Danmarks Tekniske Universitet


Geometric Data Analysis and Processing

# Rendering using Blender

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# 1 Introduction

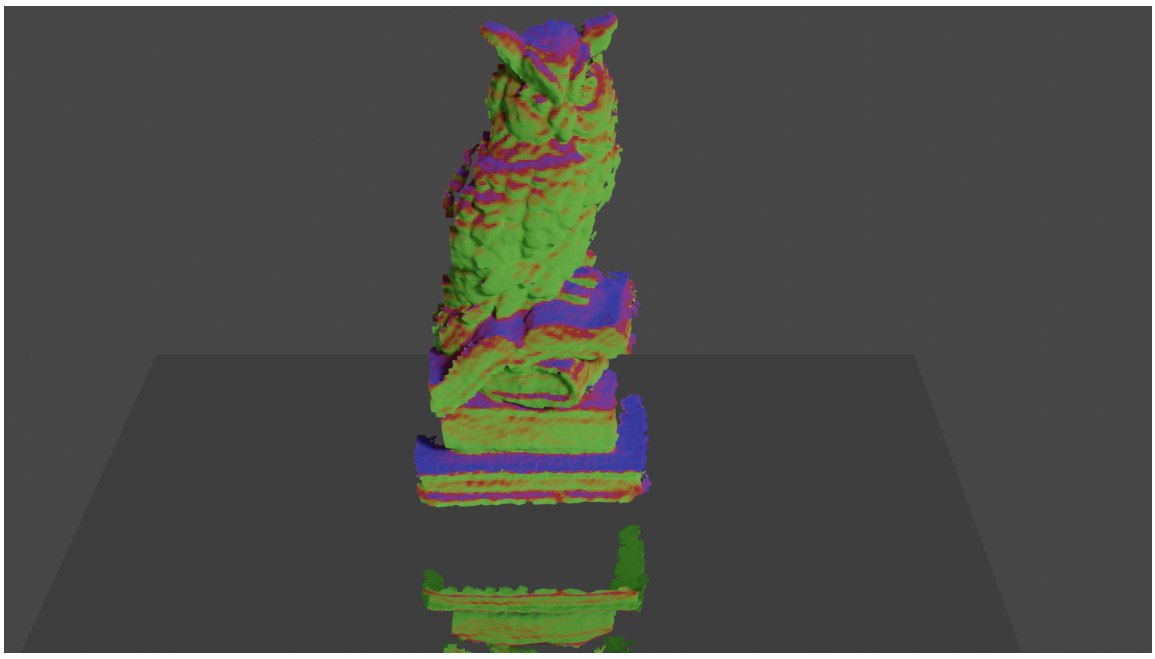
The program Blender should be used to create one or more images. This is done by rendering geometric data sets that have been acquired by 3D scanning.

In section 2, images have been created that display geometric information about the geometric data sets in consideration. In section 3, geometric data sets have been rendered without the purpose of showing geometric information but with the purpose of creating visually interesting images - e.g. images that have been rendered with interesting effects.

