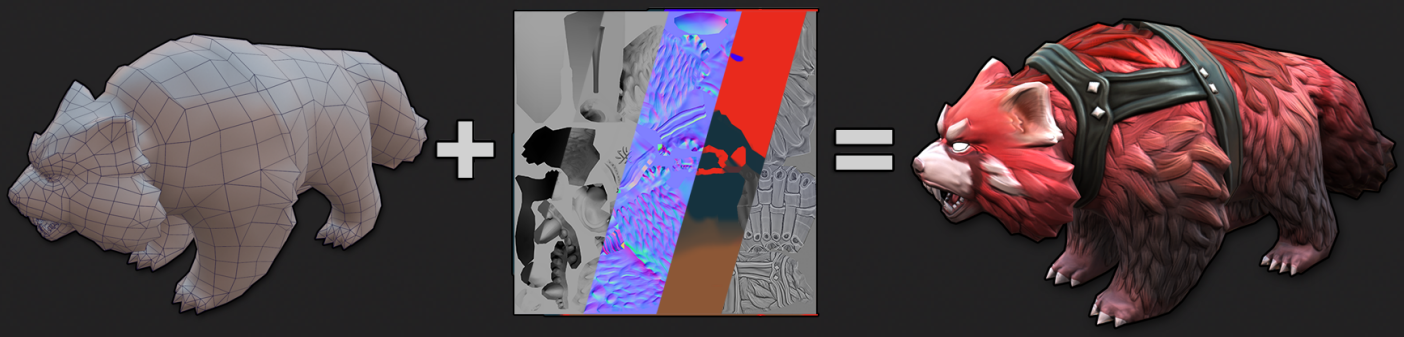
Texture Guide for 3d artists

part 1
Quick bakes

INTRODUCTION



What is "Baking" and why I need to know in order to create 3d assets

"Baking" is the act of pre-calculate some informations that are going to be stored on the texture, aiming to reduce the amount of processing to render that model.

In some production like movies or architectural represetations, it is normal to spend minutes or maybe hours on just one image. For a game you need to speed up the process to be able to render at least 30 images each second, and getting more processing power is not the answer since you need to address that to an average[1] computer be able to render in realtime.

Advantages

- It is necessary for a game asset if you want more details then a simple flat texture or a hand painted texture
- It can help you on the texture painting by guiding your strokes and reducing the 2d knowledge required

Disadvantages

- Takes more time to start texturing because you will need the model UV unwrapped
- It may have low quality textures depending on your UV skills and engine limitations
- Not everyone likes UVs[2]

1 *Average depends on the public you are adressing*

2 *I love it, it is like playing tetris but with more complex pieces*

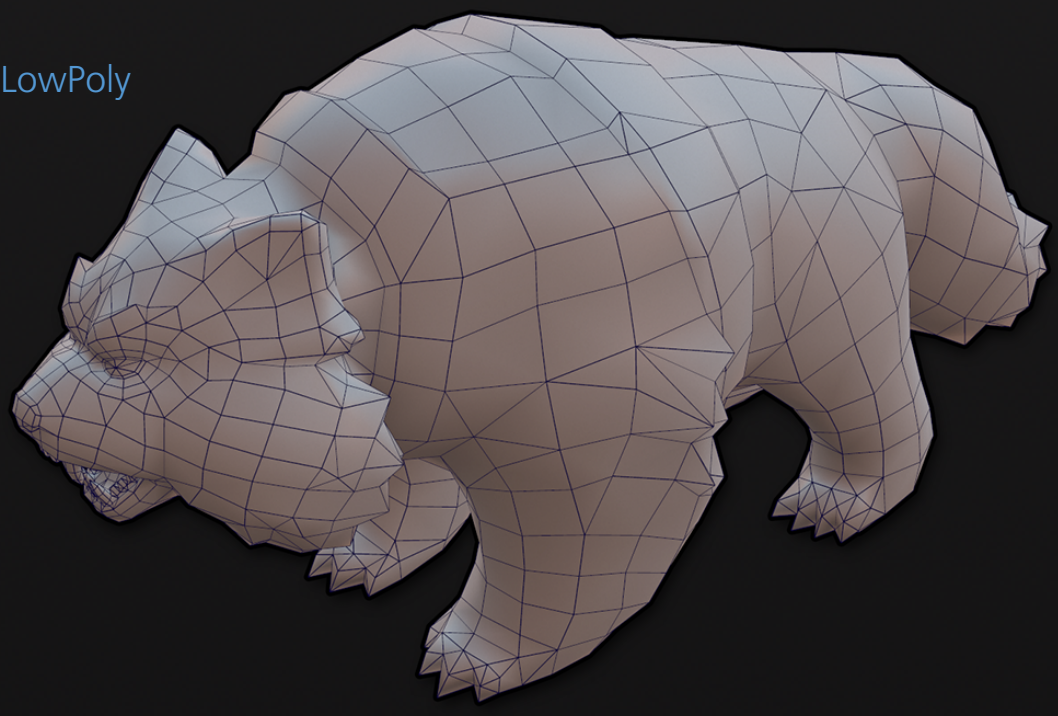
HighPoly and Lowpoly

On this kind of workflow were you need to “bake”, it is necessary to have a HighPoly model to generate the informations over the LowPoly

Below is a comparison between a Highpoly model and the LowPoly model with the textures applied.

If you ignore the color, they look pretty much the same right? The most visible difference is in the silhouette because of the reduced number of polygons, that is why the silhouette on the concept is really important. But that will be covered on another tutorial

And this is the clean LowPoly



At the end of this Tutorial, you will be able to get this clean lowpoly and build the textures to look like the one above

Usually the Highpoly is made in 3d sculpting programs like ZBrush or Mudbox and it can involve other programs like maya, 3d max, blender...

The workflow of creating the highpoly can vary a lot depending on the artist, some start from a rough shape, some start from a sphere/cube and some does almost everything on a more traditional 3d program (maya, max, blender..) and just add some details later.

The Lowpoly is normally created after the Highpoly[1] and follows its topology. While the highpoly's triangles organization are not important, on the LowPoly they are extremely important, specially if the model is going to be animated

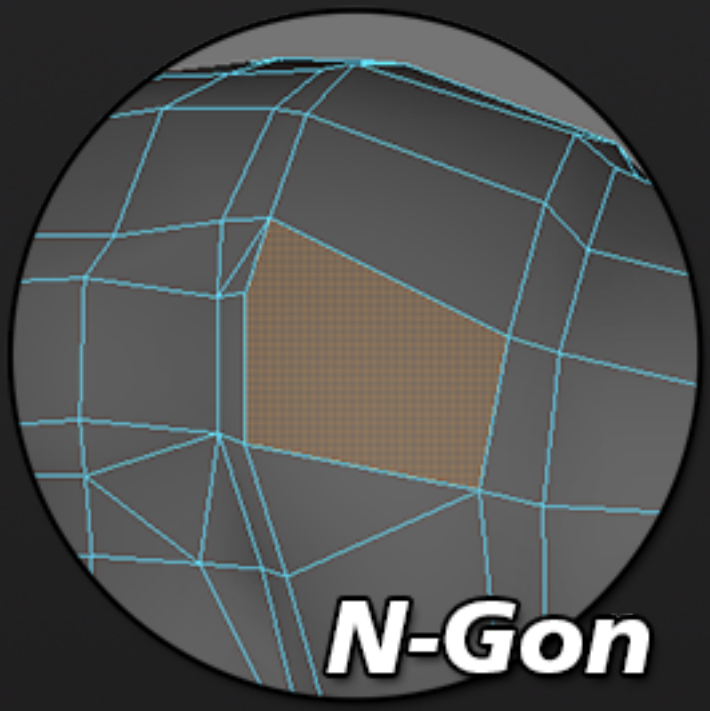
Programs used on this tutorial or to create the content

- Adobe Photoshop
- Pixologic ZBrush
- Xnormal (free)
- 3D Coat
- Marmoset Toolbag 2

1 *I am not going to cover the Highpoly or the Lowpoly production here, It will be on another tutorial*

Preparing the bake on XNormal

Before start baking you need to have model with all the polygons not exceeding 4 sides each, called N-Gons. If you do so XNormal will give you a warning message and stop the calculation.



Your model is all made of triangles, using quads helps visualize the edge flow and if you need to smooth your mesh the engine will know a proper way to subdivide it. That is why when you count your polycount, you count in triangles and not in polygons.

