

fragMOTION Animation Tutorial

In the tutorial I will give a brief description how to animate a Character for 3DRAD. I am no expert in animation although I have animated many models.

First I will do a familiarization exercise in the fragMotion and controls you will use.

I am using fragMotion 0.9.1a I think the techniques used here are similar to later versions.

Chapter 1: fragMotion Tools

fragMotion has a system of tabs on the right of your computer screen, these tabs contain the Animation, Tools, Textures, Properties, Model and Skeleton. These tabs contain sets of tools you use to build and manipulate the mesh.

1. Animation: If your project has no animations it only have the default pose, you can't do anything with this, If it contains any animations then they will be all listed. They are listed in reverse order, that is the one at the bottom is number 0 in 3DRAD. You can rename the animation same as renaming any Windows file. It is best to rename using a name that represents what the animation is. You can change there position in the list by clicking on and holding the button down and dragging it to the position you want. Double click on the animation and it will open the animation Frames Editor window. I will describe how to use this when we get to animating a character.
2. Tools: This contains all the tools you will use to create a model. The top 4 are the selection tools, The next is Hide mesh tools, Create is for creating new objects in the 3d space, Transform tools are used to manipulate the mesh and bones, Mesh tools used to manipulate the mesh, Skeletal Animation used to move or rotate animation keys, Vertex Animation used to manipulate vertexes which 3DRAD doesn't support, Textures for 3D painting of textures, Camera Used to move the mesh around the screen and Info for vertex and face information.
3. Textures: Shows all the textures related to the model.
4. Properties: Select any part of the mesh like Bones, Textures or Mesh and the properties displays all the information about these components.
5. Models: Shows all the models mesh, smoothing groups, groups, textures and materials.
6. Skeleton: This displays all the bones contained in the model. You can change the position of the bones here. If you have made a mistake with your skeleton you can reposition the bone in the skeleton to where it was meant to be. But a warning this must be done long before you do any animation.

Other Tools you will use is Ctrl-Z, Ctrl-Z, Ctrl-Z, Ctrl-Z (Undo) I will explain more about these and other tools as I get further in to the tutorial.

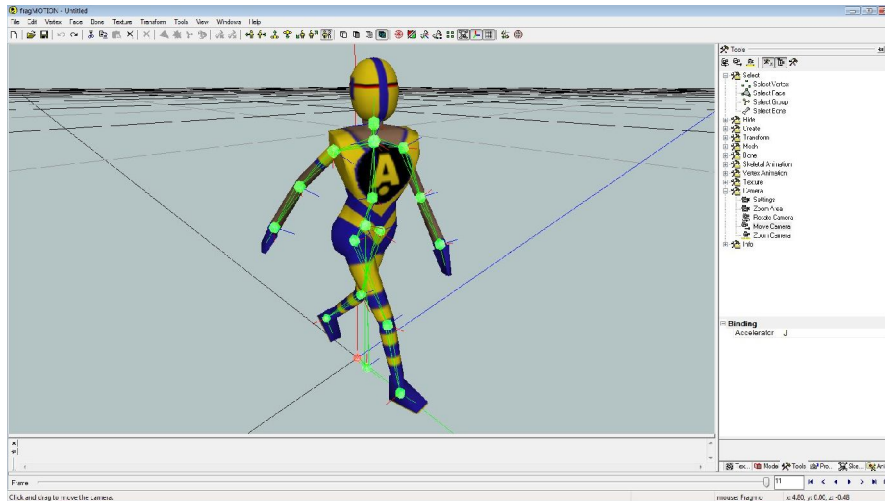
Saving your work:

I recommend to save your working file in fragMotion's default file .ugh This stores the data about the project in more detail and better format that fragMotion understands. When converted to .x the Group items are all combined into 1 Group. This makes it much harder to hide or show parts (Groups) of the mesh making selection more difficult.

Chapter 1: Exploring Andro

Load Andro mesh so you can study how the skeleton is constructed. Click the Select / Select Bones from the Tools tab. Drag the selection box around Andro to select all the bones. Study the skeleton and the way it is laid out, it starts with the root bone which is positioned at 0 x, 0y, 0z which is the model's root position. Next is the hip bone and from here it branches to the legs, up to the shoulders, head and arms. Andro's backbone has a joint around the waist line this gives it more flexible movement.

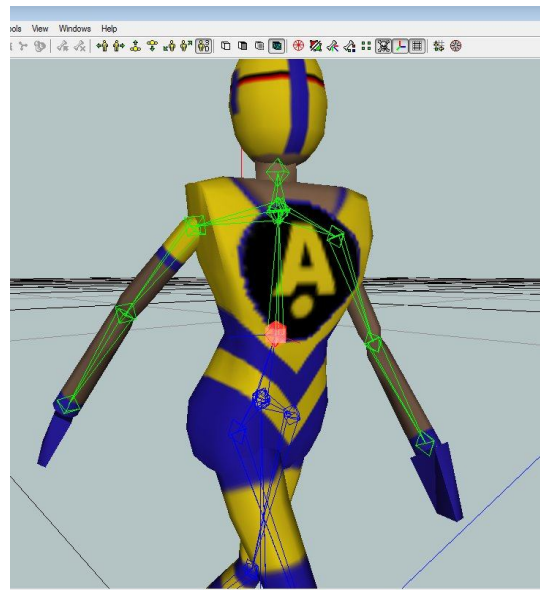
There is another bone between the root bone and the hip. This has been added to allow for better translation for the sitting animation and if you run the walk animation you will see it moves the whole skeleton up and down giving more life-like movement.



Here I have selected the waist bone and it shows the child bones connected. Try selecting other bones to see which is connected.

If you alter the waist bone in an animation you will alter all the child bones so it is important to start at the bottom when you are positioning bones or animating.

