the **teeth** vertices on their normals, in order to thicken them, and add edge-loops where needed to make the transition from the **alveoli** to **inner mouth** as natural as possible.

   When you are done, it's time to update the unwrapped UV layer with the new modifications.
10. In **Edit Mode**, first select the vertices of the **new teeth**. Because we made them by duplicating one of the already unwrapped **fangs**, the **new teeth** will share the same UV island. In the **UV/Image Editor**, press *A* to select all their UV vertices and *Alt* + *P* to unpin them, and then press *E* for a new unwrap.
11. Scale the new **teeth** islands to **0.200**, and then select the original **teeth** on the mesh; adjust the size and position of the new islands based on the old ones and then pin them.
12. Now, switch to the **Face** selection mode and select the **Gidiosaurus** face; in the **UV/Image Editor** window, unpin all the vertices of its island (*Alt* + *P*), and then pin only the vertices of certain areas such as the **eyes**, **nose**, and upper outside edge-loop (*P* key).

With this method, the unwrap of all the new geometry gets recalculated together with the old one. Thanks to the pinned UV vertices, it will keep the previous size and position as much as possible. In the following image, you can see the face island before (left) and after (right):

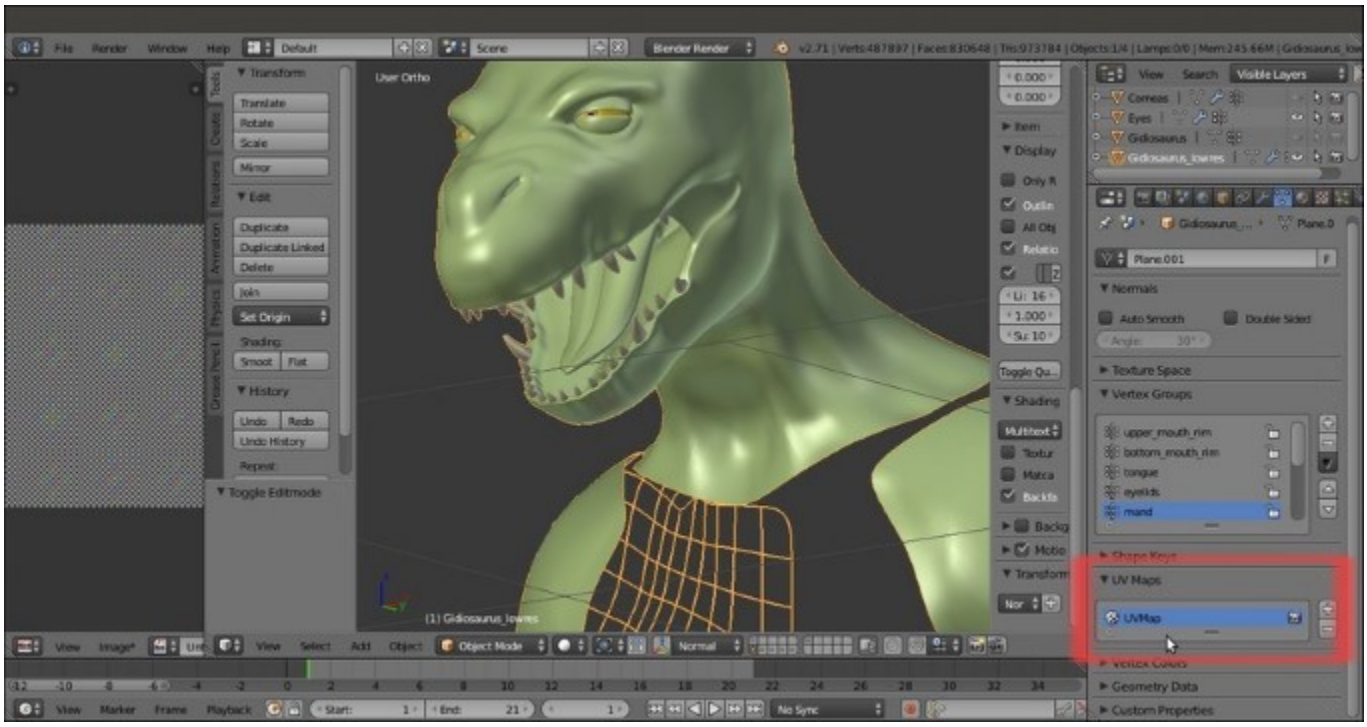


The updated unwrap

Note that you need to recalculate the unwrap for all the islands involved in the mesh's modification, and then save the file.