# 2 Renderend Images with geometric information in Blender

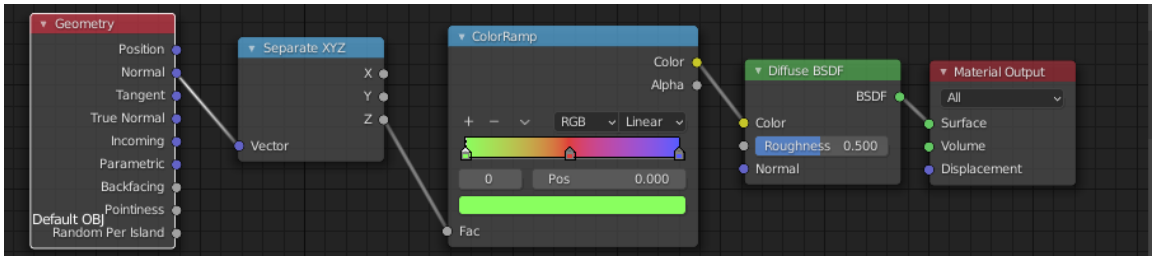
## 2.1 Normals on owl

In image 1 below, the mesh obtained from a 3D scanning of an owl has been rendered. The normals of the owl has been found and the owl is colored according to the $z$-value of the normal vector with blue being equal to 1, red being equal to $\frac{1}{2}$ and green to be 0 or below. The diffuse BSDF has been used. Moreover a plane has been inserted into the image and the surface of this plane is glossy BSDF. This gives a mirror-like effect, which can be used to show that the owl is hollow - in other words it is not a closed surface.



Figur 1: The geometric data set of a 3D scanning of an owl has been rendered in Blender

The configuration of the shader is seen in the image 2 below. Here it can bee seen that the $z$-value of the normal is used to determine the color in a colorramp.

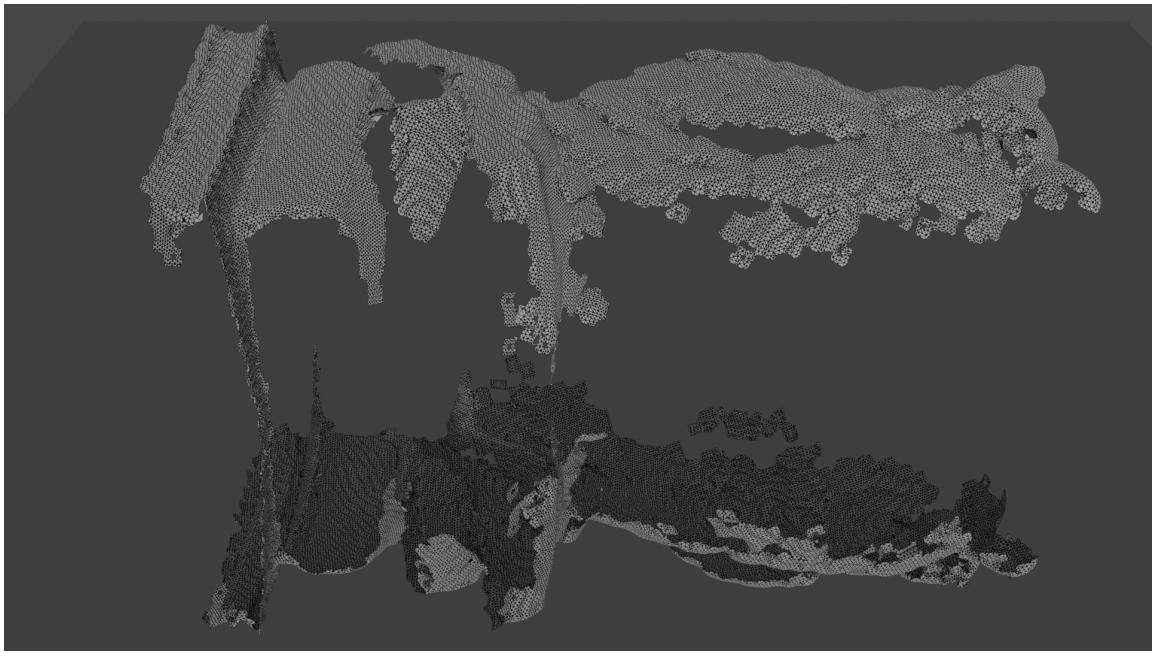



Figur 2: The configuration of the shade-editor for the owl

Lastly, it should be noted that two different light sources have been inserted into the scene. The first light source is an area light with a power of 1000 $W$ and the second light source is a 'sun' with parallel rays and with a strength of 1.230 $\frac{W}{m^2}$.

