

This is a Tutorial about how to create Bones based Animations, explained with the Wiper Animation, that was the one, where I've spend the most time to get it working.

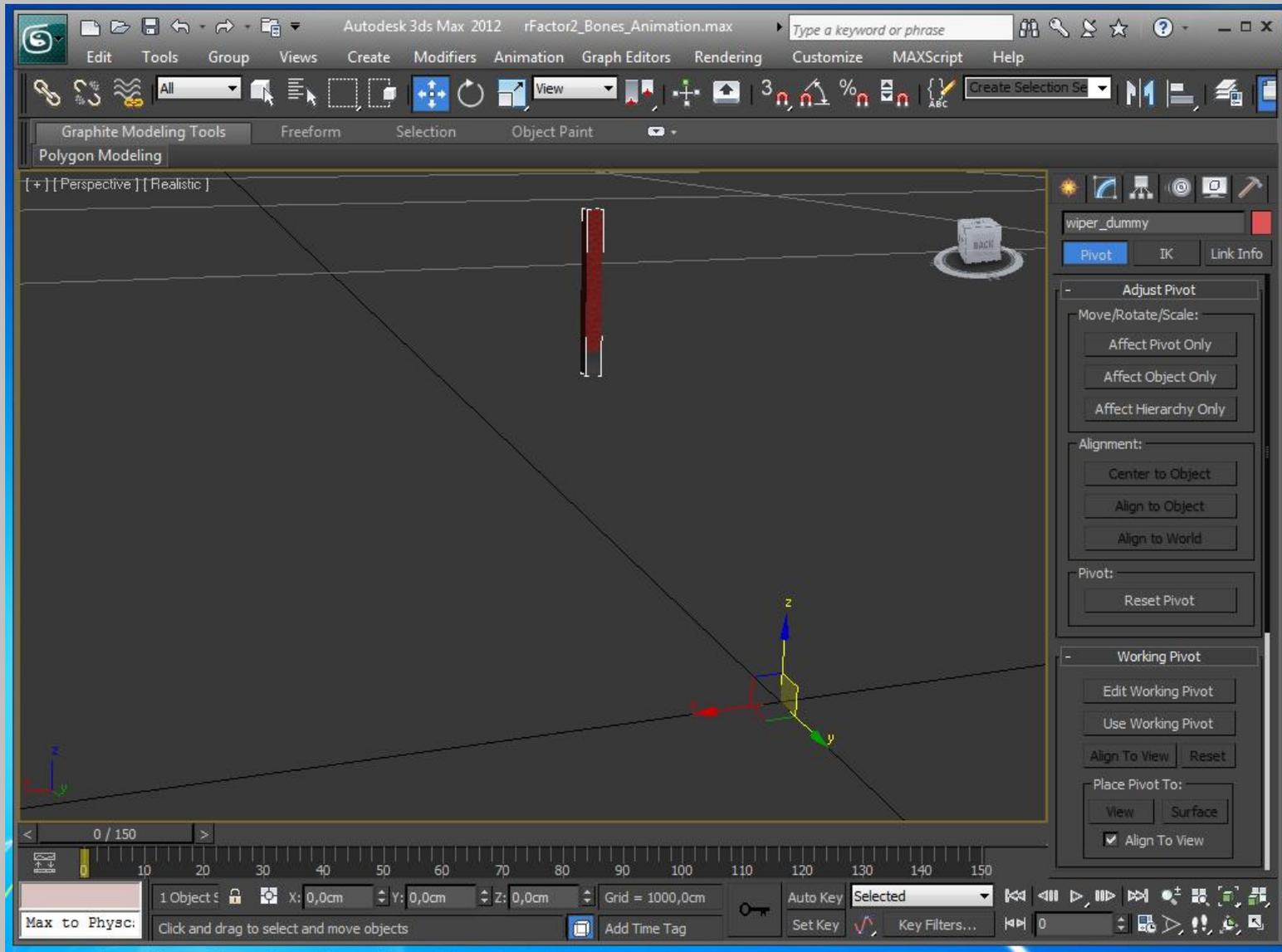
This Tutorial is made for 3DSMax experienced Users.

And don't care for the Shape of the used Bones, they are created only to explain things.

As first, you have to create or import the Mesh, that you want to animate.