Setting up additional UV layers

Up until now, we have set just one UV layer whose name is, by default, **UVMap** (go to the **Object Data** window and look under the **UV Maps** subpanel):



The UV Maps subpanel with the UV Map coordinates layer

Actually, in Blender, it is possible to set more than one UV coordinates layer on the same object in order to mix different UV projections that can eventually also be baked into a single image map.

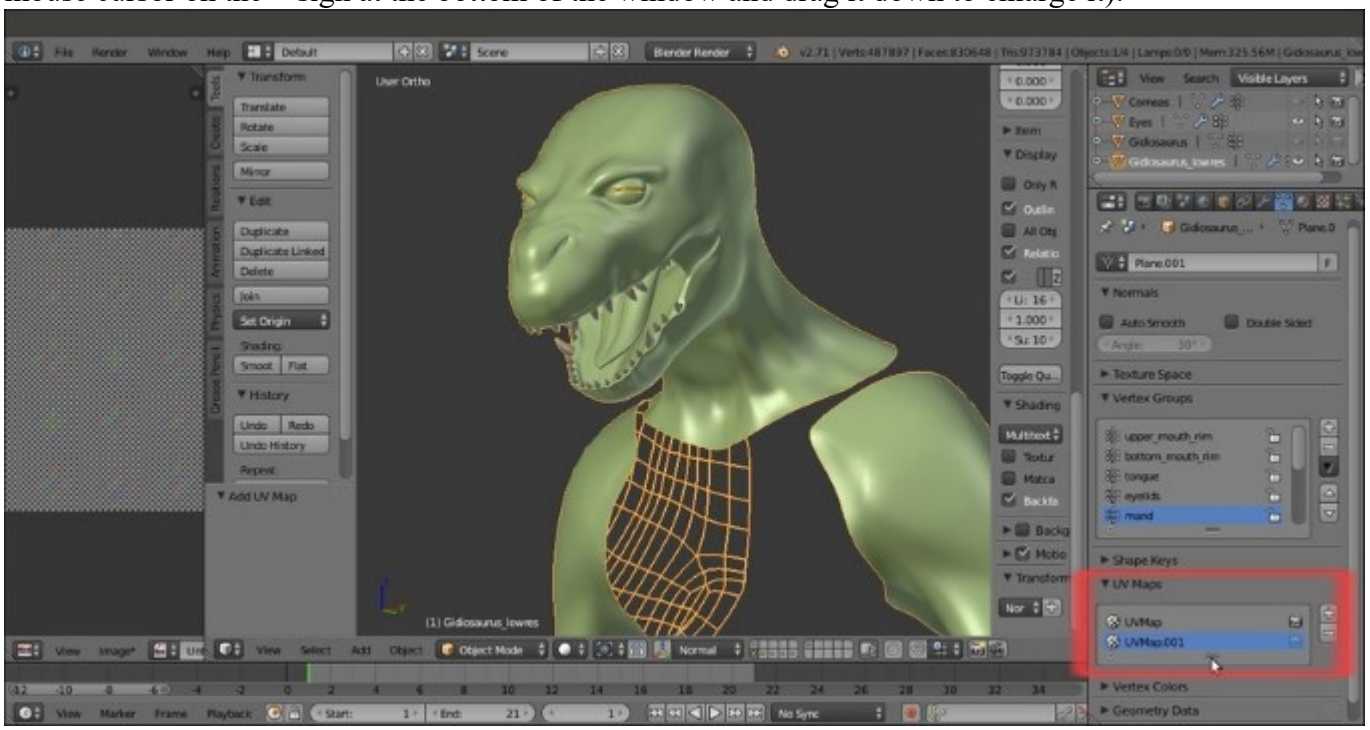
The names of the UV layers under the **UV Maps** subpanel are important, because they specify which one of the projections a material has to use for the mapping of a texture. By clicking on the + icon to the side of the **UV Maps** subpanel, it is possible to add a new UV layer (whose name, in this case, will be **UVMap.001** by default; of course it's possible to change these names by using *Ctrl* + clicking on them and typing the new ones).