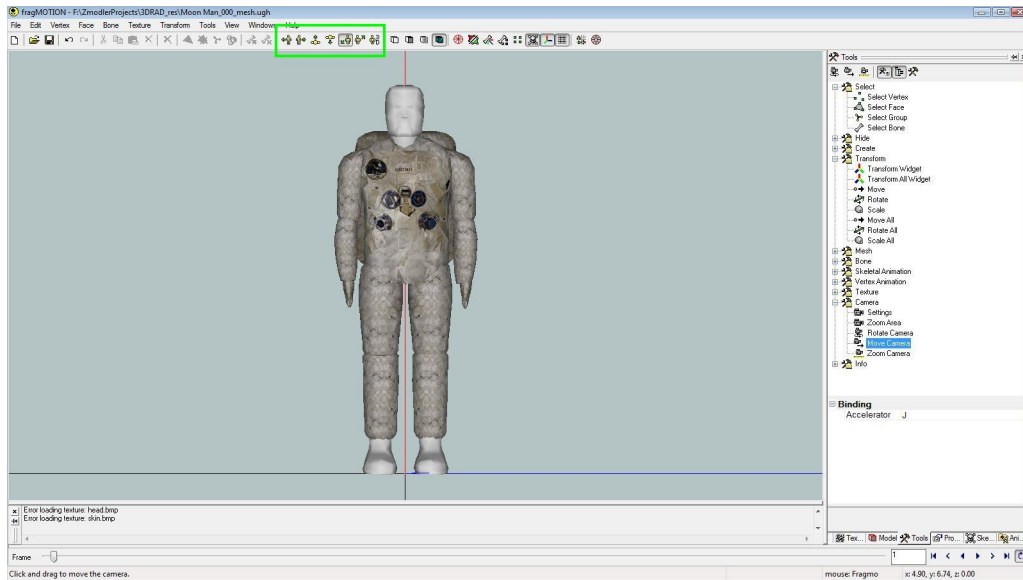
The theory behind bones animation is that each vertex that's connected to a bone will move and rotate maintaining its relative position with that bone. The animation for each bone contains that rotations and translation data that provides the relative position for those vertices. Animations are divided into frames, generally there is 24 frames per second. In 3DRAD you can adjust this time to speed up or slow animations.



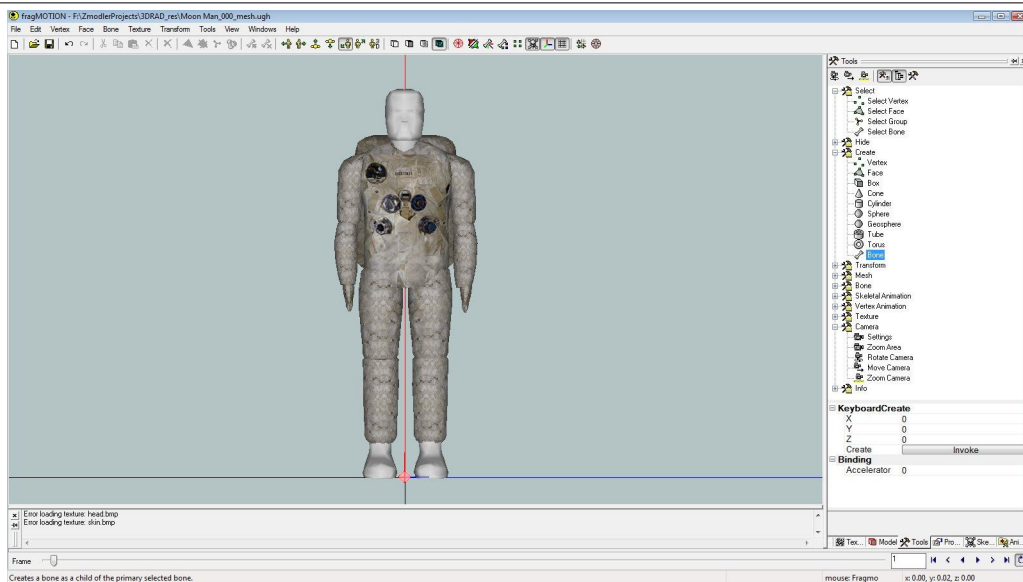
Chapter 2: Getting Started

Load the character mesh. If you are using the moon man mesh shown, it sits below the zero y position. For 3DRAD you need to move it up so hit feet are on the 0x, 0y, 0z line as shown in the picture. You must do this for all animated models.

Shown in the green box are all the window selection buttons. You will use these views to view your model from all angles. When you build the skeleton its best to start from the front view.

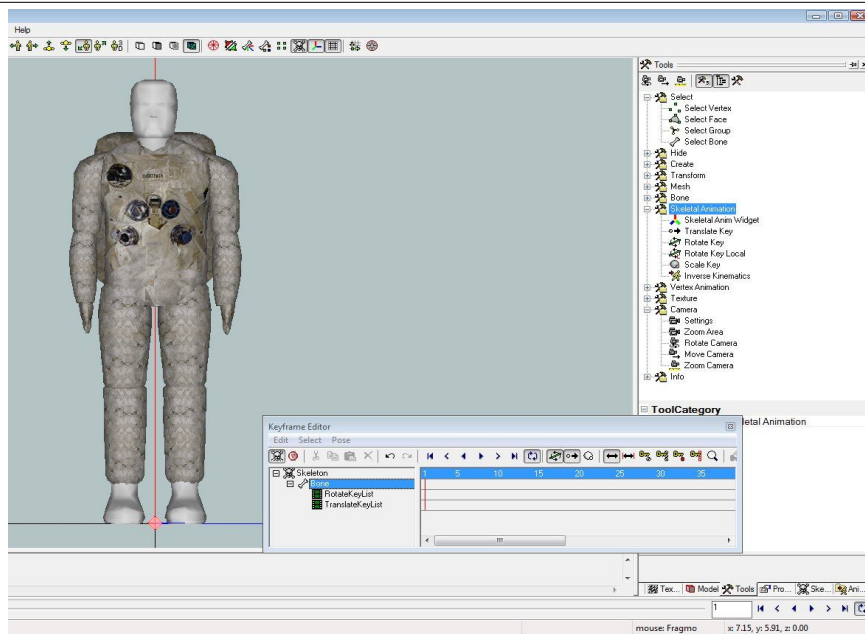


From the Tools tab select Tools / Create / Bones then click the 0,0,0 position between moon mans feet, this creates the first bone, the root bone. Next page I show how to set the 0,0,0 root position.

