

I. Character Building - Deformation frames are applied to skeleton joints. They generate clusters of CVs around skeleton joints that control the way the surface of your model deforms.

A. Method

1. Select a joint that you will use to apply deformation controls to the surrounding geometry.
2. Window -> Deformation Cntrl
3. Set the attributes you wish to apply in the Deformation Cntrl dialog.
4. Frame Control -> Set Attribute. Select Go after any further changes.
5. Frame Control -> Attach. Then select the geometry you wish to deform using the attributes on the selected joint.

B. Snafus

1. Skeletons should already have all limits, constraints, and IK Handles properly set.
2. Surfaces should be built with further joint deformations in mind.
3. Character Builder deformation frames are applied to who your geometry as a whole.
 - a. If you wish to have two different bulge types on a limb, you should build two separate portions of the arm.
 - b. Then apply Character Builder deformation frames to the joints for each segment respectively.
4. Attach the deformation frame only to the joints that you want. Set your hierarchy accordingly. Issues may arise from attaching several deformation frames to a joint.
5. Be aware that blend surfaces are dependent on construction history.
 - a. Construction history is removed when you attach deformation controls to a surface.
 - b. Perform blends after you attach deformation frames and the rest of the geometry to your skeleton.
6. When animating the skeletons, turn blend surfaces off.

C. Particulars of the Deformation Cntrl window

1. Frame Control - This button has tools to apply and remove deformation frames to joints/geometry.
 - a. Attach - Attaches the specified deformation frame type to the geometry.
 - b. Detach -
 - i. Detaches any deformation frame type from the selected joint(s).
 - ii. When detaching a frame from a model, the frame is retained, but all associated deformation clusters are deleted, including bulging clusters.
 - c. Collapse - detaches a deformation frame from a model and collapses all of the transformations defined by the frame to the attached model.

NOTE: The following Frame Controls are only available for Skeleton and Character Builder.

- d. Modify - Modifies the way CVs on a frame are currently attached.

- i. Convenient for changing options in the Deformation Cntrl window.
 - ii. Same as detaching the deformation frame and then attaching the new frame.
 - e. Set Attributes - Store the currently displayed character joint and bulging attributes on a picked joint.
 - f. Load Attributes - Updates the Deformation Cntrl window with the attributes of the currently selected joint.
 - g. Remove Attributes - Removes any and all previously set attributes to the selected joint.
- 2. Frame Type: Specify the frame type you will use for deformation.
 - a. Curve - A curve is used to generate the deformation frame. Manipulation of the curve manipulates the attached surface.
 - b. Axis - The local axes of the object are used to deform the surface based.
 - c. Skeleton - The skeleton and it's joints are used as the frame for deformation.
 - d. Character Builder - The skeleton and it's joints are used in conjunction with bulging properties to deform the surface.
- 3. Frame Parameter -
 - a. Hierarchy Depth - Determines the scope when attaching the deformation frame to the geometry.
 - i. Limiting the scope of frame attachment is a wise idea.
 - ii. Applying different bulge types to individual joints offers more variety and reality in your models.
 - b. Bulging - Toggle this on for bending and bulging properties around joints and along bones.
- 4. Joint Attributes - Where you define the region around the skeleton joint where the bending and tucking occur.
 - a. The CVs clustered under the joint are ramped according to the chosen interpolation between the upper and lower bound, creating the tucking/bending effect at the joint.
 - b. Upper Bound -
 - i. Defines a percentage along the bone from the current joint to it's parent joint.
 - ii. CVs at the upper bound receive 0% of the transformation. The full effects of the upper bone.
 - c. Lower Bound -
 - i. Defines a percentage along the bone from the current joint to it's child joint.
 - ii. CVs at the lower bound receive 100% of the transformation. The full effects of the lower bone.
 - d. Interpolation - Refers to how the percentage effects are ramped among the CVs clustered under the joint.
- 5. Bulging Attributes - Where you set attributes for the bulging properties of surfaces along the bones in your skeleton.
 - a. Bulge Type - Determines the bulge type.
 - 1. List of available bulge types are kept in misc_data in your project directory.

2. They are project related.
- b. Scale Factor - Determines the scale of the bulging, larger is more exaggerated.
- c. Zero Degree Section -
 - i. tells you which direction around the bone represents 0 degrees.
 - ii. The way you specify which slice along the bone will receive the bulge profile.
- d. Section Placement - Determines where the clusters are attached.
- e. Relate To - Determines what the joint is related to.
 - i. Lower Joint - Relates the bulge to transformations on the lower joint. (Used for an upper arm, or thigh.)
 - ii. Other Node - e to transformations on any existing dag node in the SBD window.
- f. Relate Transform - Specify which transformations on the related joint/node cause the bulging.
- g. Transform Range - Determines the valid range for transformation from the initial state. (A value of 90 would mean that bulging would occur when the value of the transform was between it's initial position and the initial position +90.)
- h. Bulge Definition Lister - A way to add and delete bulge types from your project.
- i. Bulge Section Editor - a looking down the barrel of a gun view of the bone you are applying bulging properties to.
 - i. Angle Selectors - A small circle off a line connected to the circular icon of a bone.
 1. Used to show bulging positions along the bone.
 2. Use Add to add more selectors - increases the detail in the bulge.
 3. Delete any extraneous Angle selectors.
 4. Red Arrow - used to indicate which bulge section is viewed in the section editor.
 - ii. Section Editor - A profile of the bone, displaying the bulge curve as it appears on the bone at the angle selected.
 1. Add more keypoints for finer detail in the profile curve.
 2. Delete keypoints that don't really give you anything.
 3. Position the keypoints so the profile curve reflects the bulge position at all percentages of the bulging transformation.
 4. NOTE: there are two types of keypoints.
 - a. The x keypoint changes the overall shape of the bulge.
 - b. The o keypoint effects the placement of clusters along the bone.

- Spring 1999