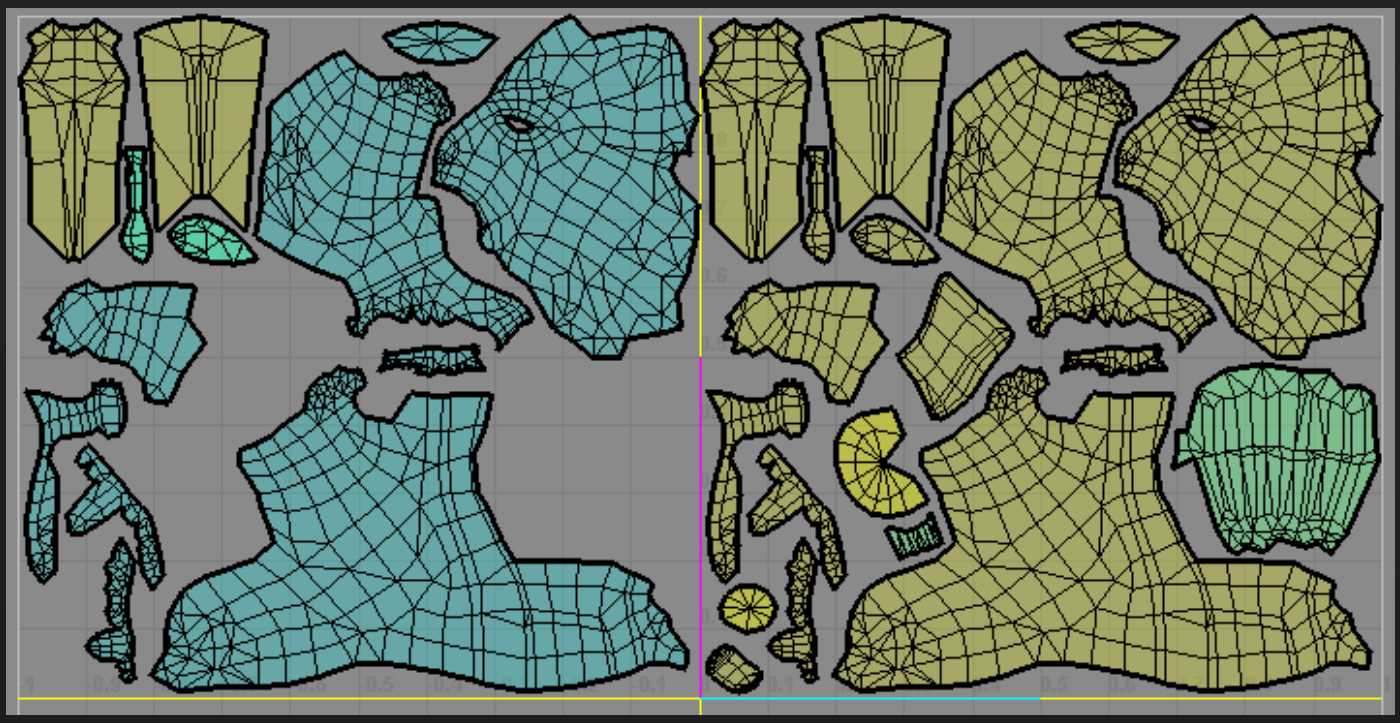
In the end all your models are going to be all triangles inside the game engine, so it is not necessary to worry in keeping everything in quads. I use a lot of triangles in my workflow

You also will need your lowpoly model Unwrapped[1], which means that you need to project all your faces on a 2d texture. Deformations will appear and it is up to you to hide them or use in places that are not that visible.

UV Layout of the model

1 *Again, another subject for another tutorial*

UV Layout with mirrored parts to save space and have more resolution

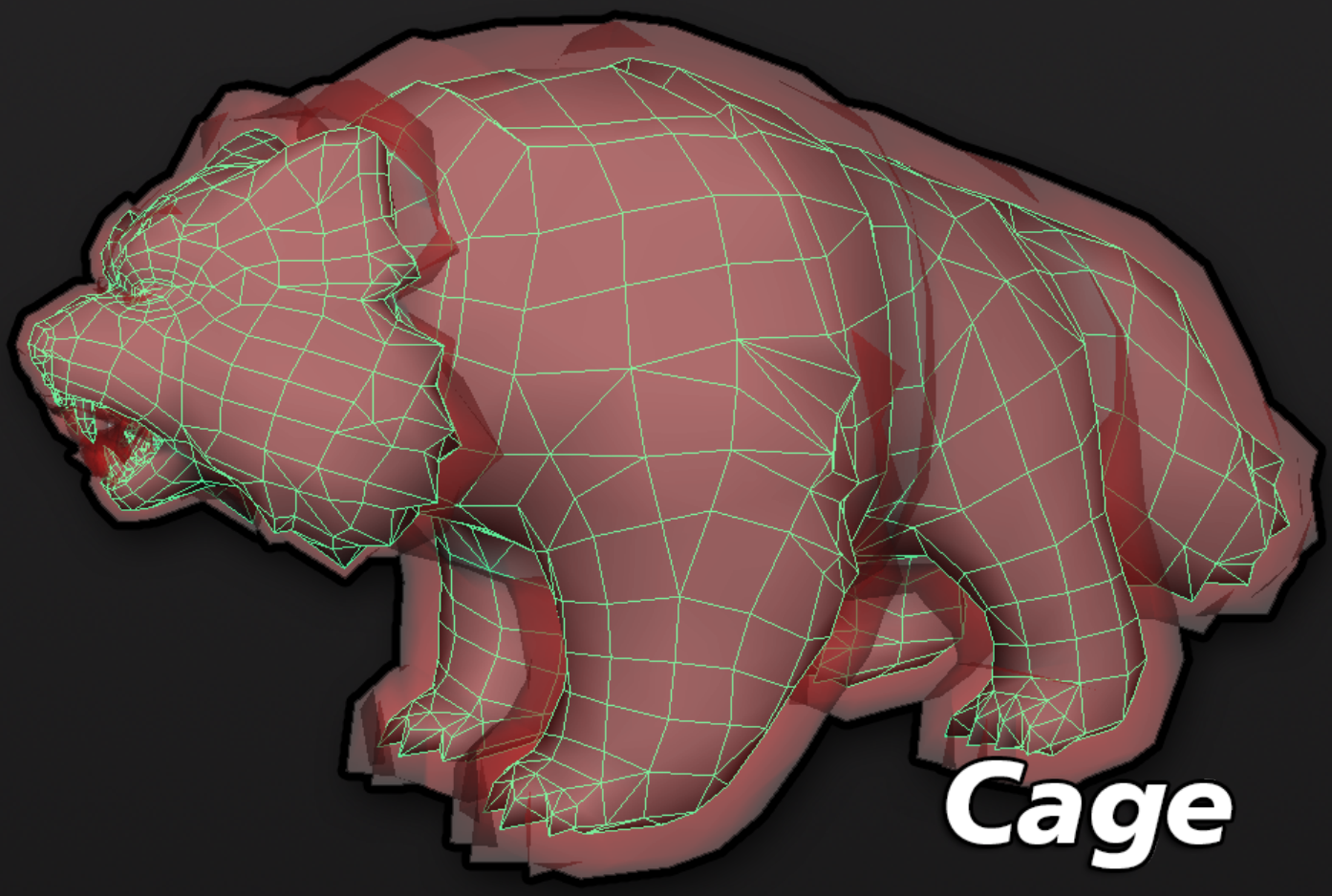


Looking the UV Layout now months later, I can see parts where it could be a lot better, but it is part of the evolving process, learning with your mistakes and making it better on the next project

The texture limitations in Dota 2 are sometimes hard to use, it makes the game playable for more people but makes the artist life more challenging. Mirroring the UVs is one of the many solutions you can come up to get a good resolution and still be inside the pre-defined requirements for each asset.

to Cage or not to Cage?

The baking process will get your highpoly model and project on the lowpoly. The size or influence of this projection can be determined on XNomal or by creating a Cage.