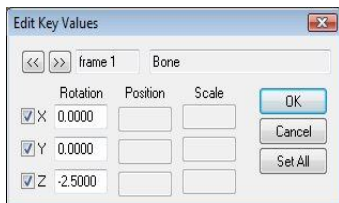


Chapter 3: Building the Skeleton

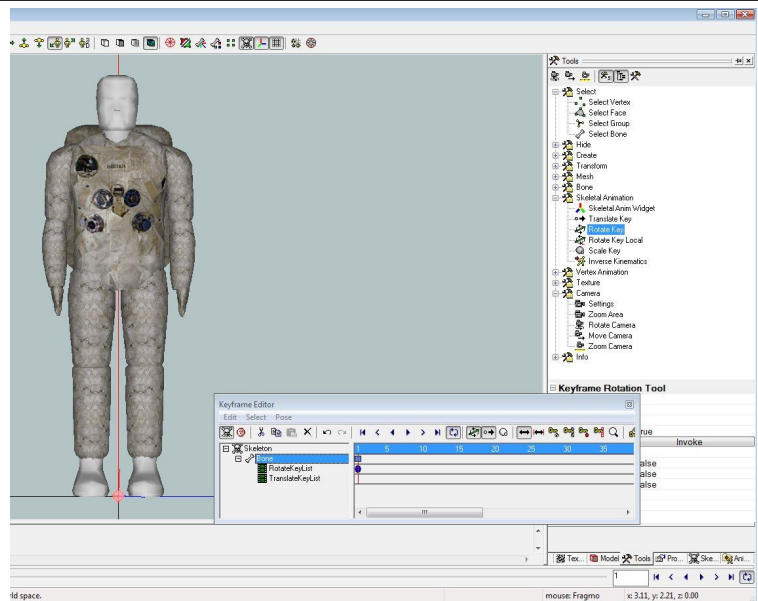
When you created the root bone you create an animation set. Click Animation tab and open the new animation set. In the animation window you can see the bone is selected. Select Skeletal / Animations / Rotate Key from the Tools tab.



Click anywhere on the screen and move the mouse a little. This will create a Keyframe for that bone. Double click on the little yellow Keyframe icon and the Keyframe dialogue will open. Change the all of the values to 0,0,0 and click OK.



If by any chance you alter the position of the Root just open this dialogue and edit it. (Continued on the next page)

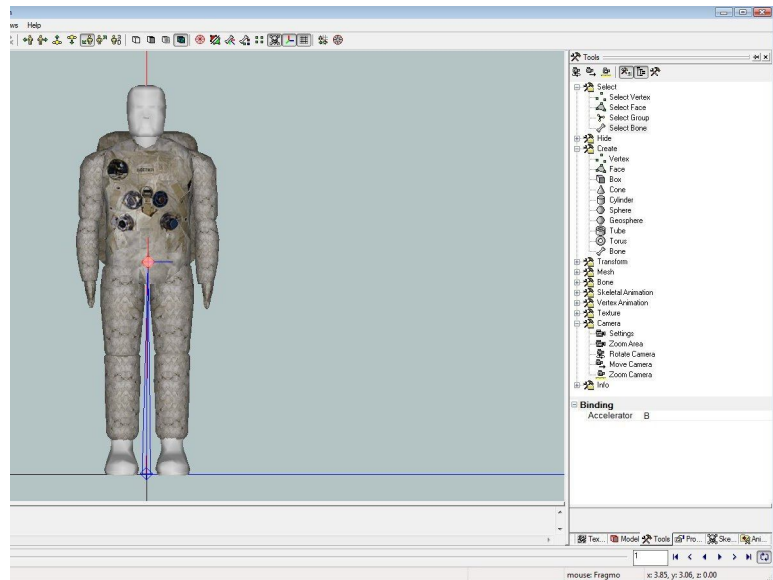


Do the same with the Translate Key. Select / Skeletal Animations / Translate Key from the Tools tab. Click anywhere on the screen and move the mouse a little. This will create a Translate Key frame for the root bone. Double click on the yellow Translate Key frame icon and the Translate frame dialogue will open. Change the all of the values to 0,0,0 and click OK. Close the animation editor for now.

Now we can continue to create all the other bones in the skeleton.

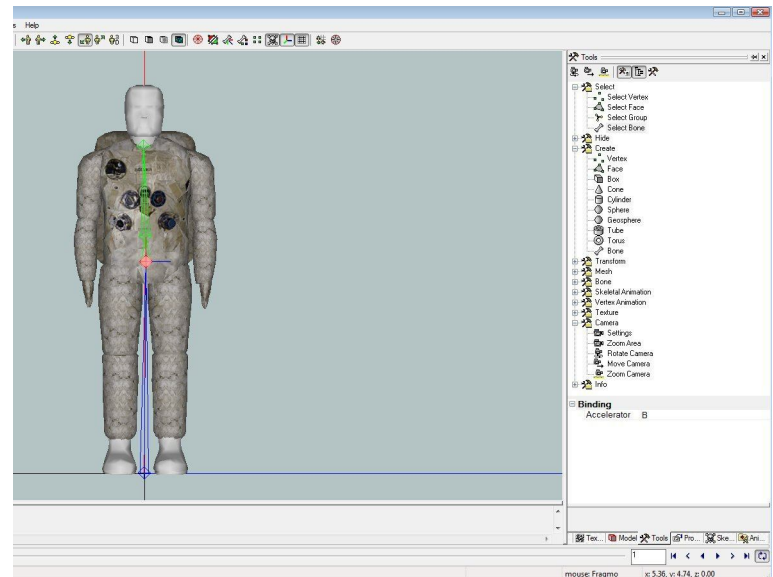
Position the next bone in the middle just above the hip joint. As you position each bone it will be highlighted. So the next bone will be a child of the previous bone.

When you create a bone from the front you place it in the x and y position so the z axis is always at 0. So most bones z position must be changed. You can do that now but I have chosen to show how to create all the skeleton first then correct there z positions after.