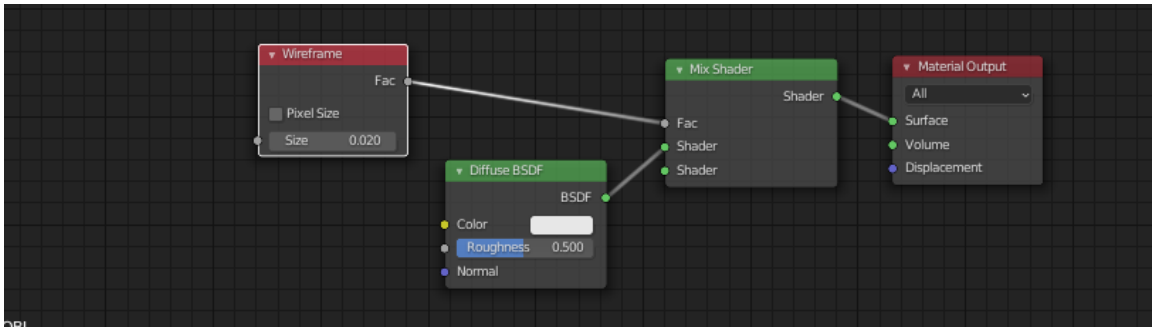
## 2.2 Wireframes on owl

On image 3 below, the wireframes on the owl are displayed. Moreover, the owl is rotated such that it is possible to see the back of the owl (the other side of the 3D scanning) by using the plane in the image as a mirror.



Figur 3: The wireframe on the owl

The configuration of the nodes in the shade editor that was used to generate the image in blender is seen in image 4 below.

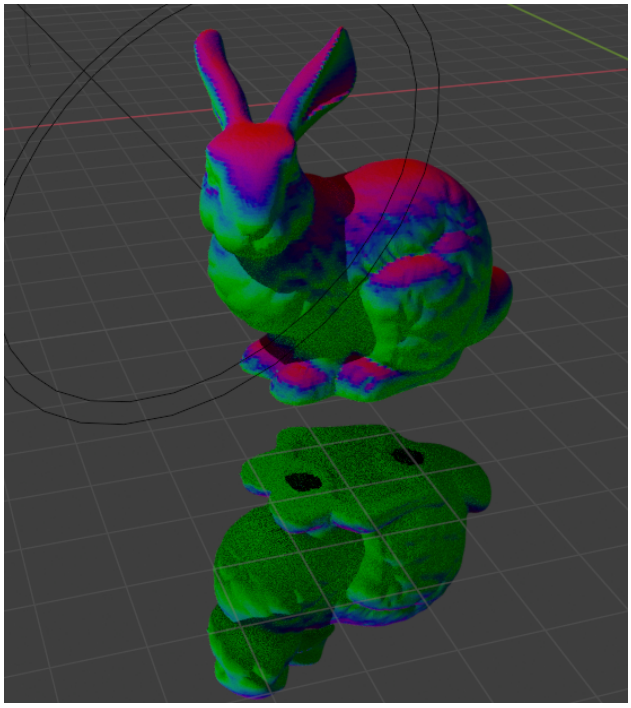



Figur 4: The configuration of the nodes behind the wireframe on the owl

Similar to the image generated in subsection 2.1, two light sources were added. These light sources had the same properties as in the other image.

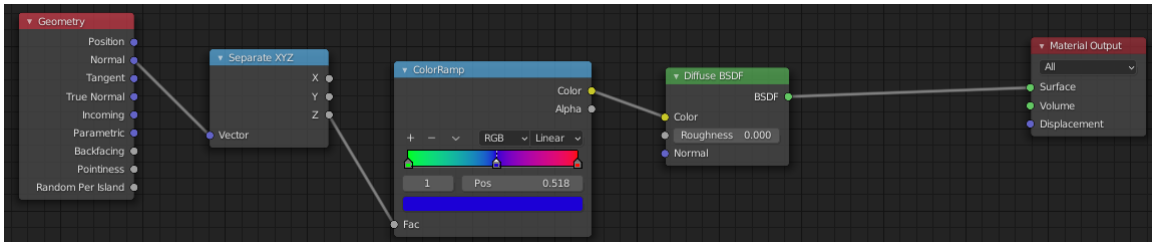
## 2.3 Normals on bunny

Similar to the owl in image 1, we also visualized the z-axis normals on the bunny object. As can be seen on image 5, the value of the normal is high (red) where the surface normal points in the direction of the z-axis (top of the head and body) and the value is low (green) where the normal is perpendicular to the z-axis (neck and side). A mirror plane has also been added as a ground surface and it shows that the bunny object is not a closed surface either.