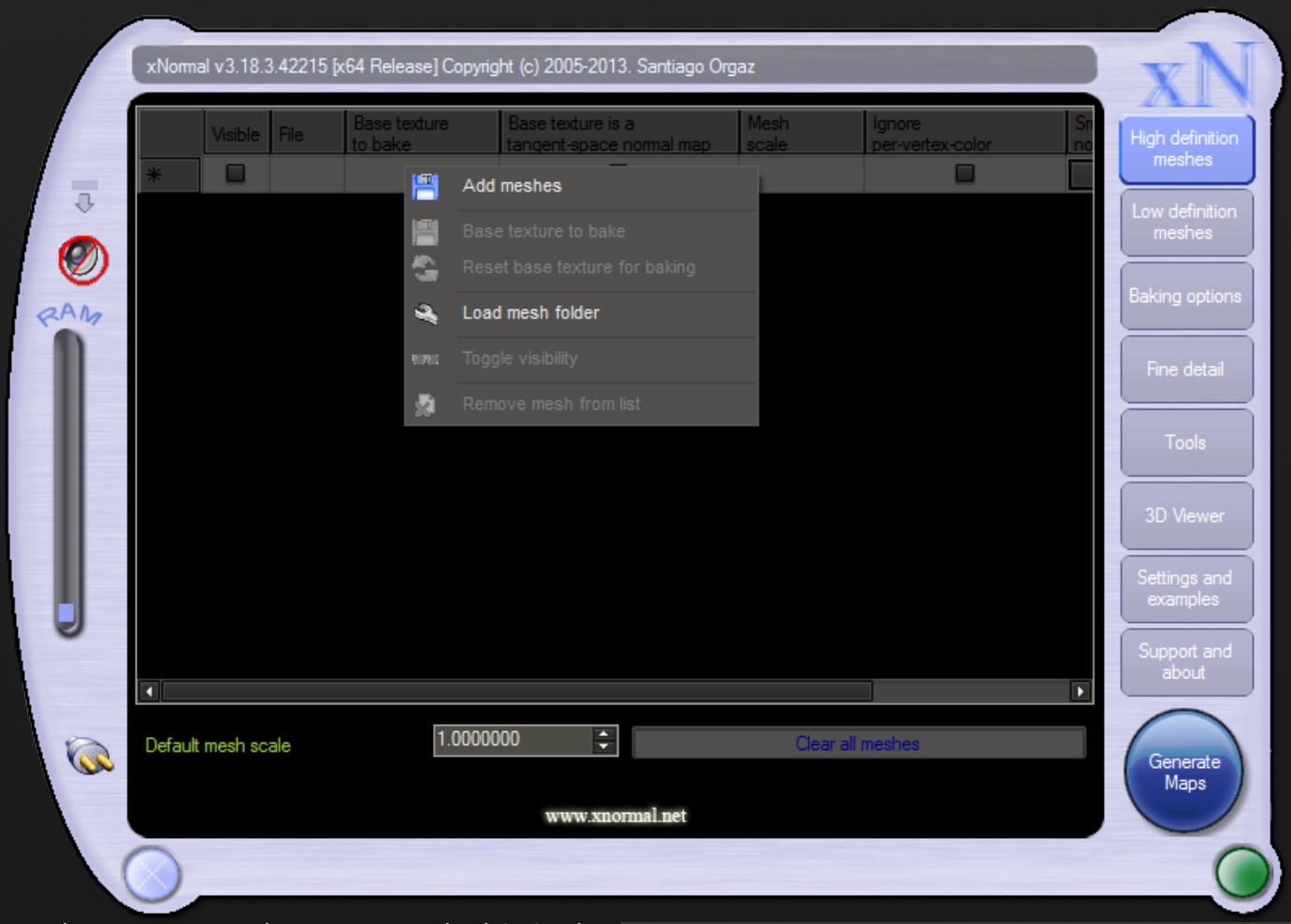


The cage is a copy of your lowpoly model but with its vertices offseted on the outside convering all the highpoly.

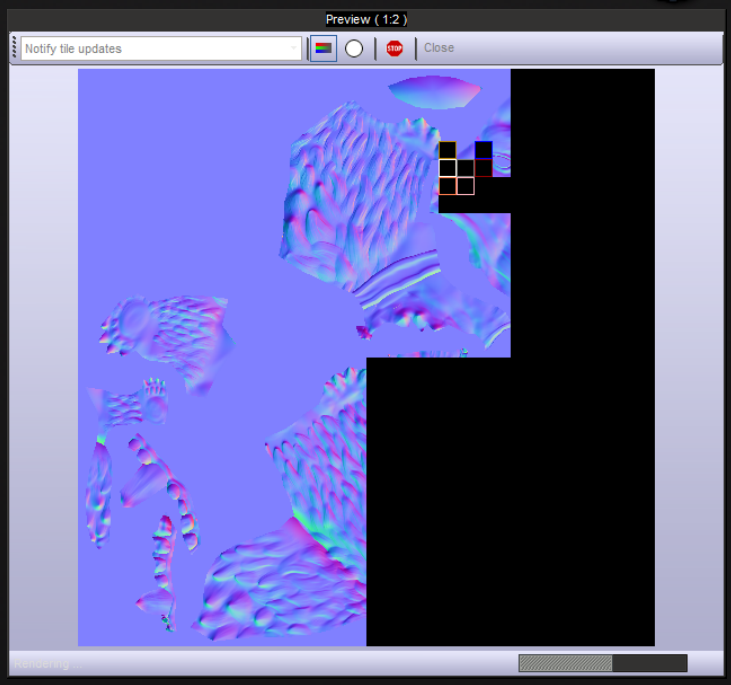
Using a Cage will give you more control over the projecting but it will increase the work load. Simple objects don't need but on characters I strongly suggest to use one. That way you can keep the higher polygon density (more important parts), like the face, with less deformation and you can fix small problems by tweaking the vertices position.

BAKING

Enough introduction, lets bake the textures You will need to fill the highpoly and lowpoly paths on XNormal



For those not used to XNormal, this is the interface.



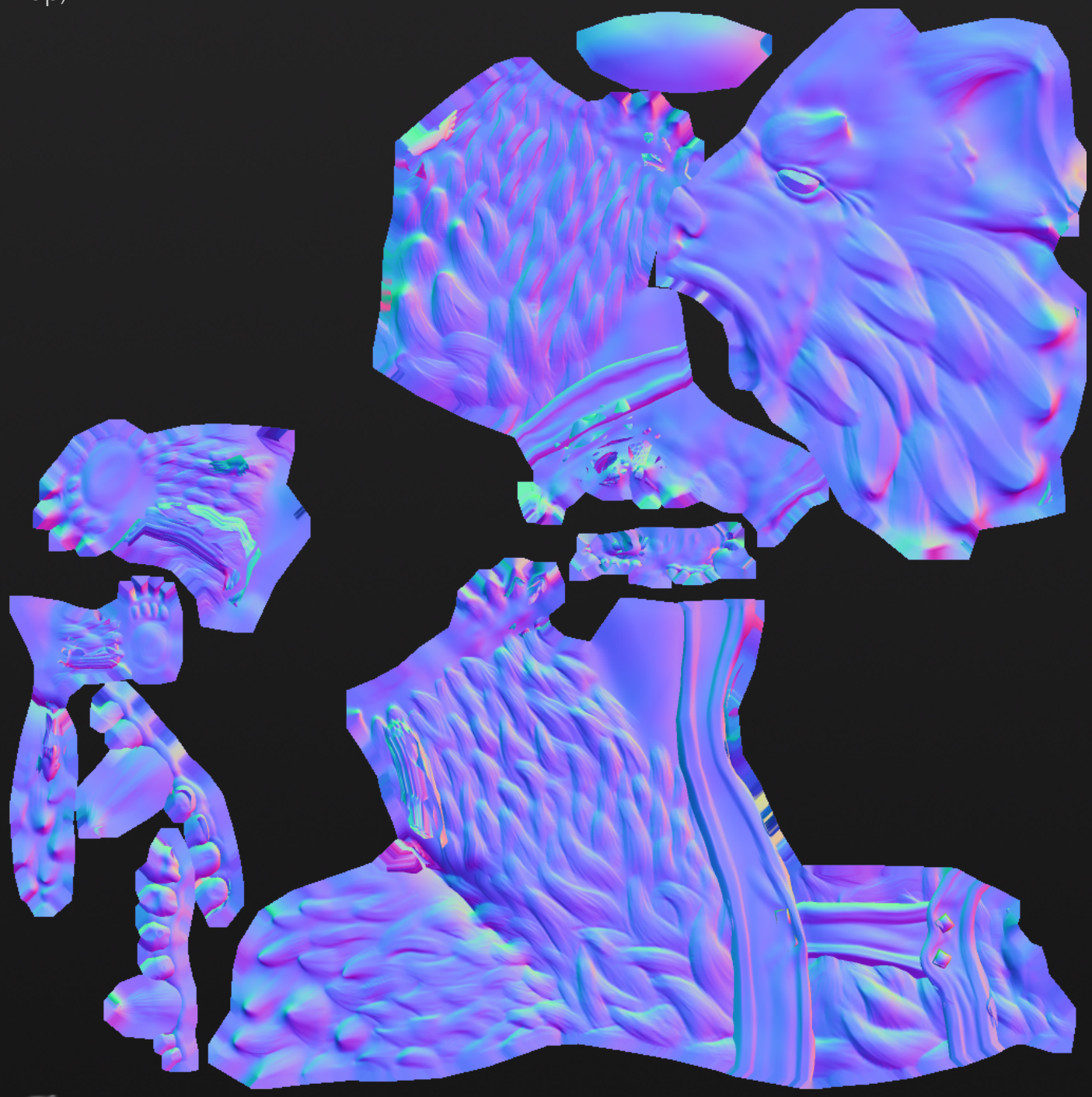
This is what you expect to see while it calculates.

I normally follow the cores calculating to look for issues on the first bakes. In my opinion, is the best way to check all your texture.

If you just look at the end with 100% rendered, you may miss some details.