Getting ready

We are now going to add a new UV layer to the **Gidiosaurus** object:

1. Ensure that the **Gidiosaurus** object is selected and go to the **Object Data** window under the main **Properties** panel to the right-hand of the screen.
2. Go to the **UV Maps** subpanel and click on the + icon to the right-hand side of the names window; a new UV layer is added to the list, right under the first one, and its name is

UVMap.001 (in case you don't see it, it may be because the window is too small; just put the mouse cursor on the = sign at the bottom of the window and drag it down to enlarge it):



The new UV coordinates layer

3. Use *Ctrl* + left-click on the **UVMap.001** item and rename it as **UVMap_scales**. Then, press *Enter* to confirm.

How to do it…

Now we must set the projection of the UV layer:

1. Go into **Edit Mode**, switch to the **Face** selection mode, put the mouse pointer on the mesh, and press the *L* key to select all the faces of the skin of the **Gidiosaurus** mesh.
2. Go to the **UV/Image Editor** window, select all the visible islands and unpin them (*Alt* + *P*).
3. Click on the **Image** item on the toolbar and select the **Open Image** item in the pop-up menu (or else, put the mouse cursor in the **UV/Image Editor** window and press *Alt* + *O*); browse to the `textures` folder and load the `scales_tiles.png` image.
4. With the mouse pointer in 3D view, press *U* and from the **UV Mapping** pop-up menu, select the **Cube Projection** item.
5. In the **UV/Image Editor** window, select all the islands and scale them **5** times bigger (*A* | *S* | *5* | *Enter*):

The Cube Projection mapping

6. Go out of the **Edit Mode** and into the **Properties** 3D view sidepanel, enable the **Textured Solid** item under the **Shading** subpanel to see the result of the unwrapping in the 3D viewport:

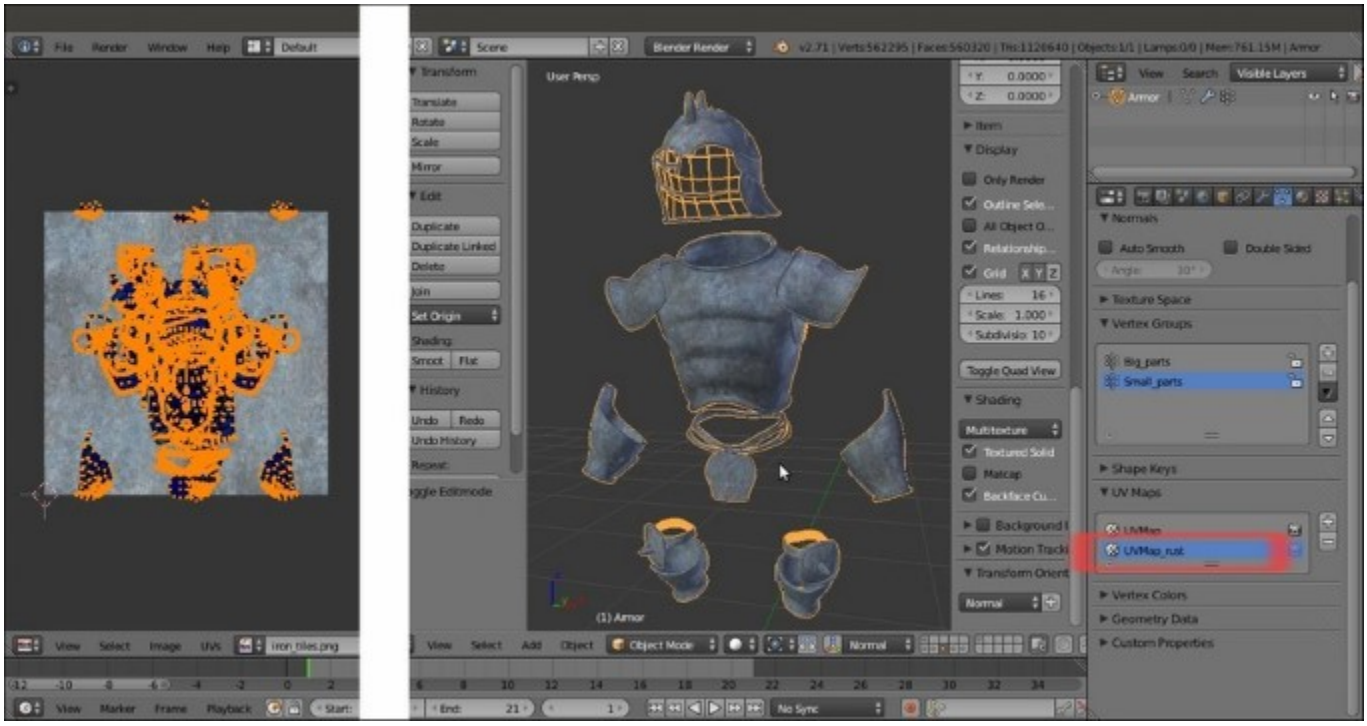
The scales_tiles.png image mapped on the model using the second UV coordinates layer