Figur 5: The geometric data set of a 3D scanning of a bunny has been rendered in Blender

The configuration of the shader nodes can be seen on image 6. They are similar to the owl configuration in image 2 except for the fact that we used 0.0 roughness for the Diffuse BSDF node this time.

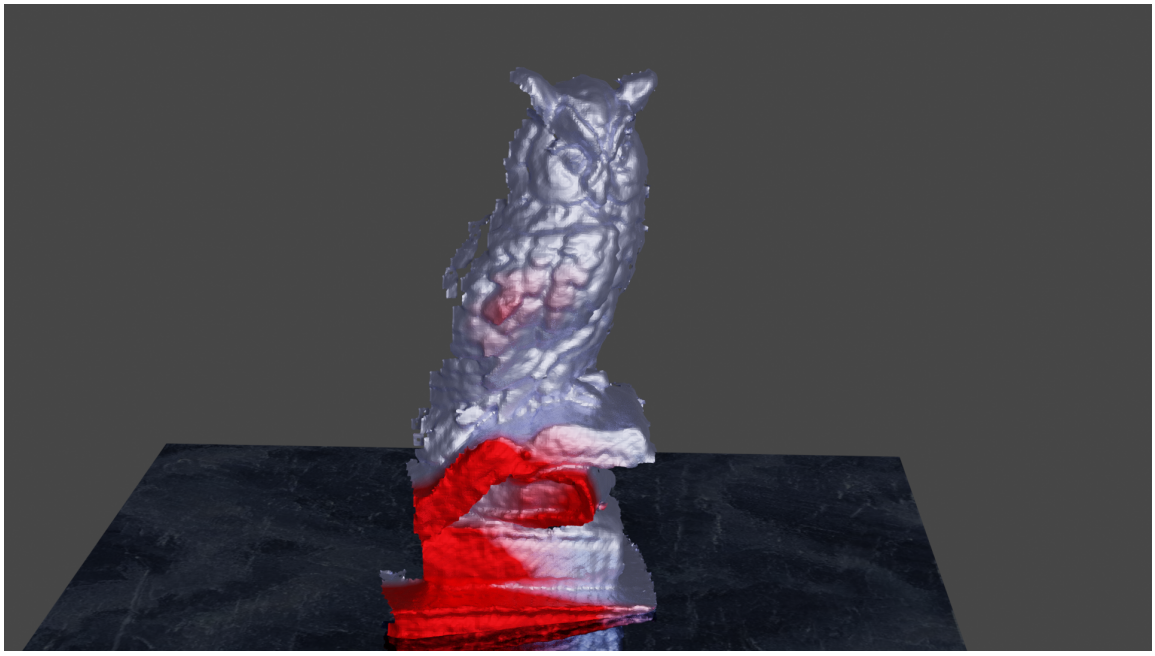



Figur 6: The configuration of the shade-editor for the bunny

# 3 Rendered Images without geometric information in Blender

## 3.1 Rendered Image of Owl

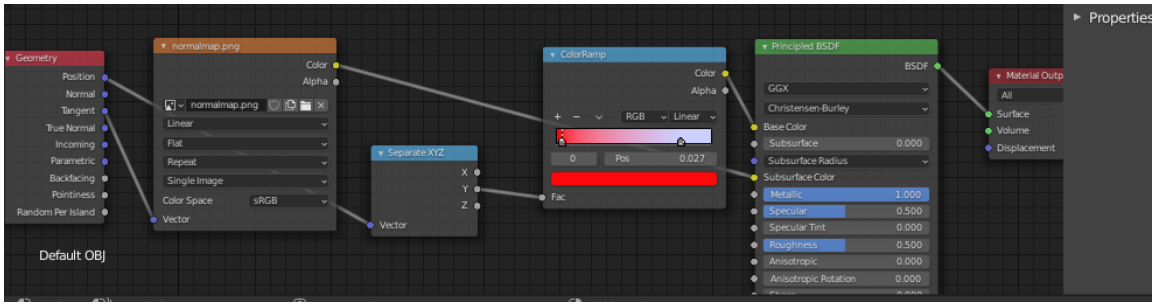
In figure 7, the mesh obtained from a 3D scanning of an owl has been rendered.