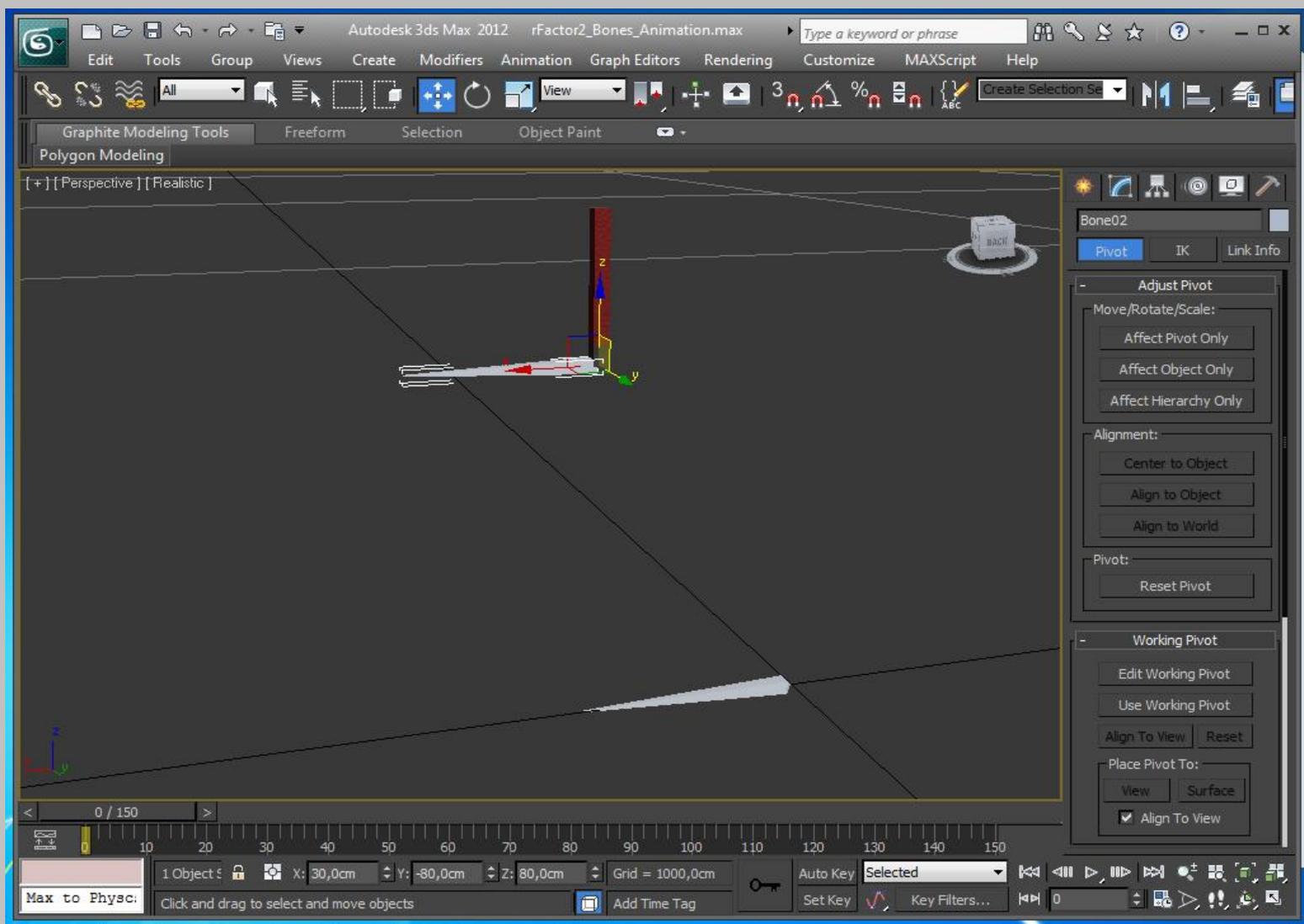
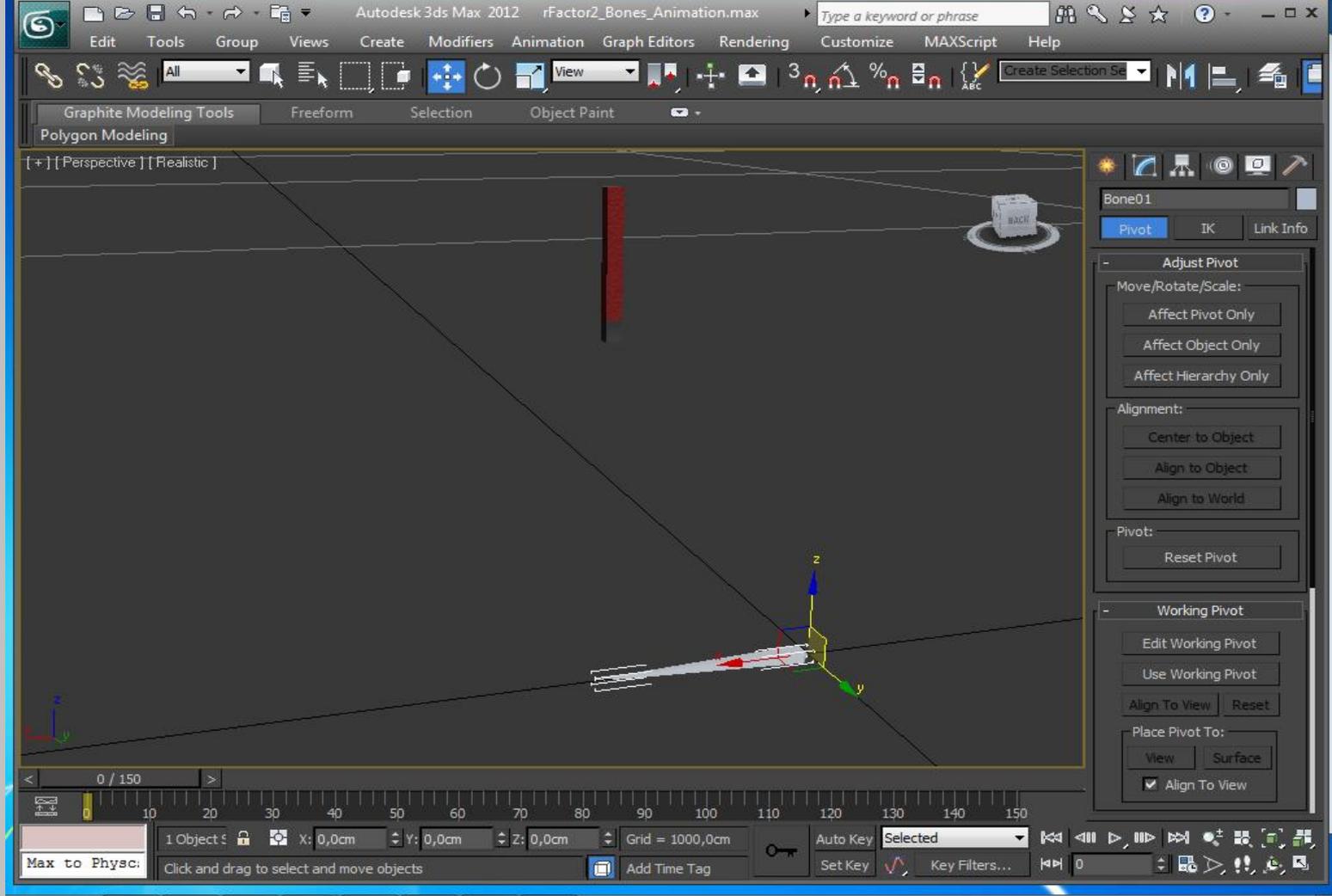
I use a simple Box here. Move the Mesh to the Position where it shall appear in Game later.

**IMPORTANT:** Set the Pivot Point of the mesh to XYZ 0,0,0



As next Step, create 2 Bones. The first is used as "Root" Bone and the second as the one that defines the Animation.

**IMPORTANT:** Position the first Bone to XYZ 0,0,0 also. The second Bone has to be positioned to that Point, around that the Wiper shall rotate.



Now we need to “connect” the mesh with the second Bone.

To do that, mark the Mesh and select the “Skin” Modifier from the Modifier Dropdown.

In the Rollout click the Button “Add”, select both Bones in the opening Window and click “Select”.

**IMPORTANT:** Never collapse the Skin Modifier

Now the Mesh is connected and can be moved by moving Bone02

The skinning is the most important Part, to get your Mesh moving properly.

You have to define which Vertex of the Mesh is connected to which Bone. If you e.g. want to move 2 Wipers, you have to use an own Bone for each of them.

So you e.g. use Bone02 for the left Wiperarm and Bone03 for the right one (both Wiperarms are (have to be) in one Mesh, of course).