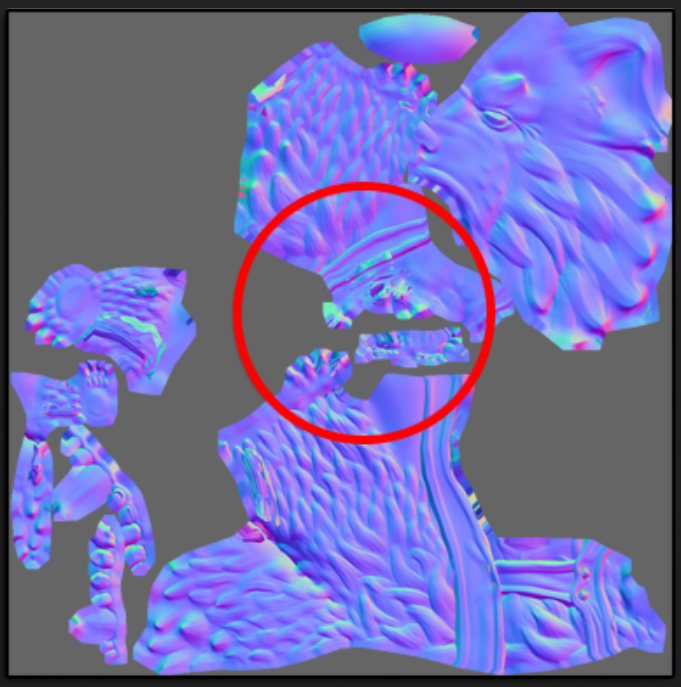
THE FIRST BAKE

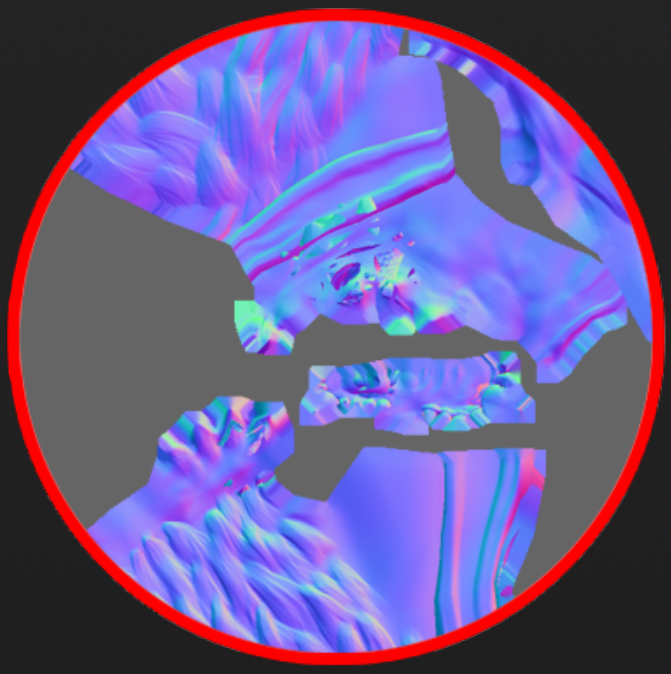
Adding the high/low* models and hitting bake with the default option (just the normal map)



Notice that im am baking just the body of the model, that is why the result is not filling the UV space

As you may noticed, we experience some issues on the texture like this one.

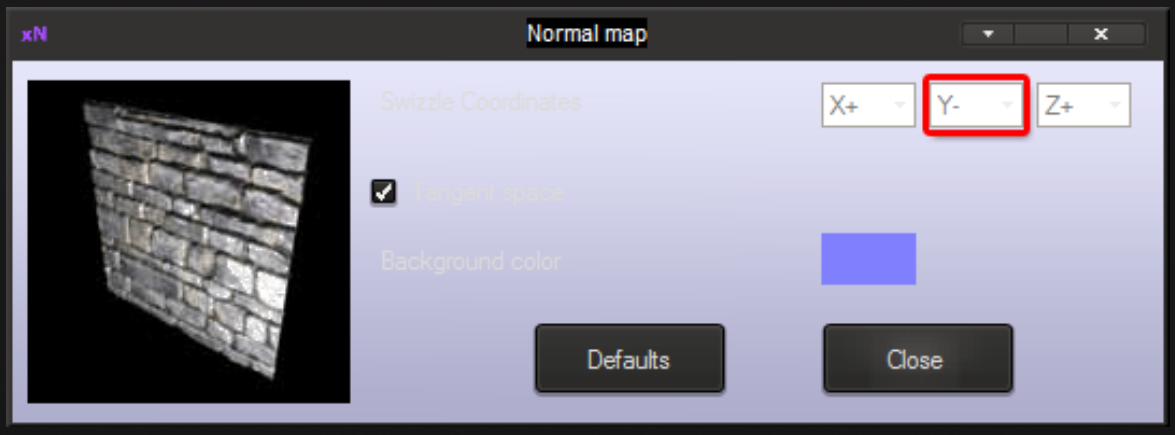




We will need to tweak the numbers to make it work, or use a cage.

You can keep baking with different values on the "Maximum frontal ray distance" and "Maximum rear ray distance" (at the Low definition meshes) and use Photoshop to merge then, but we are going to use the cage to avoid that.

I am using 8 pixels of edge padding (expansion of the texture to avoid showing the seams) and the Y axis inverted



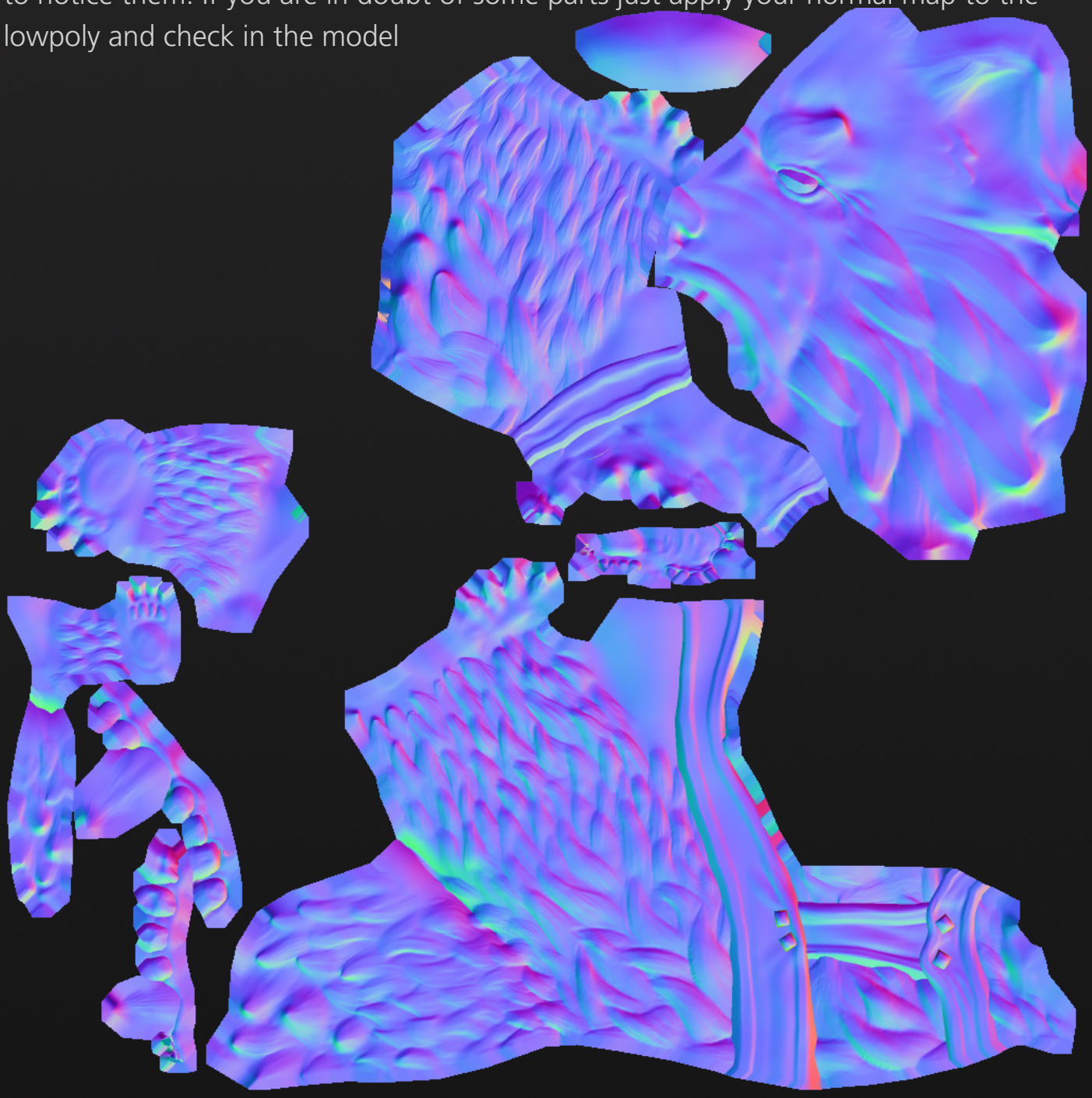
You can invert the Y on Photoshop later by inverting the green channel (select the green channel and press ctrl + shift + i)

Why inverting the Y?