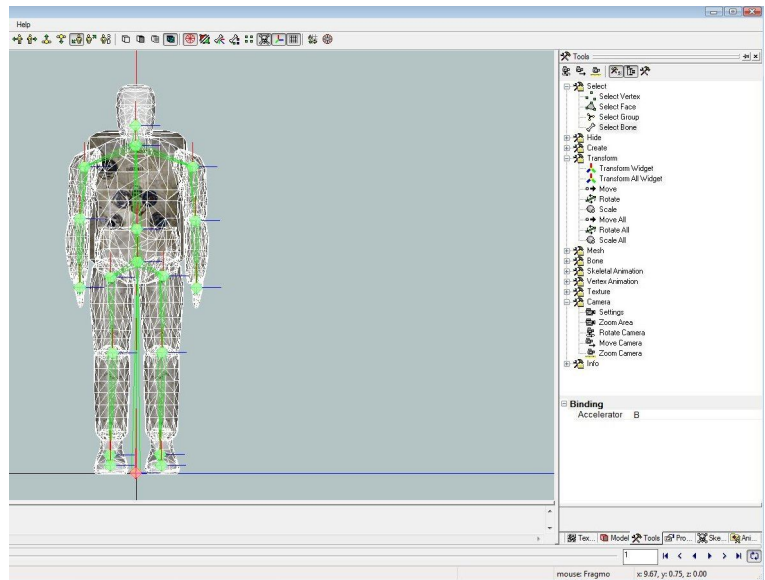
Then create the next and the next at this point there is no science about it. You can move them later before you animate them if it is required.

In this image the lower back bone is highlighted so we can create the upper back and neck bones.



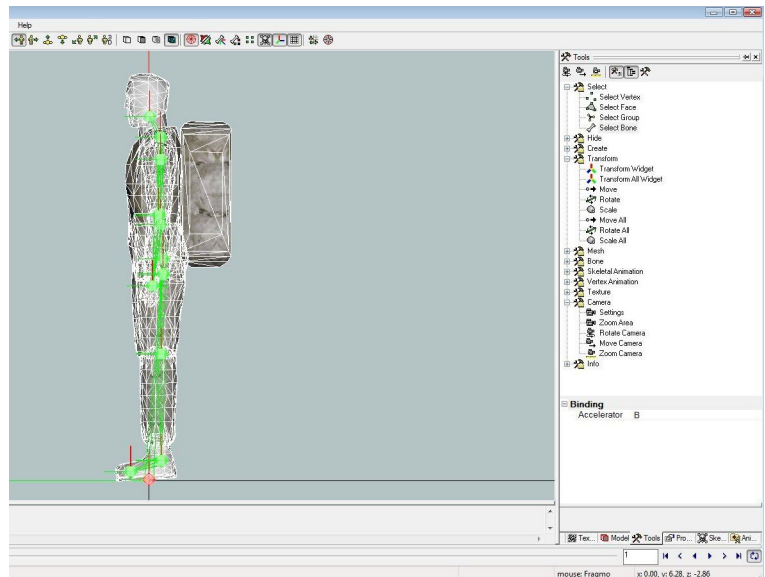
Start at the bottom remember if you move a bone the child bone will also be affected. So you work up through the skeleton making sure they are aligned as you want.

This view from the front shows all the bones in the right position.



Next change the View to a Side view and do the same correcting from the root up through the skeleton.

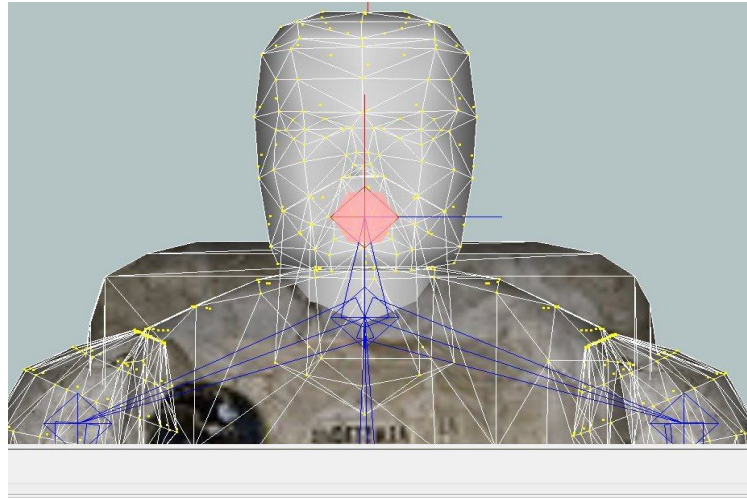
Now the Bones have all been placed in there right position we can move to the next step linking the vertexes to the right bone.



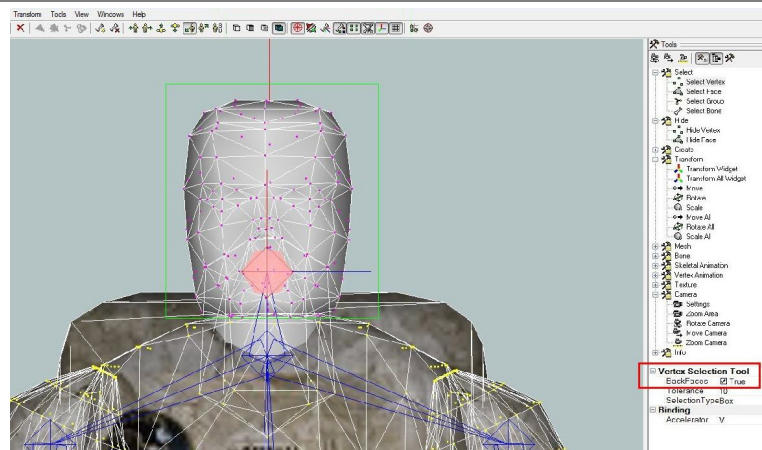
Chapter 4: Linking the Vertexes

Next we must link the vertexes to the bone.

We will start at the head. First select the head bone. Using Select / Bones from the Tool tab.