But you don’t want to have, that the Movement of Bone03 also moves Vertices of the left Wiperarm.

To avoid that, you have to “Edit Envelopes”.

You have 2 Options to do that.

During my Work, i figured out, that for me the second Option is the better one, if i want to move 2 or more Parts inside of the Mesh, separately.

But i start with **Option 1**, that can be used, if you want to move the whole Mesh.

Click the Button “Edit Envelopes” and select a Bone.

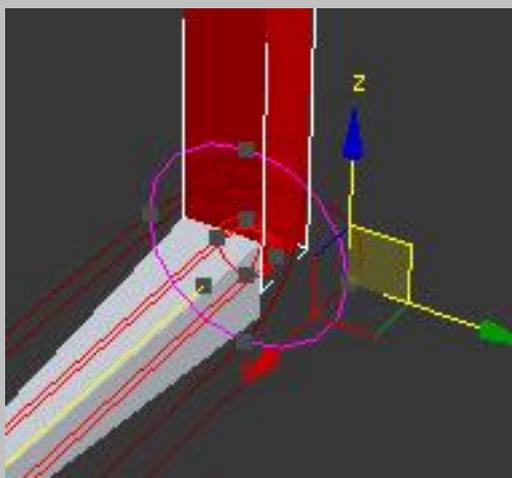
You’ll see the Bones “covered” by 2 “Envelopes”.

An “inner” and an “outer” Envelope and each Envelope is defined by 8 Vertices.

And in the middle of the Envelopes, you see the yellow Line with a Vertex at each End.

With the Vertices of this yellow Line, you can move around and also modify the Length of the Envelopes.

With the Vertices of the inner and outer Envelopes, you can modify the Volume of the Envelopes.



The Screenshot shows one Side of the Envelopes, where the outer Envelope shows the pink Ring.

The pink Ring appears, if you select a Vertex of the Ring.

You have to manipulate the outer Envelope of the Bone that you use for the Movement of the Mesh.

Select a Vertex of the outer Ring and move it. The Ring will grow or shrink, depending of the Tools usage.



Do that for both Rings of the outer Envelopes.

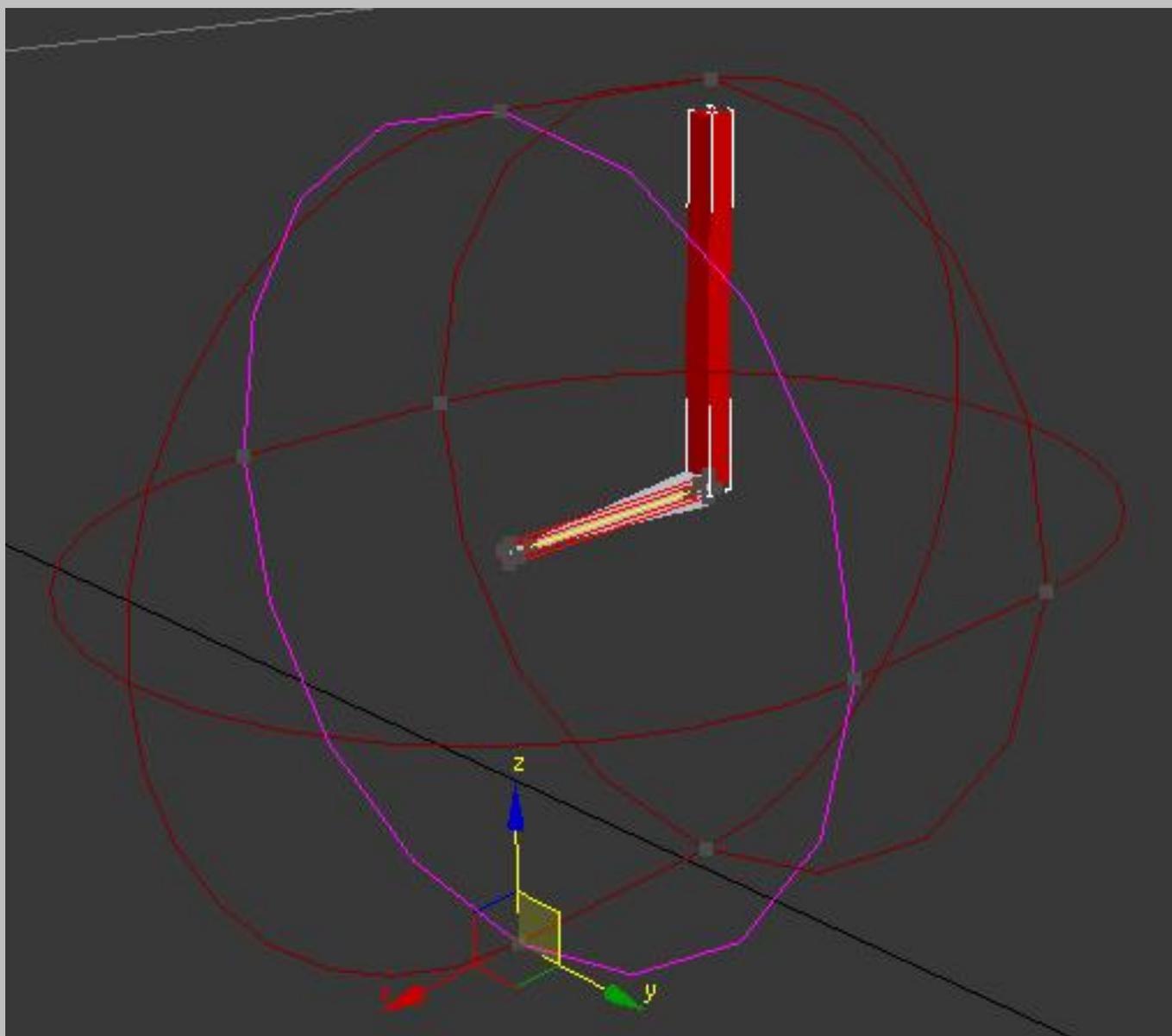
The Mesh has to be covered completely by the Envelope of that Bone, that defines the Movement of the Mesh in the Animation. The complete Coverage guarantees, that all Vertices of the Mesh are moved.

You'll see the Mesh getting red, when it gets covered, as an Indicator that the red Parts are properly covered.