At this point, as you can see in the **UV Maps** subpanel, the **Gidiosaurus** object has **2** different UV coordinate layers, **UVMap** and **UVMap_scales**. We will use the **UVMap_scales** layer to map the scales image texture on the body and thereby to bake it on the first **UVMap** layer; this will be the one we'll use in the end for the rendering of the model. However, we'll see this in detail in the texturing and baking recipes.

Repeat the process for the **Armor**.

7. Add a new UV layer and rename it **UVMap_rust**; go into **Edit Mode**, select all the vertices and all the islands in the **UV/Image Editor** window, and load the `iron_tiles.png` image.
8. Switch to the **Face** selection mode, and in the 3D view, press *U* and select **Reset** (the last item) from the pop-up menu. Then press *U* again, and this time select the **Cube Projection** item.
9. Go out of **Edit Mode**.

As you can see, there are a few visible seams. This will be easily fixed during the texturing stage, but for the moment we are done:



The second UV coordinates layer for the Armor

Exporting the UV Map layout

In this last recipe, we are going to see how to export the UV coordinate layers outside Blender, in order to be used as a guide to paint textures inside any 2D image editing software.

Getting ready

We have seen that the **Gidiosaurus** object and also the **Armor** object have more than one UV coordinate layer, so the first thing to do is to be sure to have set the right layer as the *active* one.

To do this, simply click on the name of the chosen layer inside the **UV Maps** subpanel under the **Object Data** window; if you are in **Edit Mode**, by clicking on the different names, you can also see the different layers switch in real time in the **UV/Image Editor** window.

How to do it…

After you have selected the desired UV layer, do the following:

1. Click on the **UVs** item in the toolbar of the **UV/Image Editor** window, and from the menu, select the **Export UV Layout** item (the top item).
2. You can browse the directory where the `.blend` file is saved, as the directory opens, at the bottom-left side of the screen is the **Export UV Layout** option panel where you can decide on several items: the size and format of the exported image, and the opacity of the islands (by default, for mysterious reasons, it is set to **25 percent** rather than **100 percent**). Moreover, you can decide if you want to export all the islands of the selected object or only the visible ones, and also if you want the modifiers applied to the islands (for example, the **Subdivision Surface** modifier).
3. Browse to the folder where you decided to save the UV layout of your model, or click on the side of the path in the upper line after the slash, and write the name of a new directory. Press *Enter* and click on the pop-up panel with the **OK? Create New Directory** message to confirm (this actually creates a brand new directory).
4. Write the name of the UV layout in the second line and click on the **Export UV Layout** button at the top-right of the screen.

Note that if you want to export all the different tiles placed outside of the default **U0/V0** tile space, as illustrated in the *There's more…* section of the *Editing the UV islands* recipe, at least for the moment, you have to temporarily (using *Ctrl*) move each island at a time to the default **U0/V0** tile space and export it.

Chapter 6. Rigging the Low Resolution Mesh

In this chapter, we will cover the following recipes:

- Building the character's Armature from scratch
- Perfecting the Armature to also function as a rig for the Armor
- Building the character's Armature through the Human Meta-Rig
- Building the animation controls and the Inverse Kinematic
- Generating the character's Armature by using the Rigify add-on

Introduction

To be able to animate our character, we have to build the rig, which in Blender is commonly referred to as an **Armature**, and this is the *skeleton* that will deform the **Gidiosaurus** low resolution mesh.

The rigging process in Blender can be accomplished basically in two different ways:

- By building the **Armature** by hands from scratch
- By using the provided **Human Meta-Rig** or the **Rigify** add-on

Building the **Armature** manually by hand can be a lot of work, but in my opinion, is the only way to really learn and understand how a rig works; on the other hand, the **Rigify** add-on gives several tools to speed up and automate the rig creation process, and this in many occasions, can be very handy.