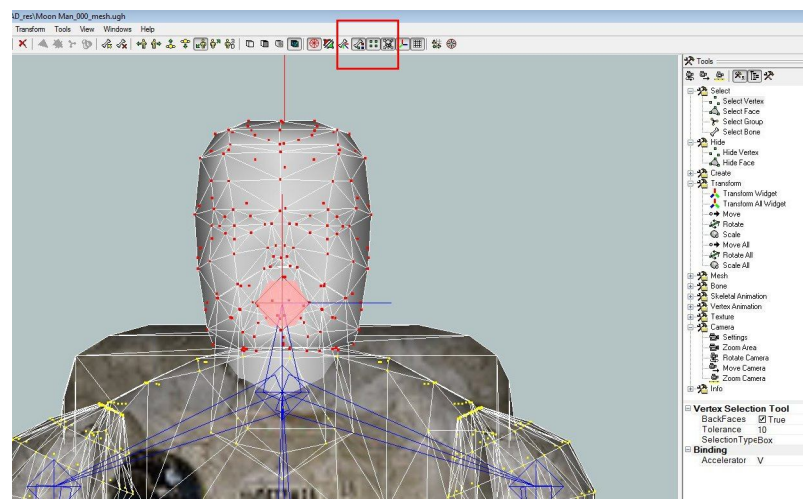
Next change to the Select / Vertex tool from the Tools tab. Check the BackFaces box is ticked and True. (shown in red outline box lower right of this picture). This allows fragMotion to select all Vertex points within the selection area. Otherwise it only selects the visible vertex. As you will see this system can have its bad moments because it will select other vertex you don't want selected. To check go to the 3D view and you may find others selected. Complex selection can be handled a little different, we will discuss them in the next section.



Next I will show how to link them to the Bones.

To link the vertex to the bone you press Ctrl / B and that's it, done. Not very complex.

I will now discuss some of the buttons seen in the above menu (shown in red box above) first and second button do the same, show or hide the connection between the Vertex and the Bone. The vertex is displayed as a red point or a red line between vertex and bone.

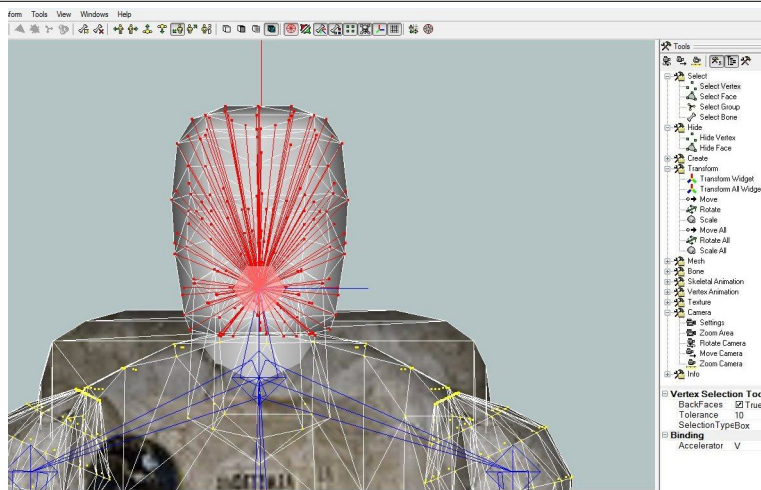


This can help to show rogue vertex that should not be connected to the bone, more on this later. Third button displays or hides all the vertex points (yellow) and Fourth shows or hides the bones (blue).

This picture shows the linked line between the vertex and the selected bone. (button 1 in the red box shown the picture above)

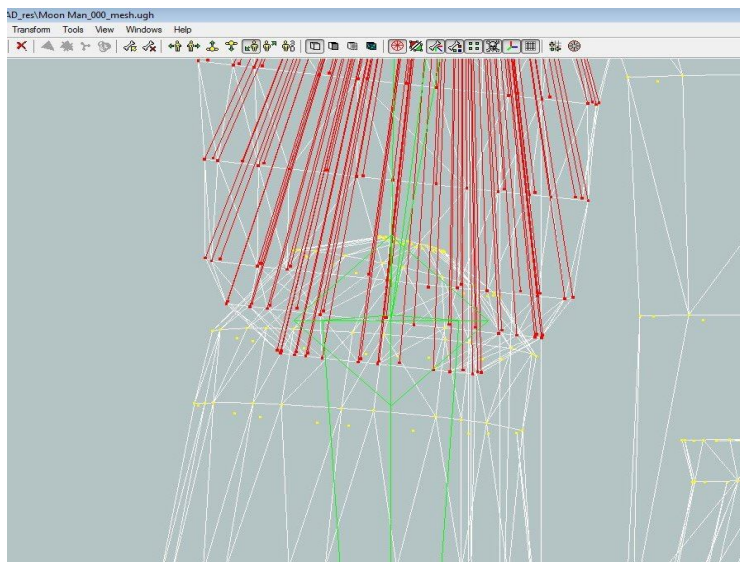
These lines can make it more obvious if there are any rogue linked vertex. Now to unlink these rogue vertex you use the Select / Select Vertex from the Tools tab.

First click anywhere on 3d window this will un-select all vertex points.



Next select one or all rogue vertex then press Ctrl / Shift / B this will un-assign those vertex. You can link or unlink 1, 2, 3 or 100 Vertex at one time there is no need to get them all in one go.

This picture shows one of the complex areas you will have to deal with. This is the arm shown at the elbow, it consist of 2 parts, the upper and lower. For good animation you must connect the vertex from the upper arm to the shoulder bone and the lower to the elbow bone. You may have to pick only one vertex at a time or 1 row if possible. As you can see from the picture the vertex cross over making selection a nightmare. Also there can be vertex behind the arm in this case the back pack the astronaut is carrying.



To do this can test your patience but doing it the right way gives the best results. If you design and build your own models it would be a good thing to consider these things. For example you will see a lot of character mesh with their arms straight out to their sides. This makes it much easier to select. I don't think its necessary to explain how to do each bone so I will go to Animation as each mesh have their own characteristics.

If the mesh is divided into separate Groups you can hide or show them in the Model tab. Just right on the Group you want to Hide or Show.