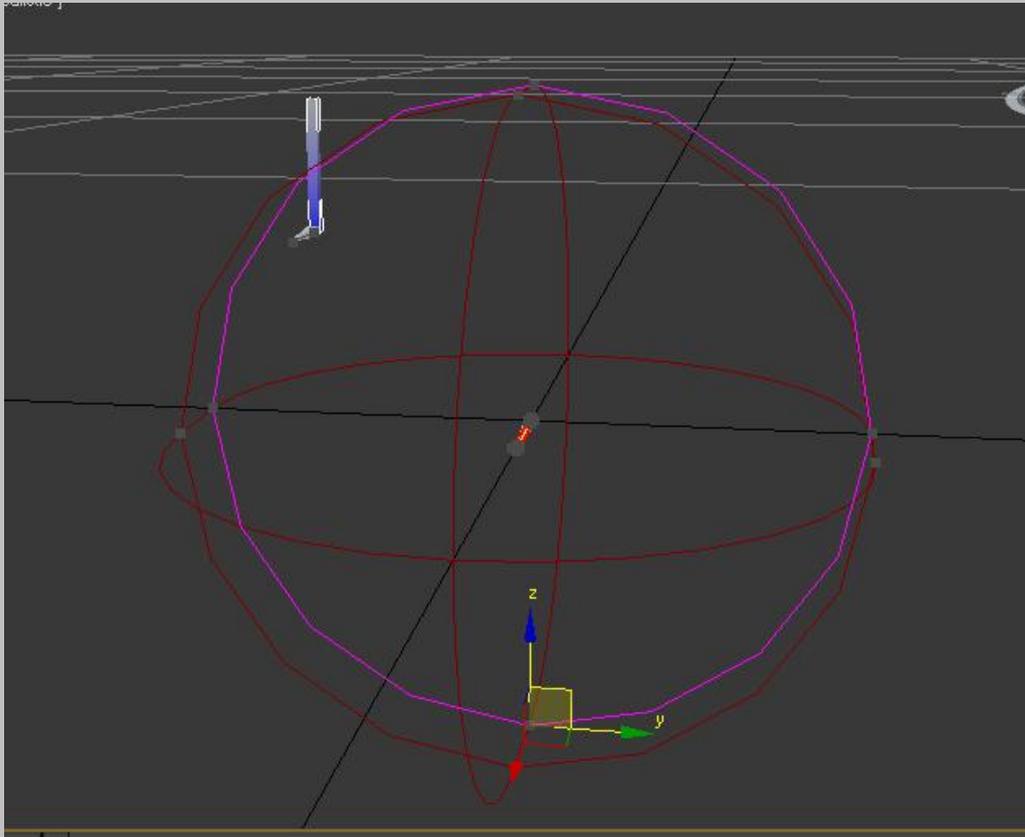
(Don't worry about the huge Volume of my Envelopes, i could have positioned them better, but it's OK as it is, for explaining things, i guess 😊).

What is important here is, that the outer Envelope of Bone02 should cover the whole Mesh, while the outer Envelope of Bone01 only should cover a small Part of the Mesh. This is done, because the Bone02 is the one that is used to move the Mesh in the Animation.

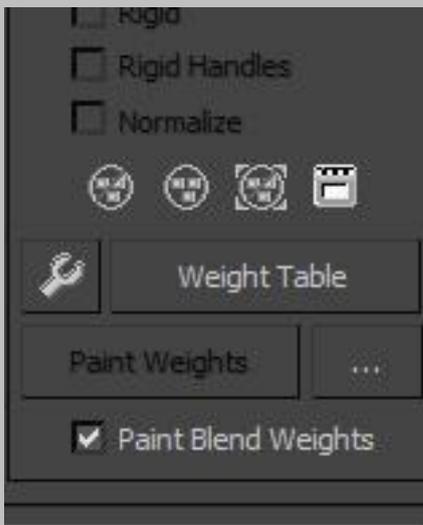
On the next Screenshot you'll see the outer Envelope of Bone02 covering the Mesh. It should look the same for you, after you have widened the Envelope.



And here is, how it should look for Bone01 (you can see that the Mesh is colored blueish a little bit. That shows that the Envelope just covers a Part of the Mesh). i have covered half of the Mesh.



If the Covering is done, scroll down a little bit, until the Button “Weight Table” appears”.



Click on the Button and a new Window opens, where the Weights of the Vertices can be edited. It was recommended by ISI to give Bone01 a small Weight of 0,001 also.

The Weights of the Vertices that are connected to the Bone that moves them, should be 1. Only the Vertices that are also connected to Bone01 (the Root Bone) have a Weight of 0,999 for Bone02 and 0,001 for Bone01.

I have noticed, that this Weight for Bone01, where Bone01 shall not influence the Movement, is needed to get the Movement of the Animation working properly in Game.

I guess it's simply used to “Ground” the Animation to World 0,0,0.

It is enough if only 1 Vertex of the Mesh has the 0,001 Weight on Bone01.

In my above Example, where i have moved the Envelopes by Hand, the Envelope of Bone01 touches 4 Vertices, so i gave all 4 a Weight of 0,001.

So edit the Values that the Result looks like this and close the Window:

Vertex ID	S	M	N	R	H	Bone001	Bone002
#0		X	X			0,001	0,999
#1		X	X			0,001	0,999
#2		X	X			0,001	0,999
#3		X	X			0,001	0,999
#4			X			-	1,000
#5			X			-	1,000
#6			X			-	1,000
#7			X			-	1,000

All vertices

Use the middle mouse button to pan the window

**Don't forget :** Never collapse the Skin Modifier!

The Envelope Editing can be a timeconsuming Procedure. While i was trying to get the Wipers working, i figured out, that the Size of the Envelopes can influence the correct Movement of the Wipers.

For that Reason, i prefer to use **Option 2** to edit the Envelopes / attach Weights.

Instead of moving the Envelopes by Hand, to get the correct Weights, i use the "Select Vertices" Option, that can be activated, by checking the Checkbox under the "Edit Envelopes" Button.

With that Method, you can select a Bone and mark/select the Vertices that you want to attach to that Bone.

In the Window, that opens by clicking the Button "Weight Table", you can manipulate the Weights directly then, which is much more precise, if Parts of the Mesh, that you want to move separately, are too close together, to get them covered properly, by editing the Envelopes by Hand.

If you have Movement Problems, except of the Problem that the whole Movement don't works, the Envelope Editing is the first Place where i would suggest to look at.

(The whole "Edit Envelopes" Procedure is a bit complicated to explain for me (English is not my native Language). Maybe you use the Autodesk Help to get better Info about it. I'm not the biggest Expert with 3DSMax and also my Skills are limited, so there maybe is a better or easier and faster Way to edit the Envelopes.)