Figur 7: The geometric data set of a 3D scanning of an owl has been rendered in Blender

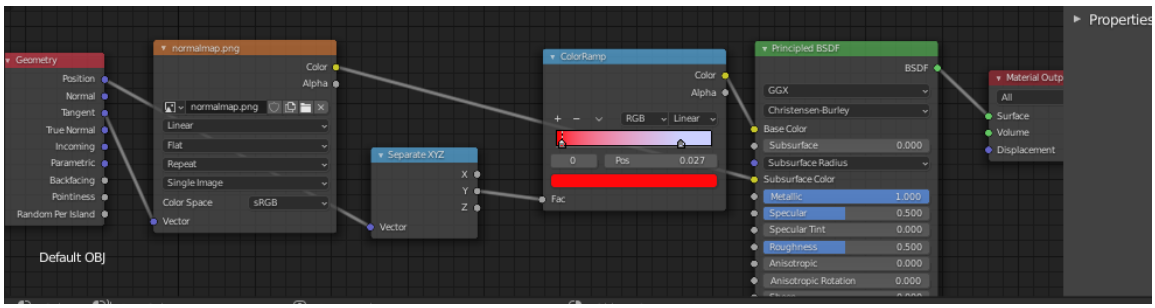
The image consist of the mesh and a plane. The owl has been rendered by creating two different light sources and adding texture to the mesh. Moreover, the color red has been added to mesh to create a dramatic effect. The color is determined by the y-position of the mesh.

The configuration is seen in image 8 below:




Figur 8: The configuration of the shading of the owl

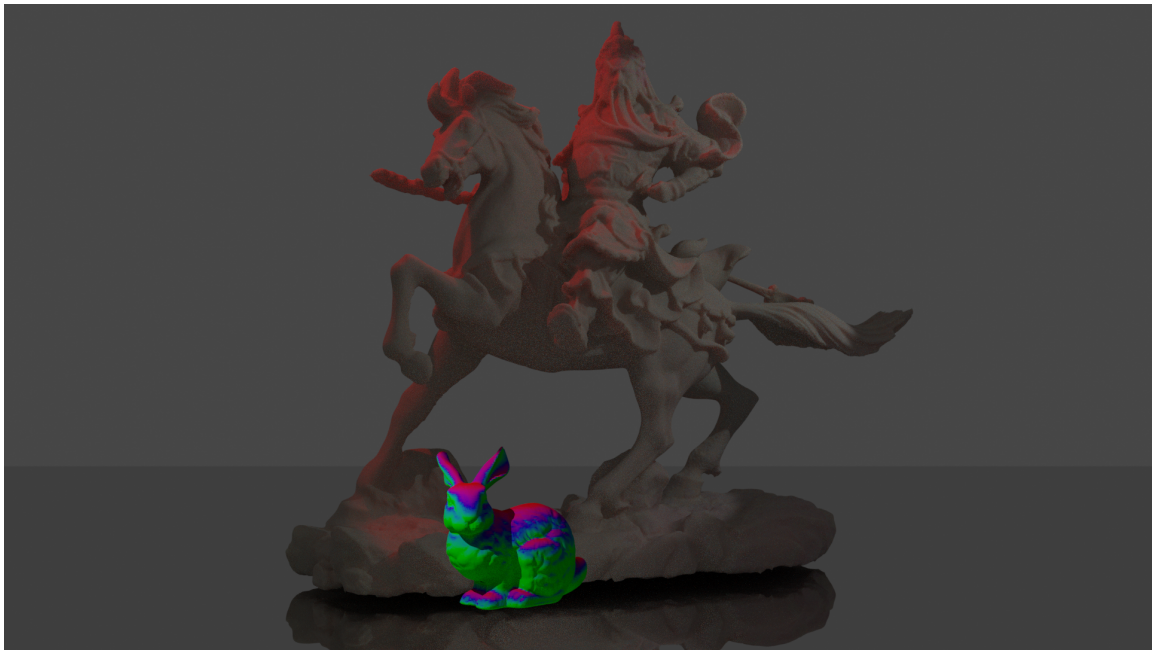
The plane that the owl stands on has also been rendered. Texture has been added but it is not really visible on the image in 7. The configuration of the plane is seen in image 9 below:




Figur 9: The configuration of the shading of the plane

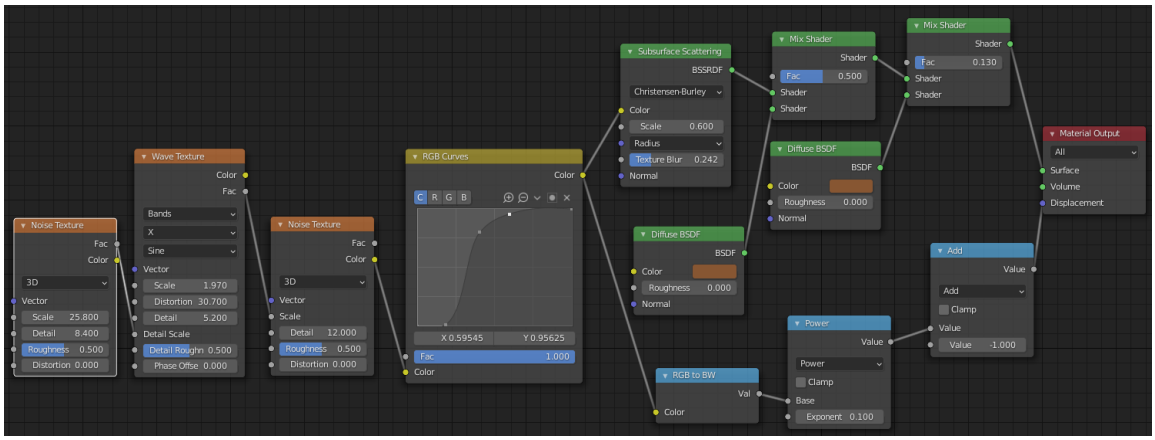
## 3.2 Rendered image of a statue and the bunny

We also wanted to experiment with the marble effect from the lecture slides so we added a statue behind the bunny and tweaked some of the shader nodes to imitate a clay effect instead. The result can be seen on image 10. The statue was 3D scanned then imported into blender as an .STL file. We also used 3 different light sources: one for the mandatory dramatic red effect, one to compensate for that and emphasize the clay color and texture of the statue and one for the bunny separately to highlight the color of the normals even more.