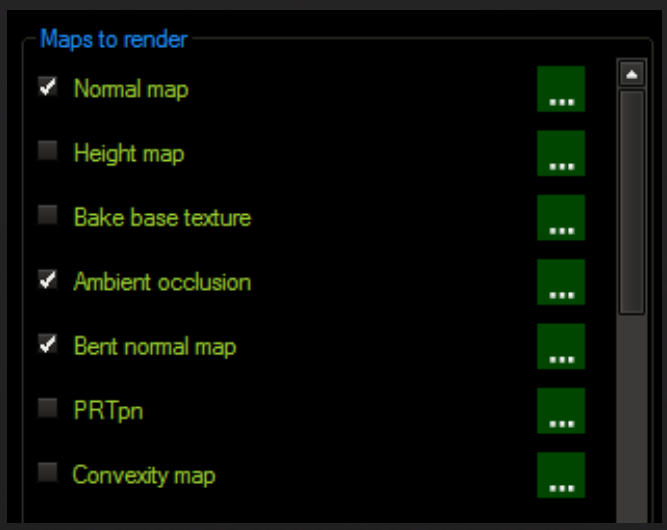
That is because source engine work better with that configuration, it will work without inverting it but it may cause some seams showing on mirrored models

When you know the bake is fine?

This is the result you want to achieve, notice that the normalmap looks fine without errors.
Try to look for some strange color transitions. With time you are going to be used to notice them. If you are in doubt of some parts just apply your normal map to the lowpoly and check in the model



Bake is working, now let's bake the other maps



I use to bake:

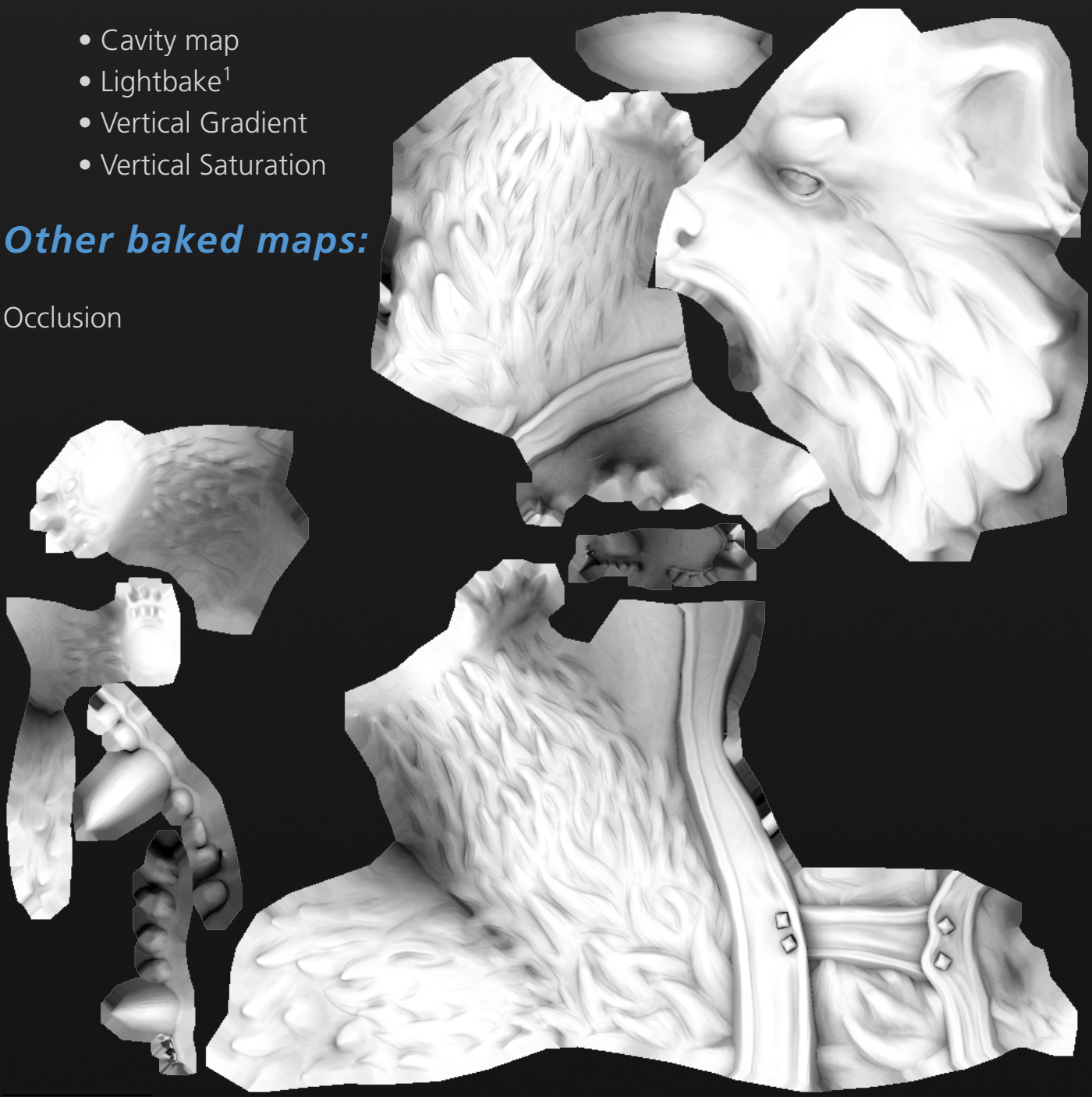
- Normal Map
- Occlusion
- Bent Normals

And later I will produce:

- Cavity map
- Lightbake[1]
- Vertical Gradient
- Vertical Saturation

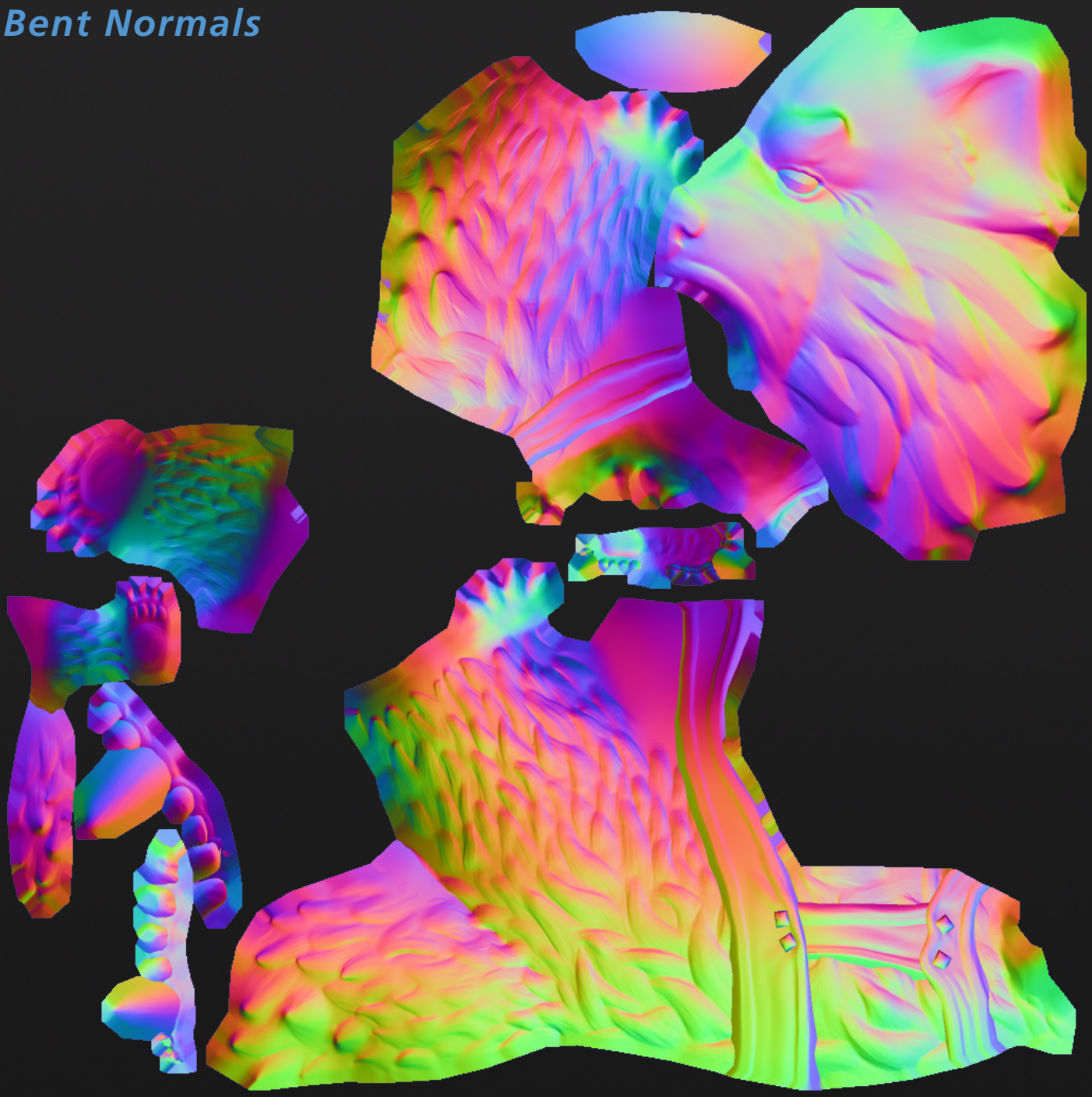
Other baked maps:

Occlusion



1 *The lightBake will be covered on the Next Tutorial*

Bent Normals

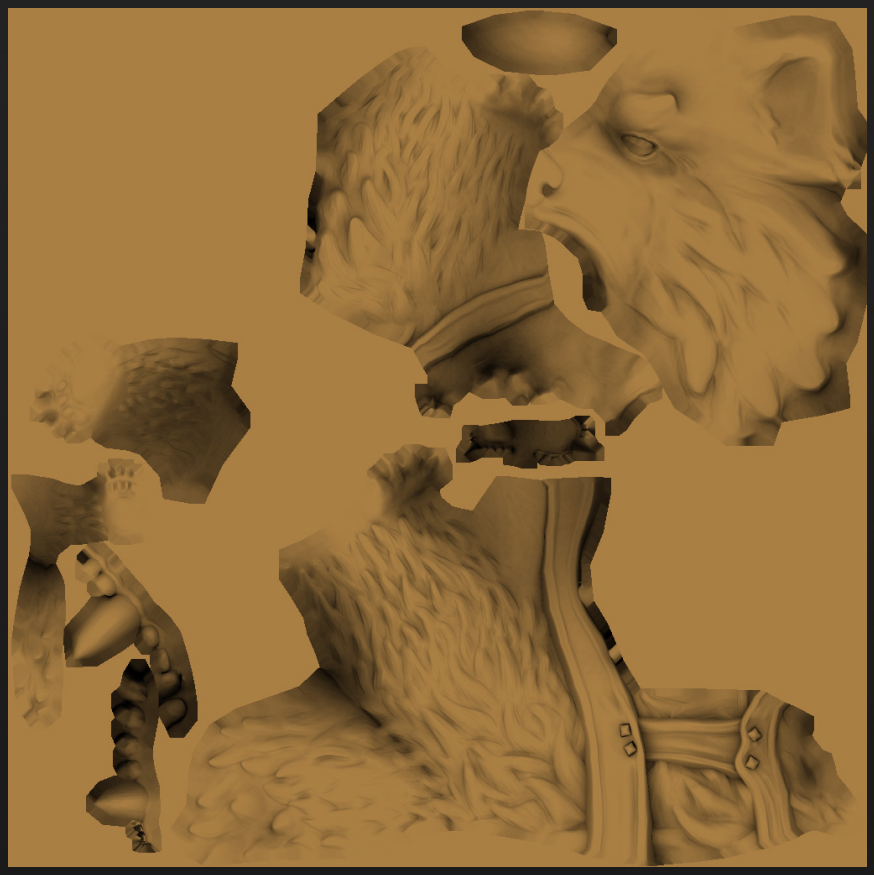


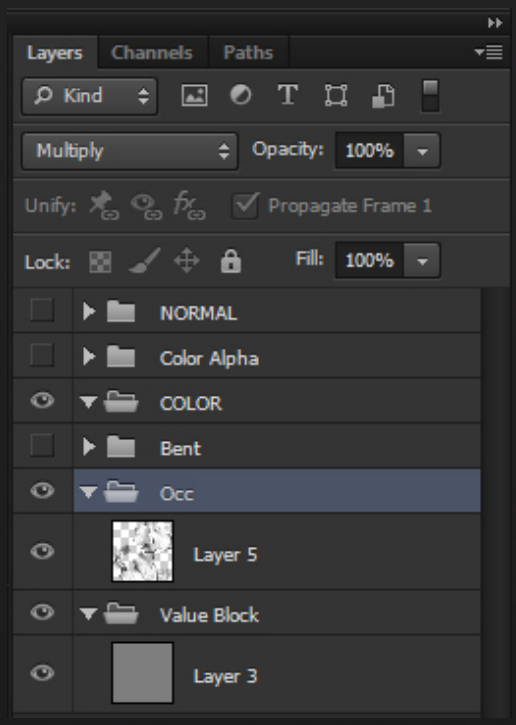
ORGANIZING THE BAKES IN PHOTOSHOP

Occlusion

Normally I start with the occlusion and put it right over my Value Block group.

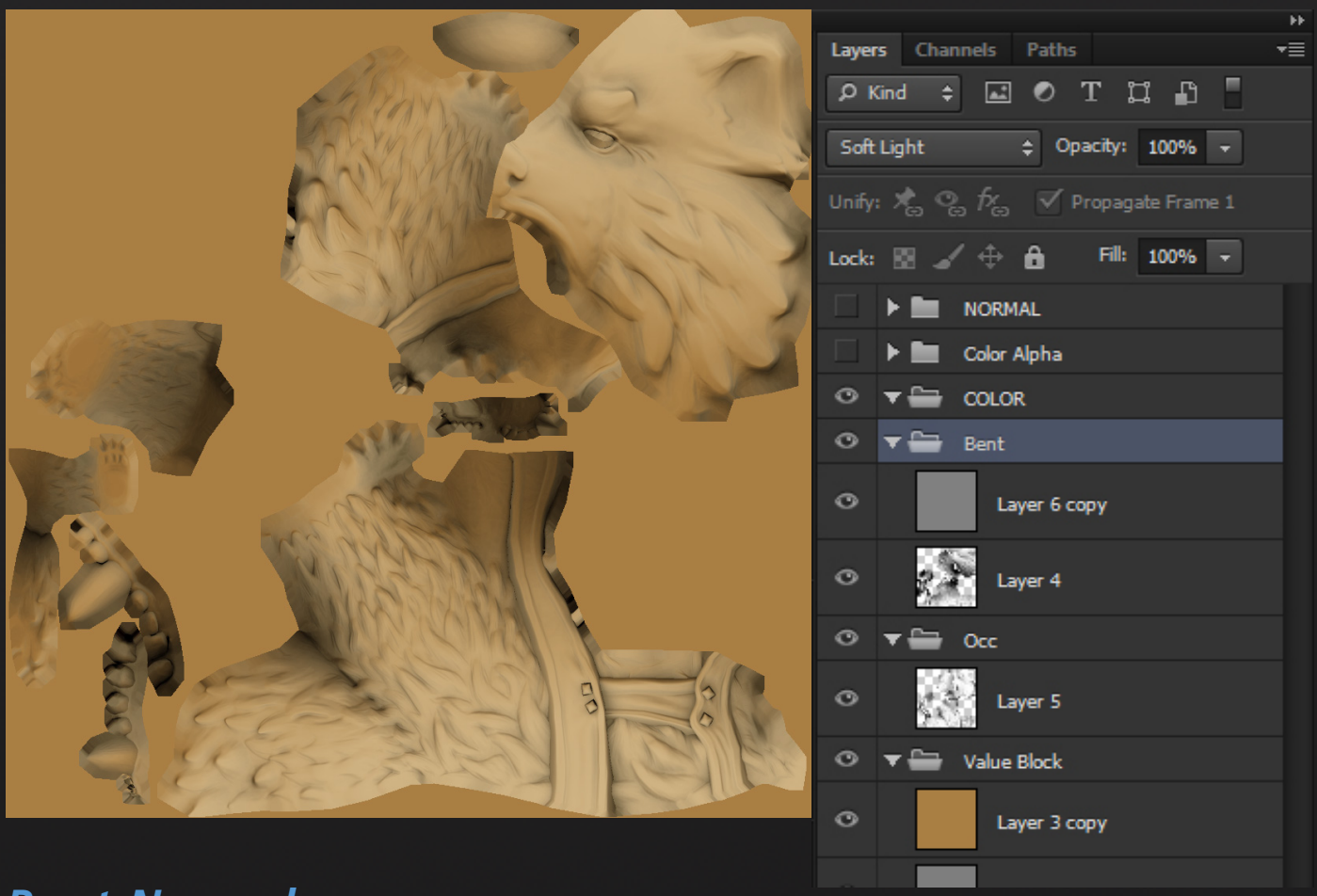
And then I set the layer blending of the GROUP to multiply.





Multiply means that it will get the grayscale version of your image and make the whites transparent. So if you have a 50% gray pixel, that pixel will be 50% transparent. A full white one will be 100% transparent.

Here is the occlusion in multiply. I added an orange background to show the transparency



Bent Normals

We are just using the green channel of this one

The bent normals is an unique normal map which is based on the world coordinates, the green one represents the Y axis (vertical one) and you can use it to fake an light from the top of the model.

On this one I set the group blending as SoftLight and I add a layer with a flat gray at 128 128 128 as screen blending

This layer is to control the darker parts of the green channel of the bent normals.