**IMPORTANT:** If you have finished the Edit Envelopes Procedure, click the Button "Edit Envelopes" again, to deactivate it. (just to remember: don't collapse the Skin Modifier)



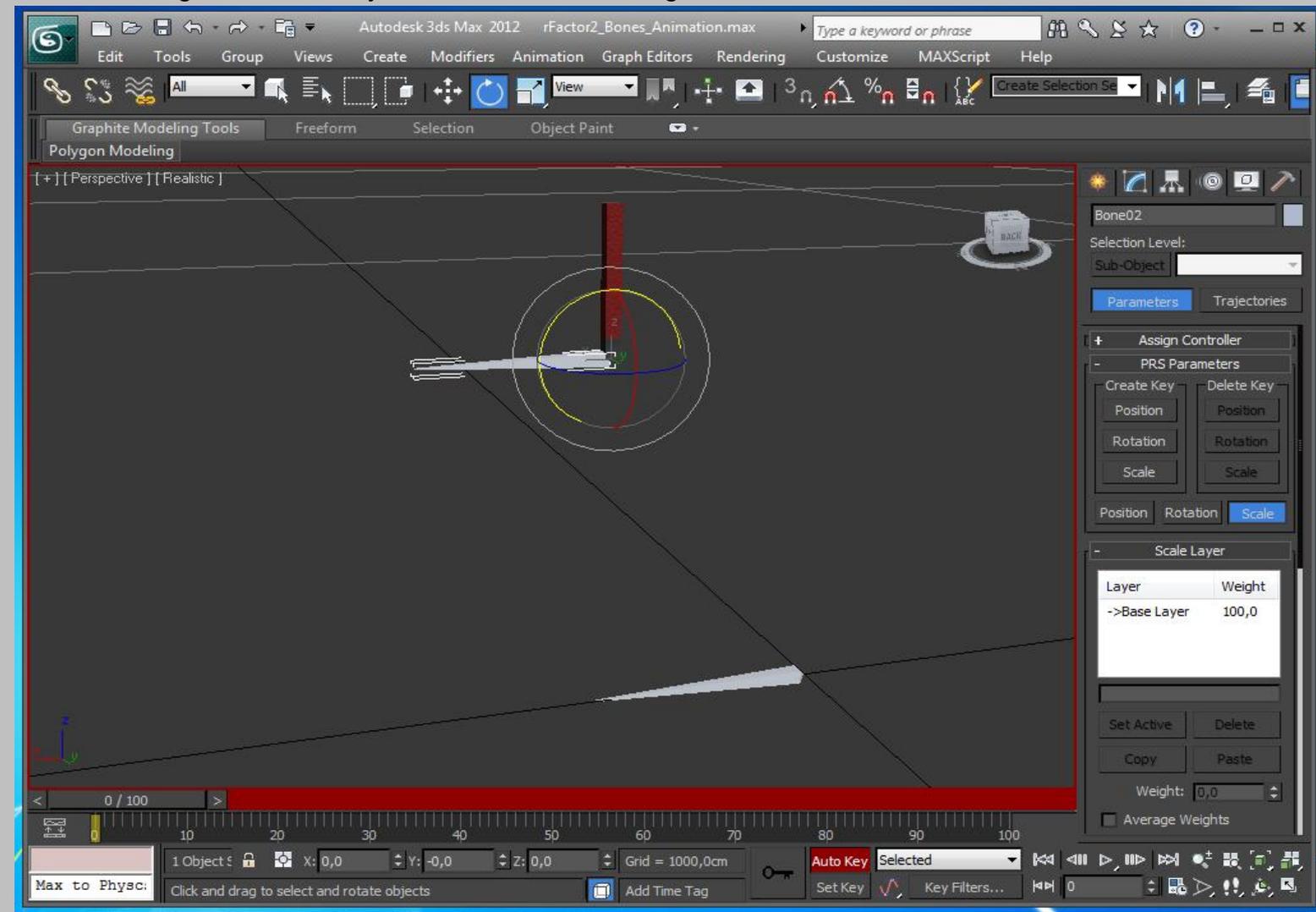
Now open the Motion "Tab"  , to start creating the Animation.