Chapter 5: Animating the mesh

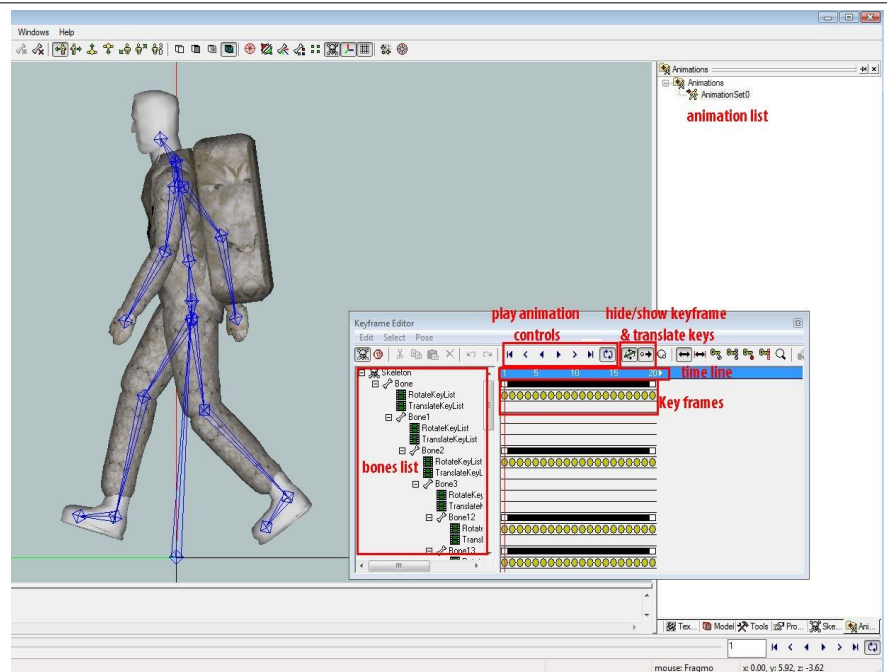
If you look at the first picture below you will see 1 key for every animation frame in the time line of 20, that translates to 400 key frames for this skeleton with 20 bones. Now if you look at it that way you have an enormous job ahead of you. Well with fragMotion that's not necessary, although you need all those Key Frames you don't have to animate each one, fragMotion takes care of that for you. What we do is divide each animation in to 3 Start, Middle and End. In this example Start is at zero, Middle is at 5 and end is at 10. Now you say 'but we have 20 frames', yes but a walk animation consist of 2 sections, Right step forward then Left step forward. Also the start and end animation will be the same. Frame 10 is between right step and left step so in total we only have to animate 4 frames. fragMotion will calculate all the frames positions between the frames you animate, for example when you play an animation the frames 2-3-4 will be calculated for a smooth transition between frame 1 and 5. During the export process to .x file the frames are fill. I will explain more about export when we finish Animation.

I start with the legs first then the arms and last the head and shoulders. Ah big mistake because the arms are child bones to the shoulders so it is necessary to animate them before the arms and head.

Again I will not show how to do each limb of the character that's up to you but the processes are the same.

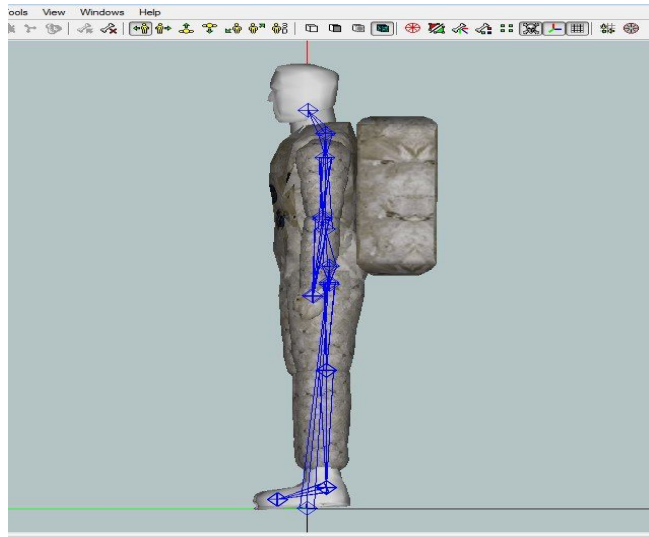
First we must start with an explanation of tools you will use.

Open the Animation tab and double click on the animation. It should look similar to the picture here without all of the animation key frames. To view the animations you use Animation controls, these are basic play animation controls. Translate keys can be shown or hidden using these buttons. Key frames contain all the animation rotations and translate information. Double click on any one of these yellow icons and the properties dialogue will open. Bones list is the complete list in parent child order. I will explain more about each one during the rest of the animation tutorial. Each bone can be renamed for easier identification if you want.



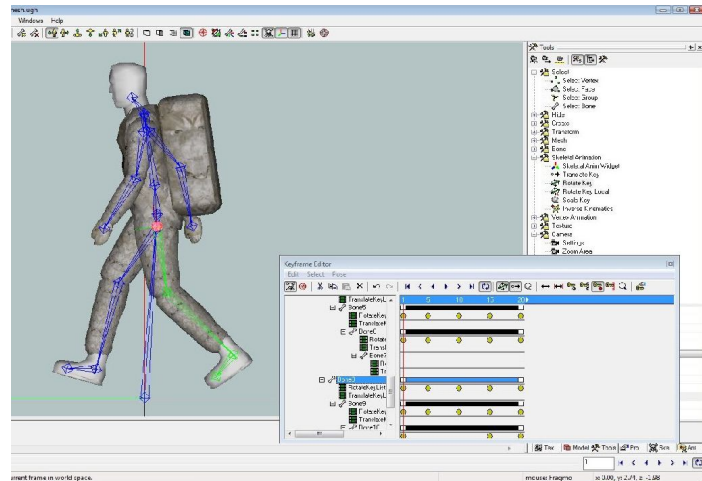
I am giving a more brief description now because you must have a better idea about tool selection now.

As I said in early chapters you must start at the bottom and work up. So we will deal with the backbone first. In a walk animation the character like this one carrying a load will lean forward more than normal so select the bone at his waist. Then select from the Tools tab Skeletal Animation / Rotate Key. Click on the 3D area and you will see your character bend in the middle. That's the basic of animations adjusting the key rotations.