With the opacity of this layer in 100% you will kill all the dark parts, you can slide it down till you think it is ok. On this example I am using it at 80%

Vertical Gradient

This one will be made not on XNormal. There is a lot of ways to do this one, but the easiest one is using a maya plugin called *Kodde Ramp* (www.kostas.se) created by *Kostas Gialitakis*

Remember everytime you use some free amazing script like this on the Dota 2 workshop, to drop an small message to the Valve developers saying you think this guys should be listed as one of the community contributors for that 5% extra share.

A small tip, the default values for the texture will be a gradient from 100% white to 100% black. Tweak a little the black, i normally put 0.1 instead of 0.0. That way i can mask the final texture and delete the extra bits

That is the result from the script

But if you are doing like me and not baking everything on a single pass, you will probably don't want your texture black on every non used space. That is why I suggested on not using a full black. You can use the "magic wand" to select the full black areas to delete

Before hitting delete, there is a workflow that I got stuck with it to expand your texture later.

1 -select the black with magic wand (load the uvs over it if necessary just to check)

2 - expand your selection by one pixel (select > modify > expand)

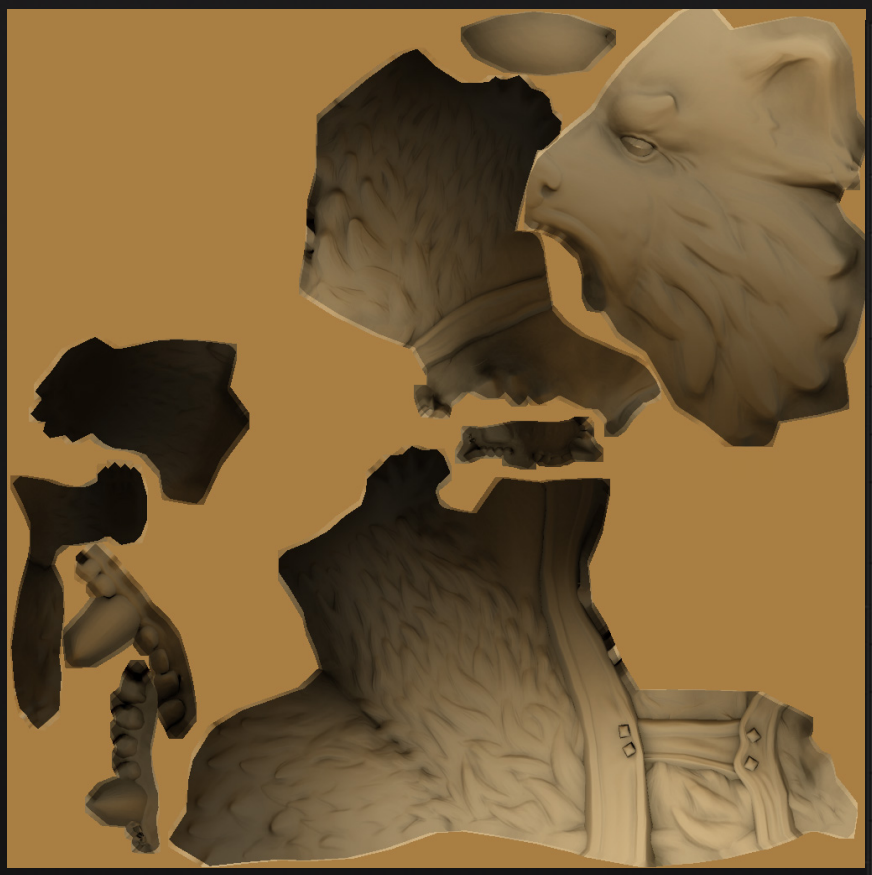
3 - delete

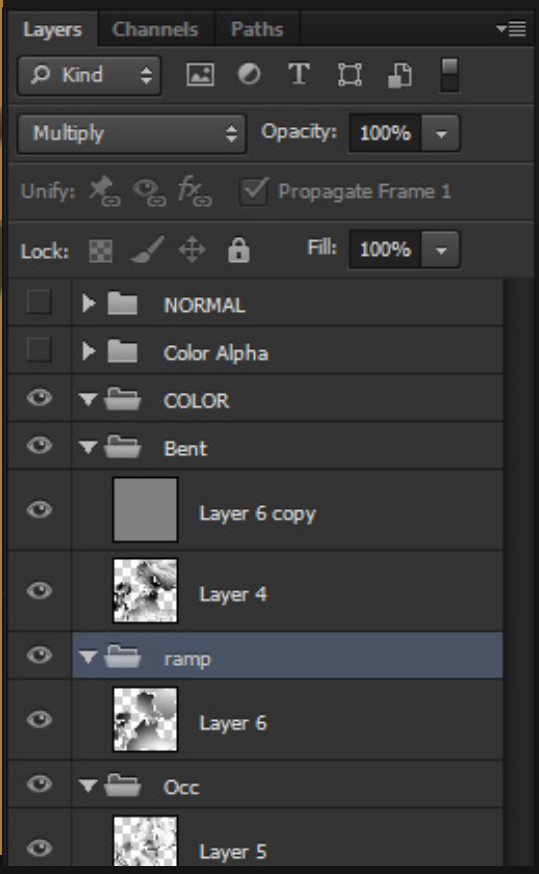
4 - defringe it by one pixel (layer > matting > defringe)

5 - expand using another great script called "Dilate many times" *download here*

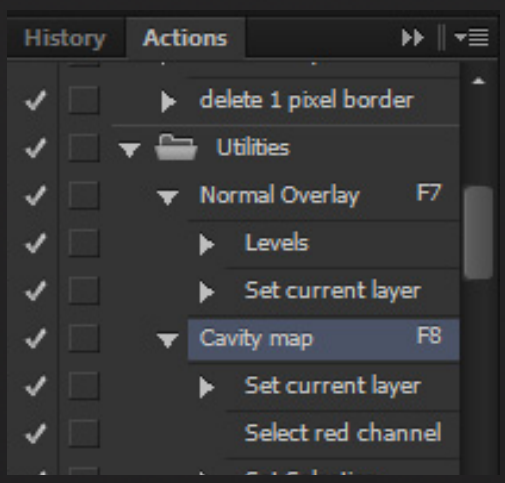
6 - merge the new layers and dilate again if you think it is not enough

I usually put this layer over the occlusion but you don't need to do exactly the same, actually is really good if you try to experiment by yourself. I do that all the time and each texture is a little different.





Cavity Map



Time for another script, this one was shared me by the great artist *Andrea "Motenai" Orioli* *download link here* [www.dropbox.com]

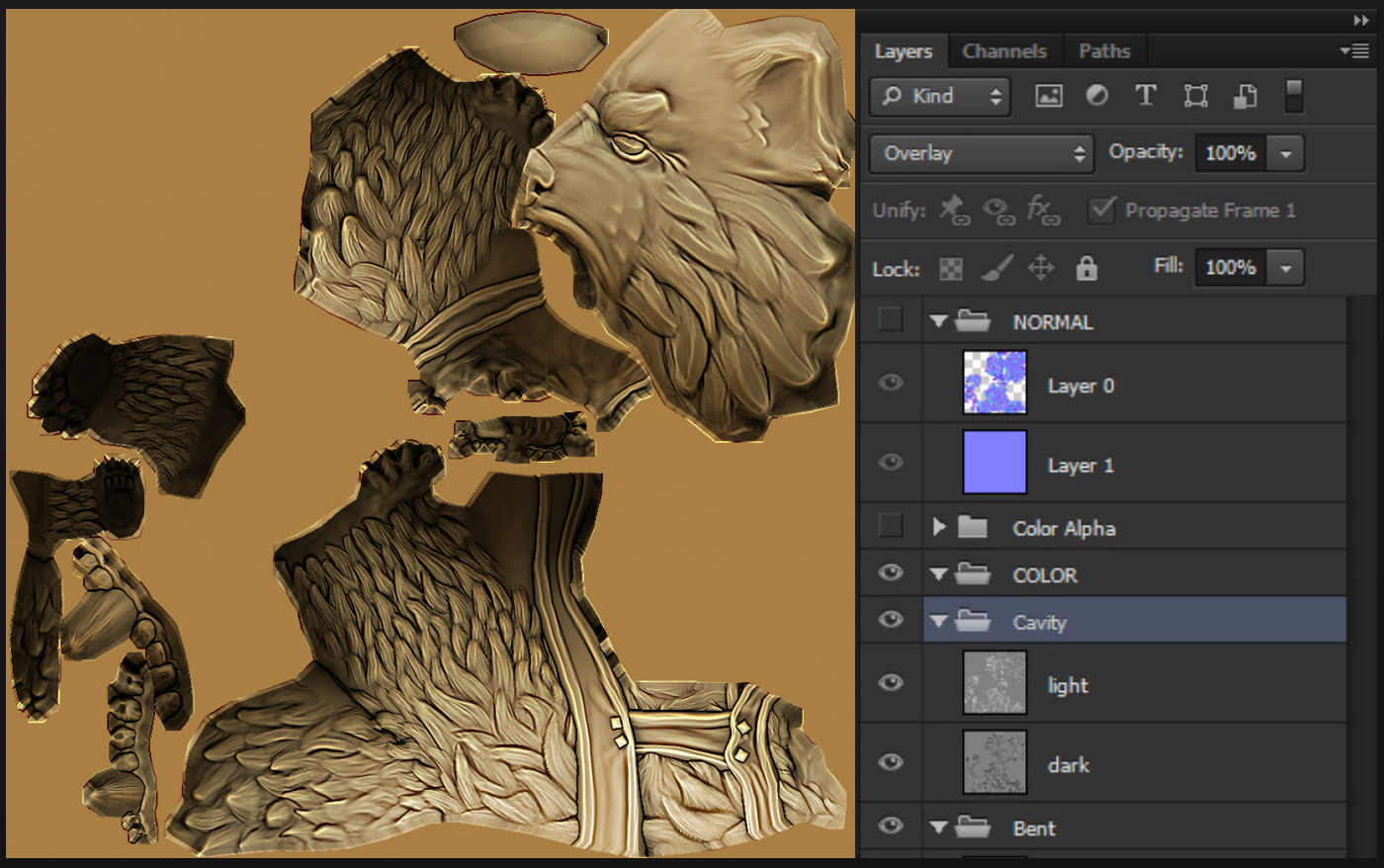
The cavity map will help with some sharpness on your texture and is great to guide your color masks later