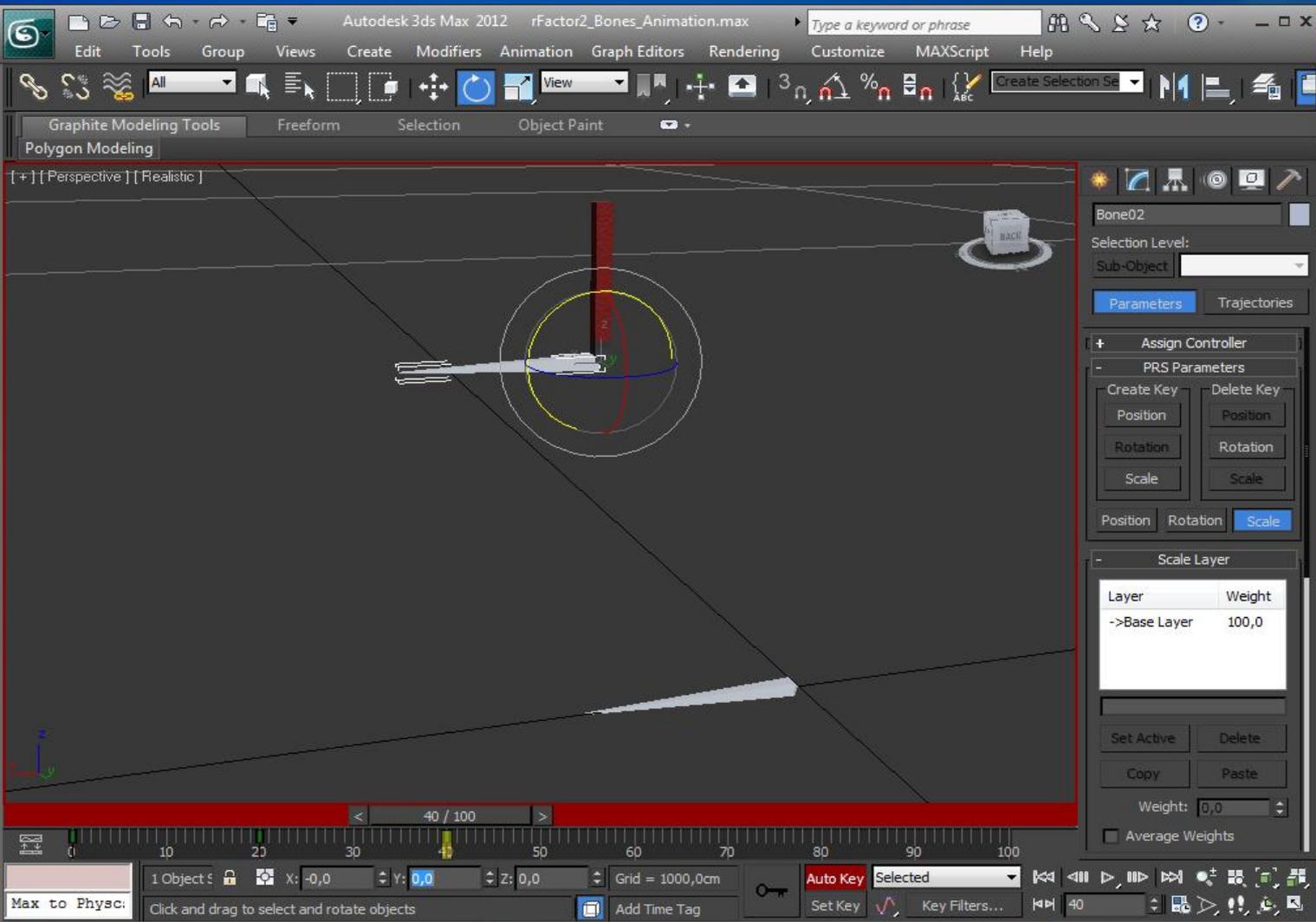
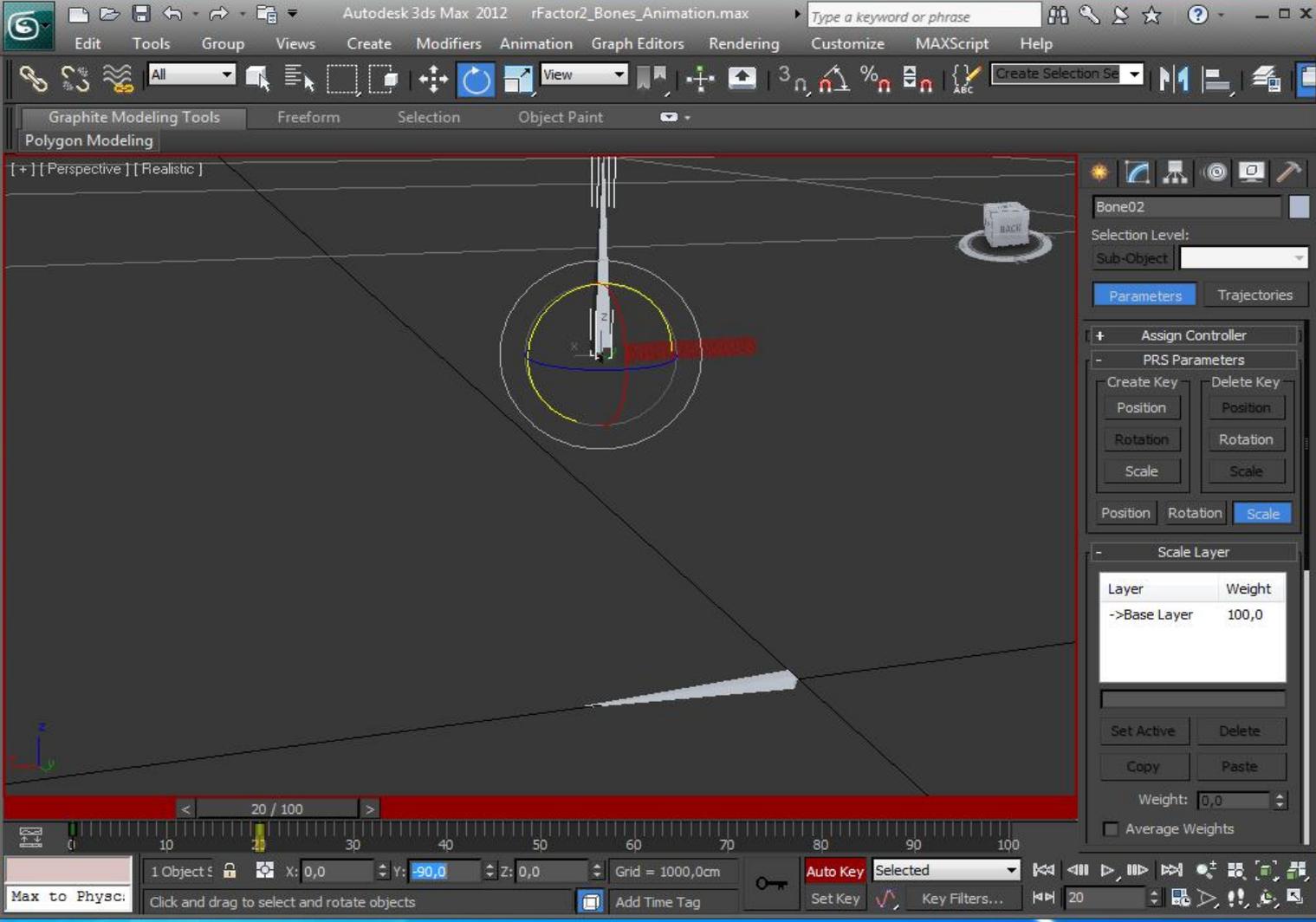
In the following i use the Auto Key Option. You can set Keys manually also.