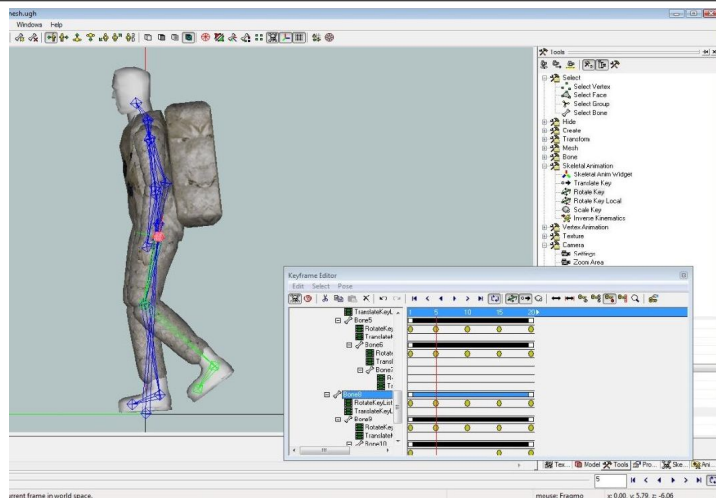
When animating you must consider the characters physical shape size and strength. The moon man in his bulky suit would not be able to walk the same as normal.

To animate click on the time line at 1 then select the right hip bone then rotate the upper leg clockwise then select the knee and rotate it anti clockwise. Select the left hip and rotate the hip and knee joint to position the left leg. If you studied Andro you could see the foot also needs a little rotation. You can change it now or later.



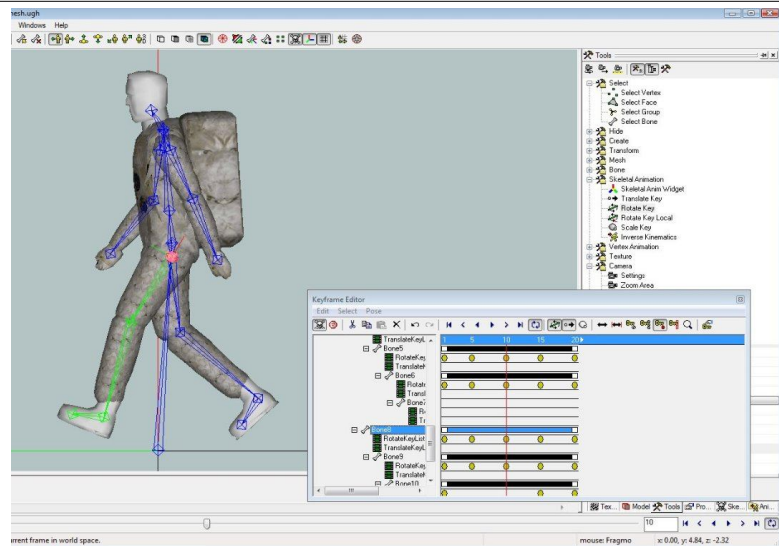
When happy with the position click 5 on the time line. Set the midway position of the leg. Remember to start at the hip and the knee next.

You may have noticed when you select a bone, the bone in the Bone List is also selected. To speed up your work process you can click on it instead of the bone in the mesh. The bone are in order so if the hip is selected the knee next and then foot. This makes it easy to change especially for small adjustments.

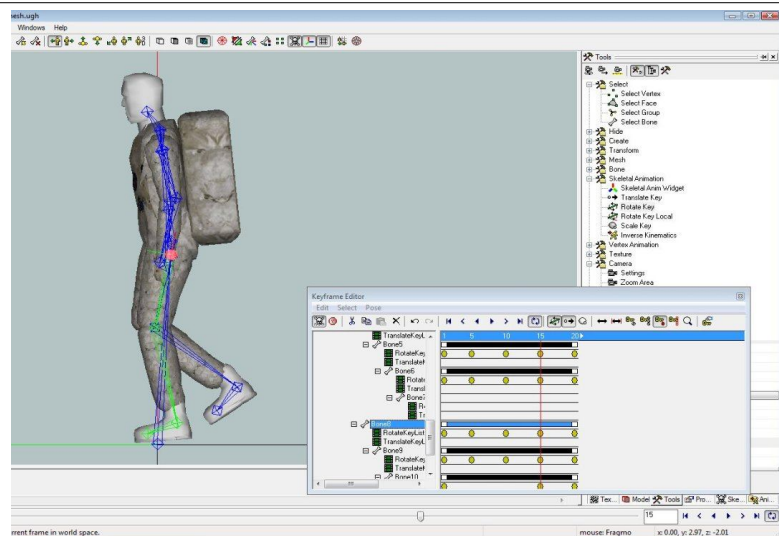


Select 10 on the Time Line and then go through the rotations setting the left leg all the way back and the right forward.

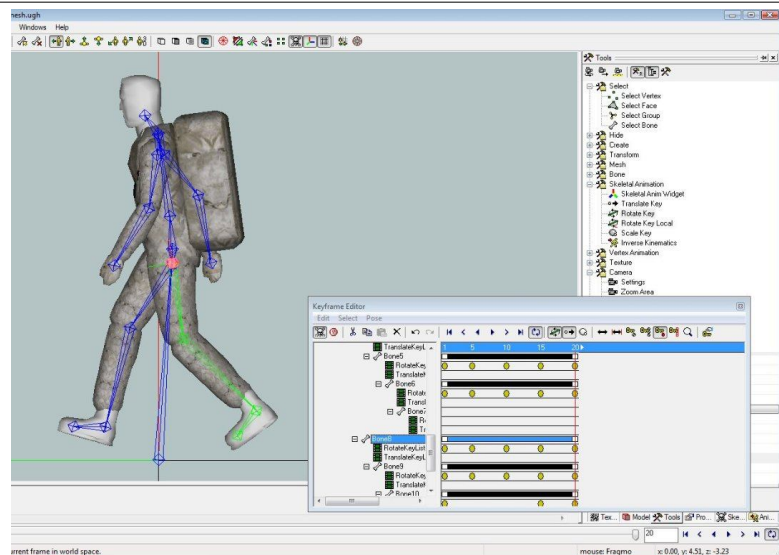
After you have finished you are halfway through the leg animations.