To use this one you will need to add a background of the flat normal color (128 128 256) to your normal map (you need to duplicate because the script will destroy it)

After duplicating and merging the background with it, go to Photoshop, open the Actions window and over Utilities hit Cavity map

The script will give you 2 layers called "light" and "dark" which are great for controlling the intensity.

I group then over a "Cavity" group with an "Overlay" blending. Those 2 textures come too strong, so it is a good idea to tone the opacity down later. Right now is on 100% but I normally using it around 30%



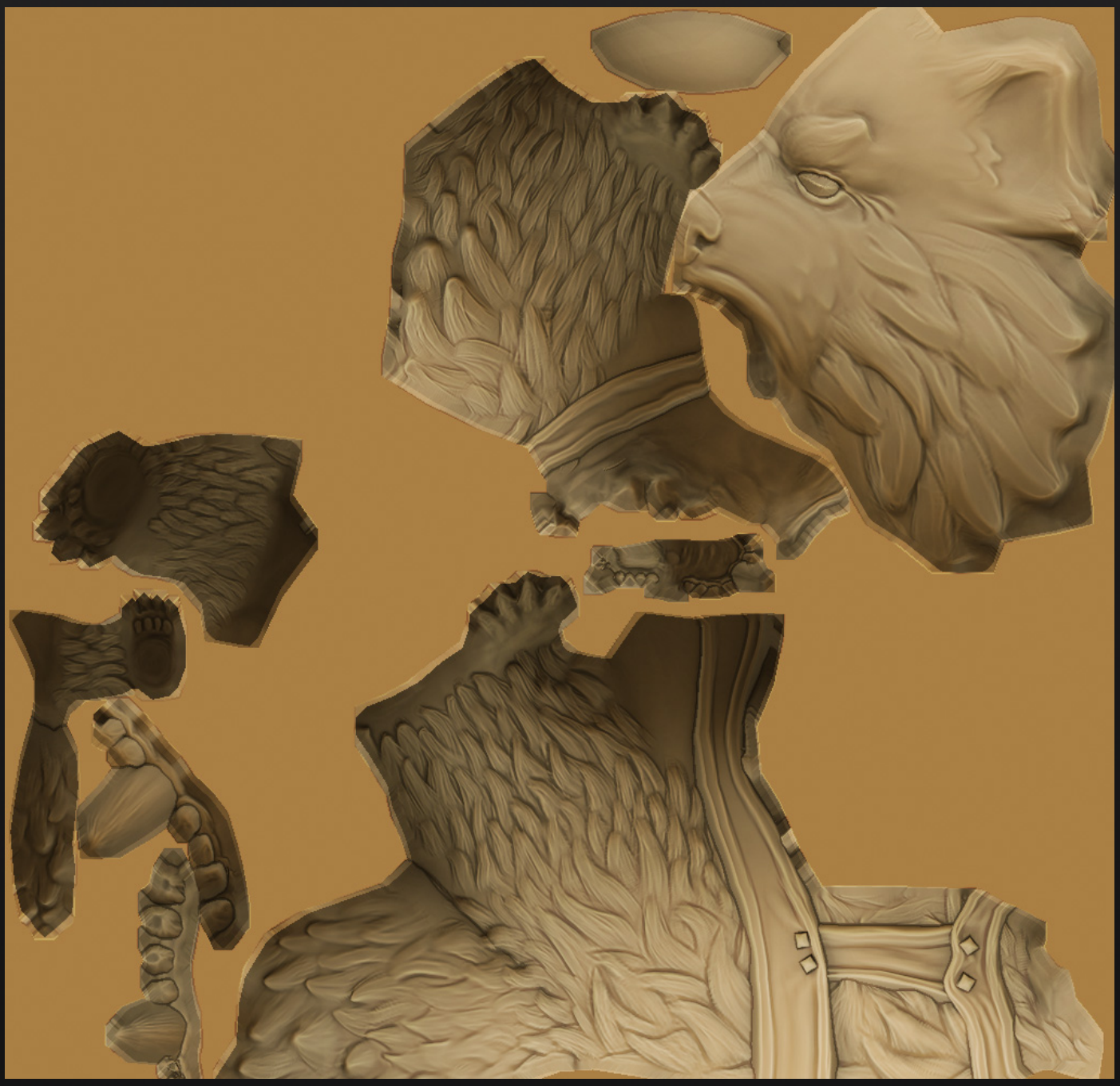
Final Result

Now it is time to tone down some of the maps

I reduced the Cavity to 30% opacity, the Bent to 78% and Occlusion to 73%

the nice thing of this workflow is that is not destructive, you can change the opacity later on the coloring stage. There is still one really important pass called Light Bake, but it is not that quick so I will create one tutorial just for that.

Here is our texture created without any 2d skills. Of course it is not finished but painting the colors and values on this one is going to be easier



Final Result

This image was generated on Marmoset Toolbag 2 using the texture from the previous page
The animated gif can be *accessed here*

Conclusion

This tutorial can help you on the texture phase if you don't feel comfortable with your 2d skills by giving you a good reference of the model and its volumes.

It also can help on a team production where the animator is waiting the model to start rigging/skinning. Providing him this base will help a lot on understanding the deformation of the mesh. In other words, he doesn't need to wait the finished texture to do the animations.

Download

The files used on this tutorial can be downloaded from my *dropbox here*

Full Set Video Presentation

Contact

The Original guide can be found at the *Steam Guide Page*

Other projects can be found at my website or at the Facebook fanpage

www.tvidotto.com

Facebook Page

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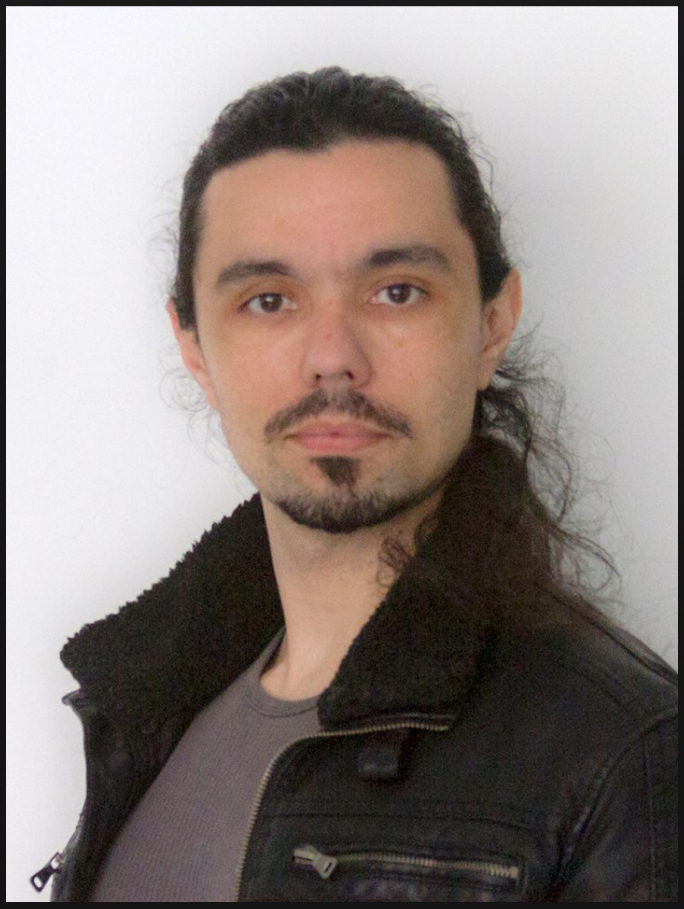
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