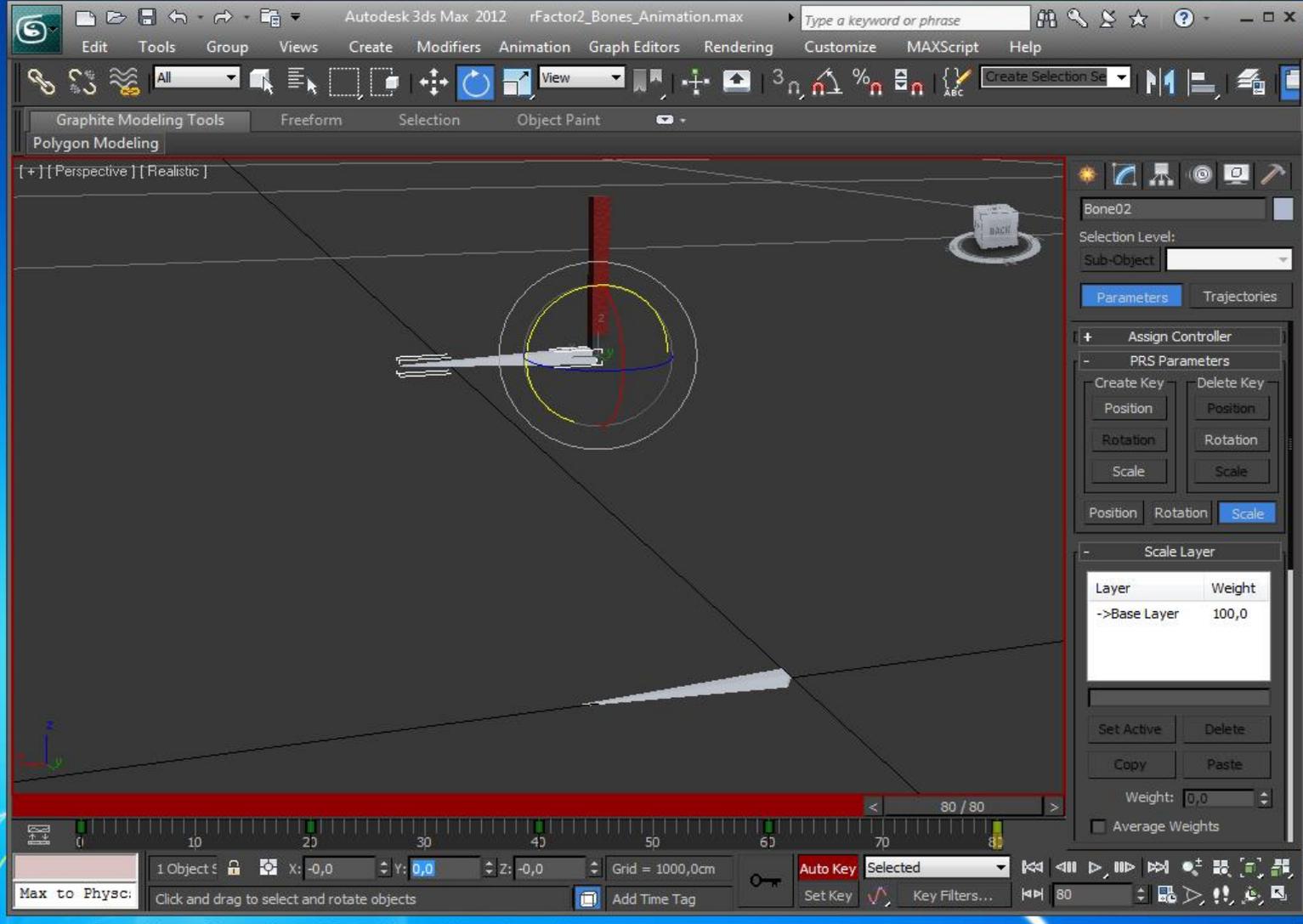
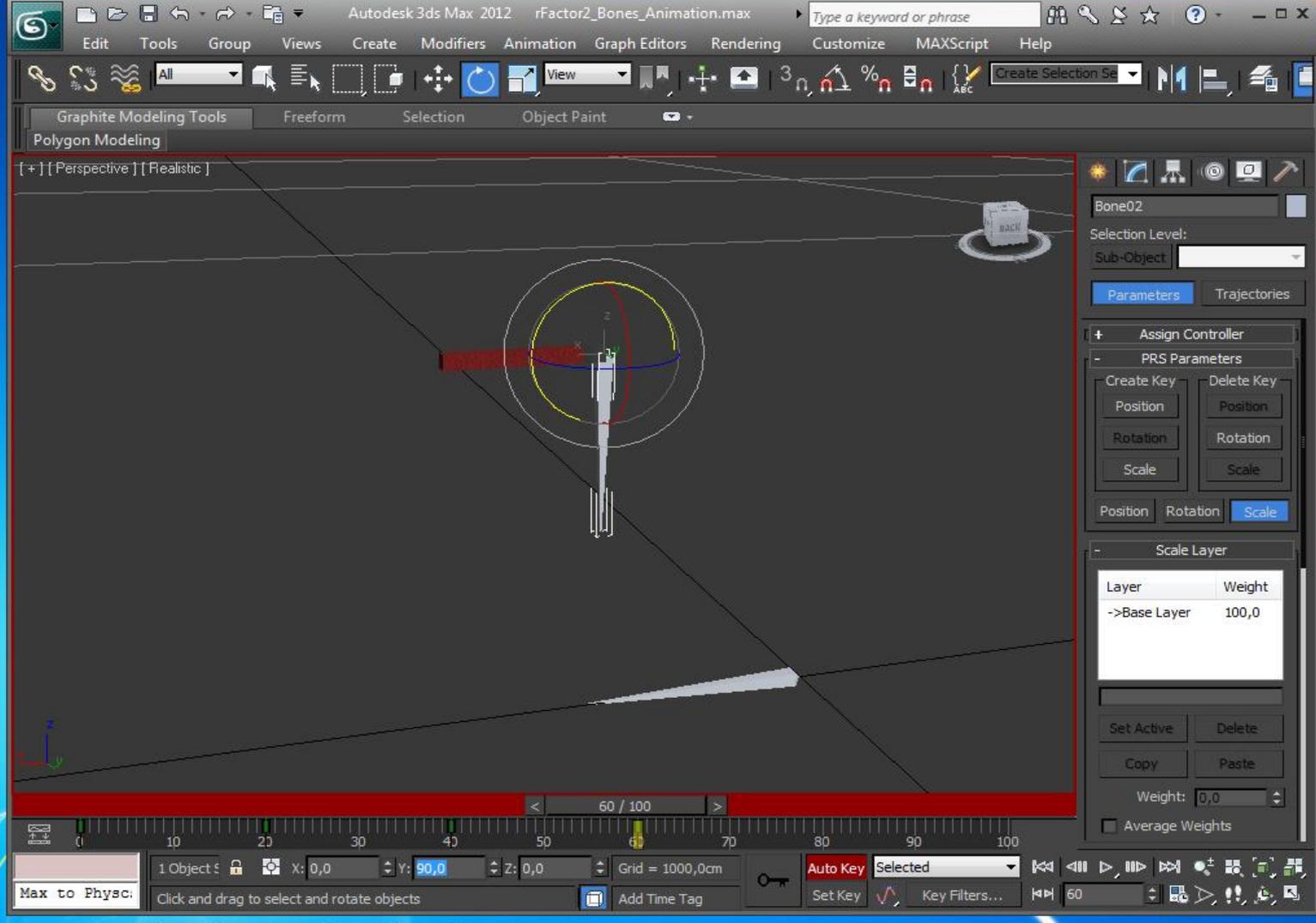
Mark/select Bone02 now and rotate the Bone to the Angles that the Wiper shall move from-to.