Set the Time Line to 15 rotate the joints into position doing the same you done in other animations. If you look at the leg position at 5 this position is the reverse in 15.



To complete the sequence the last animation is the same as the first. The best way is to copy the start animation at 1 and paste it in the last frame on the time line. Right click the 1 on the Time Line, this highlights all the first column. Open the Edit menu click Copy then open Edit menu again and click Paste. A column of green icons will appear in the first row, place the mouse cursor over the column of icons and the cursor will turn into a hand cursor. Slide the row of green icons to the last column. That completes the last column.

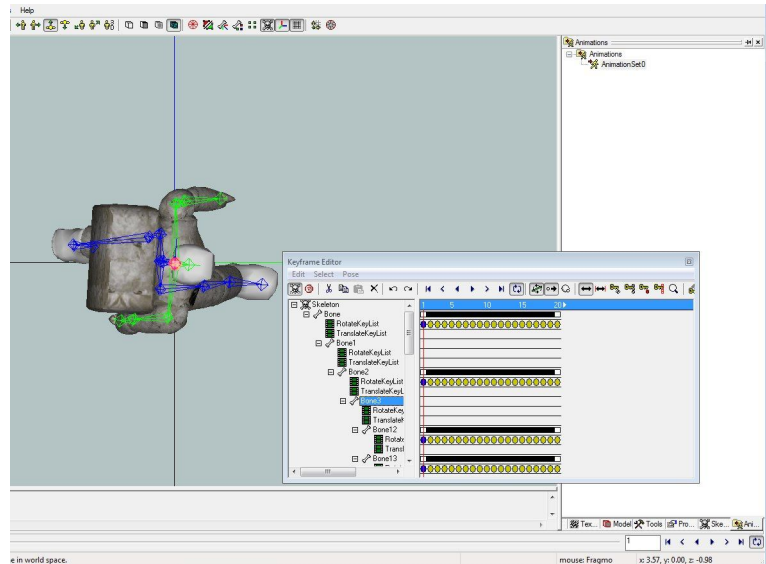


Test the animation by selecting the play the Play/Animation/Controls.

Follow these instructions to animate the arms, it is basically the same process, starting at the shoulder bone. Do the same for the last frame as above, you will also copy the leg animations but that no problem.

Another animation is the shoulder rotation when the arms swing back and forward the shoulders move. Change to the Top View and select the neck bone. Select 1 on the time line rotate the shoulders (right leg forward - left shoulder forward) next select 5 on the time line rotate shoulders to equal. Next set 10 on the time line and rotate shoulders opposite to the first.

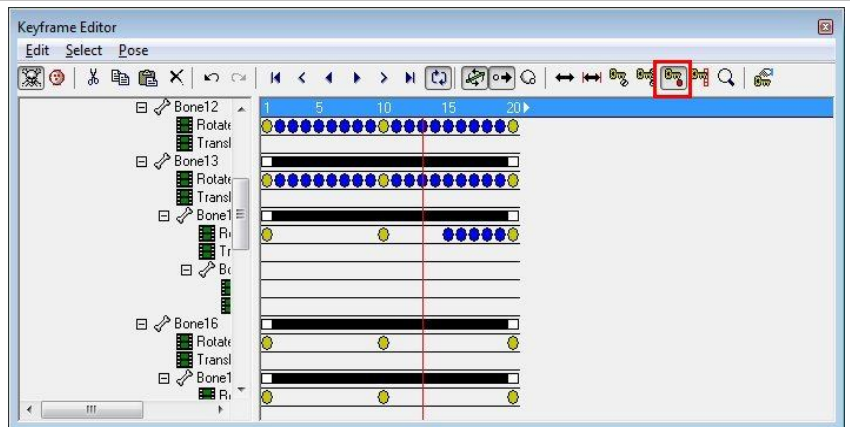
If you change anything on the first row you must copy it to the last row and last row to the first. If you don't it may cause a flicker in the animation.



Animations like walk, run and idle animations are continuous animations. For smooth animation the first and last animation should be the same. Making the first animation the same as the last it looks smoother when it restarts the animation.

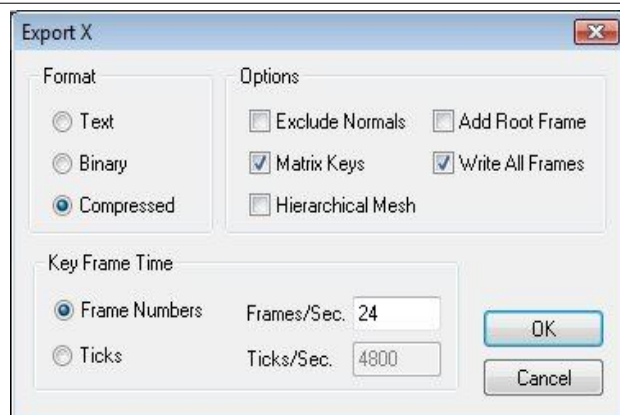
If you do one time animations like fall, jump etc. I have found it is best to copy and paste the last column of the animation at least 5 times on the time line. This gives a constant still animation at the end and makes it easier to control 3DRAD. Also Start and End animations don't have to be the same.

All the empty cells can be filled if you have the time to do so. I only usually do the first 3-4 rows. Other times I have not done this the animations went wild. I think what went wrong was when I exported to .x file it didn't copy the empty rows. So now I fill the top 3-4 rows. To do this click the button highlighted in red. Then click the empty cells. This fills them with the data needed for the animations and forces fragMotion to calculate the rest.



To export your file to .x open Export from the File menu. Select from the drop down menu at the bottom .x file format. The picture next shows the options to select, press OK and the file saved.

If the root bone has been positioned correctly as I described earlier then there is no need to select AddRootBone. In the past I never set the position of the root bone and the exported mesh didn't always work. So selecting the root bone in the dialogue would fix it but now if I set it to 0,0,0 in the Rotation and Translation dialogue it will run every time.



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