Figur 10: Rendered image of a bunny and a statue

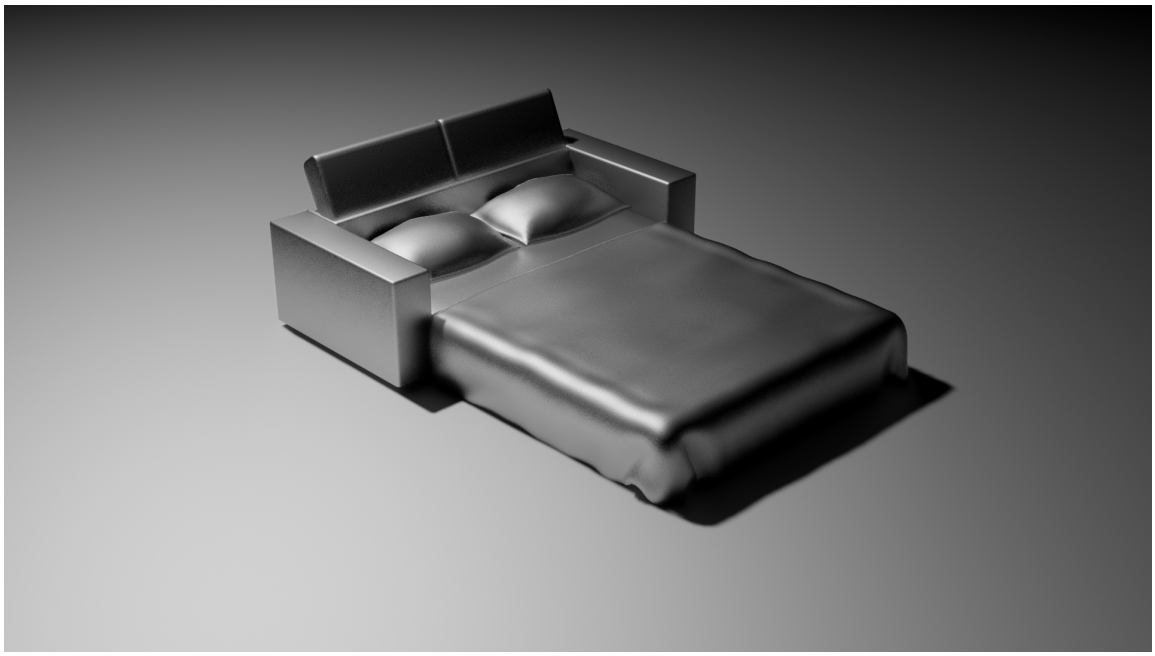
The modified shader for the clay effect can be seen on image 11.




Figur 11: Modified clay-shader configuration of the statue based on the marble-shader

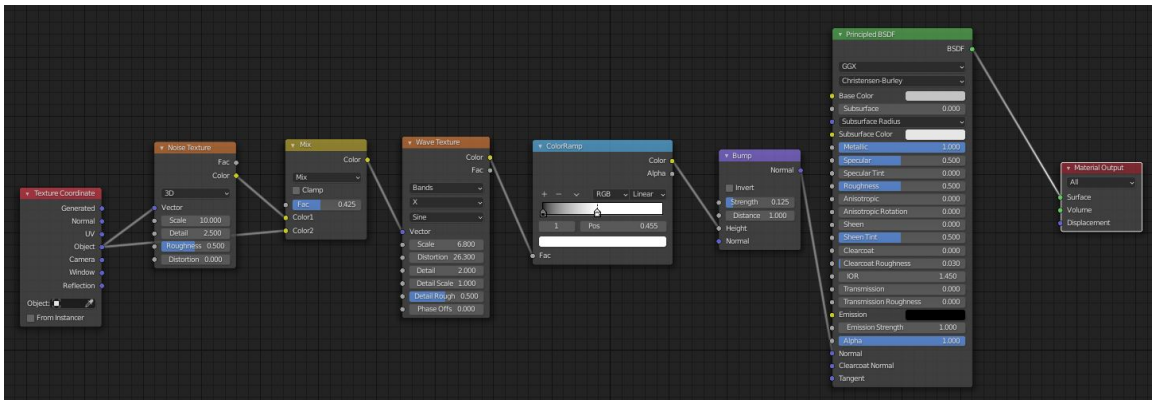
## 3.3 Metal bed with a porous effect

Then we wanted to test a method to have a metal bed, with some porosity on it to have a realistic look. To do this, we import a bed (.STL file) into blender. To add porosity, we add a Noise texture and a Wave texture that we mix with the Metal Texture. Moreover, we add a Bump node which generates a perturbed normal from a height texture, for bump mapping. The height value will be sampled at the shading point and two nearby points on the surface to determine the local direction of the normal. The result can be seen on image 12.



Figur 12: Metal bed with a porous effect

The modified shader for the metal effect can be seen on image 13:




Figur 13: Metal bed with a porous effect configuration into Blender