The Length of the Animation, affects the Speed of the Wiper in Game. For the Wiper I would use a Length of 20 Keys (in the Example i use 100 Keys, which makes the Wiper running too slow).

In the following Screenshots, you'll see what i mean, i guess. 😊





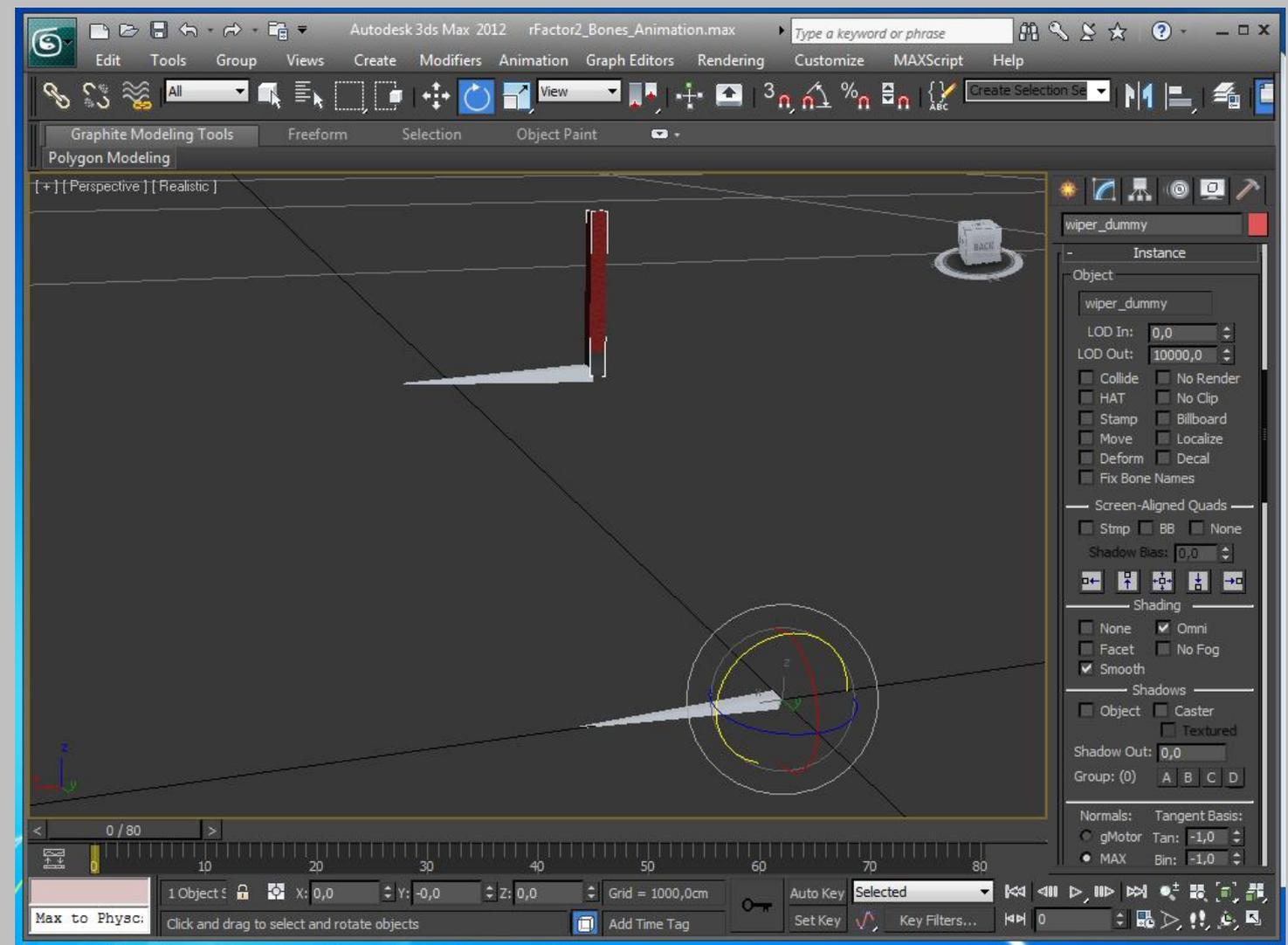


**IMPORTANT:** Because of a small rFactor 2 Bug (i guess it is a Bug), the Wiper is not at the Endposition, if the Car leaves the Garage the first Time. To get that fixed, add one more Key and make that Key the same as the Key before, that both last Keys use the same Position.

If your Work is done, play the Animation, to see how it looks. You can set the Animation longer, to add more Keys or change other things. If you are satisfied with the Result go to the next Step, the Export.

As first, mark the Mesh and check the Boxes that you like/need, in the “Instance”-Rollout.

I have checked “Smooth” and “Omni” only.



**IMPORTANT:** before you export the Mesh, scroll to the End of the “Instance” Rollout. Here you see the Field “Animation”.

Click on the Button and select the Animation File that shall be used for the Wiper.

If there is none already, create a new Textfile, name it however you want, with the File-Extension “ANM”.

E.g.: **myCar\_Wiper.ANM**

Select the File and click “Save”. The File should appear in the Animation Field now.



If that is OK, scroll up and click “Do Mesh”, to export the Mesh File.

Now comes the last Part. The export of the Animation.

Open the Rollout “Animation” and enter the Path where the Animation File shall be written into the first Field “Animation”.

In the second Field “Animation”, click the Button and select the same File that you have taken for the Mesh Export before.

In the third Field, “Animation Name:” you have to enter **WIPER.ANM**.

**IMPORTANT:** Don’t enter something different into the “Animation Name:” Field. If you don’t enter **WIPER.ANM**, the Wiper won’t work!!

In the Field “Anim Type:”, check “Selected Nodes”

As “Root Node” click the Button and select the **MESH**, not a Bone.

In the Workspace select/mark the Mesh and both Bones.

In the last Field, “Get Frames From”, check “Keyframes” and set the used Frames and if you want to Skip Frame 0

If everything is done, click “Do Anim” and the Animation File gets written.

Normally the Wiper should work now.

If you get Problems, feel free to write me a Mail to:

chris\_rf2onl@gmx.de

You can use this Tutorial for every kind of Bones based Animations.

