



Pic B: Skeleton Nomenclature: Body

Pic A: FBX Import Dialog and Link Display

Sec 6: Facial Expression Keys

Pic A: Facial Expression Key-frame Listing
Pic B: Viseme Guide
Pic C: 3DXchange Expression Editor

Sec 7: Export Settings

Pic A: Example Material Settings
Pic B: FBX Export Settings

Application Settings

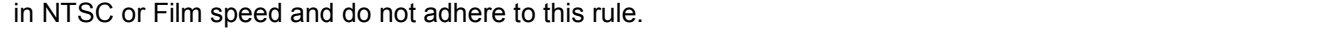
ton setup utilizing FBX as a bridge format for
ch to bone count can still utilize the full range of
cial animation system.

Work Flow

```
graph LR; iClone[iClone] --> 3DXChange[3DXChange]; iClone --- FH1[Foot/Hand Contact]; 3DXChange --- FH2[Foot/Hand Contact]
```

[Skin Data](#) [Normals Settings](#) [Apply Persona](#)

This white paper will use 3DS Max as an example 3D application with the latest versions of 3DXChange



G-5 low poly skeleton can be flexibly incorporated into any character creation process. A G5 game skeleton can auto-convert to an iClone compatible rig in 3DXchange saving the user a lot of time. To make that

Game_Root	Game_LeftHand	Game_RightHand	Game_Head
Game_Hips	Game_LeftHandIndex1	Game_RightHandIndex1	Game_BrowInnerL

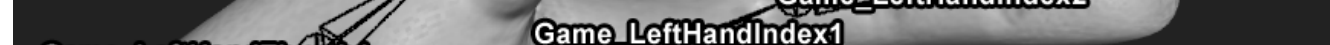
Game_RightUpLeg Game_LeftHandMiddle3 Game_RightHandMiddle3 Game_Cheek8

Game_Spine1 Game_LeftHandRing2 Game_RightHandRing2 Game_LipLowerR



Game_RightForeArm Game_RightShoulder

Game_Spine2



Game_LeftHandRing1 Game_LeftHandRings



FBX skeleton import are: file content to "Add", uncheck the Animation option and set Bone conversion to "Leave

Adds content to the scene.

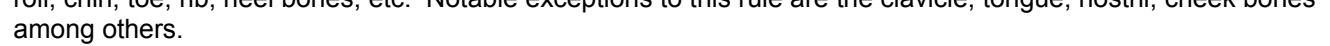
Shaded: ☐ Object Color ☒ Material Color



+ Fin Adjustment Tools



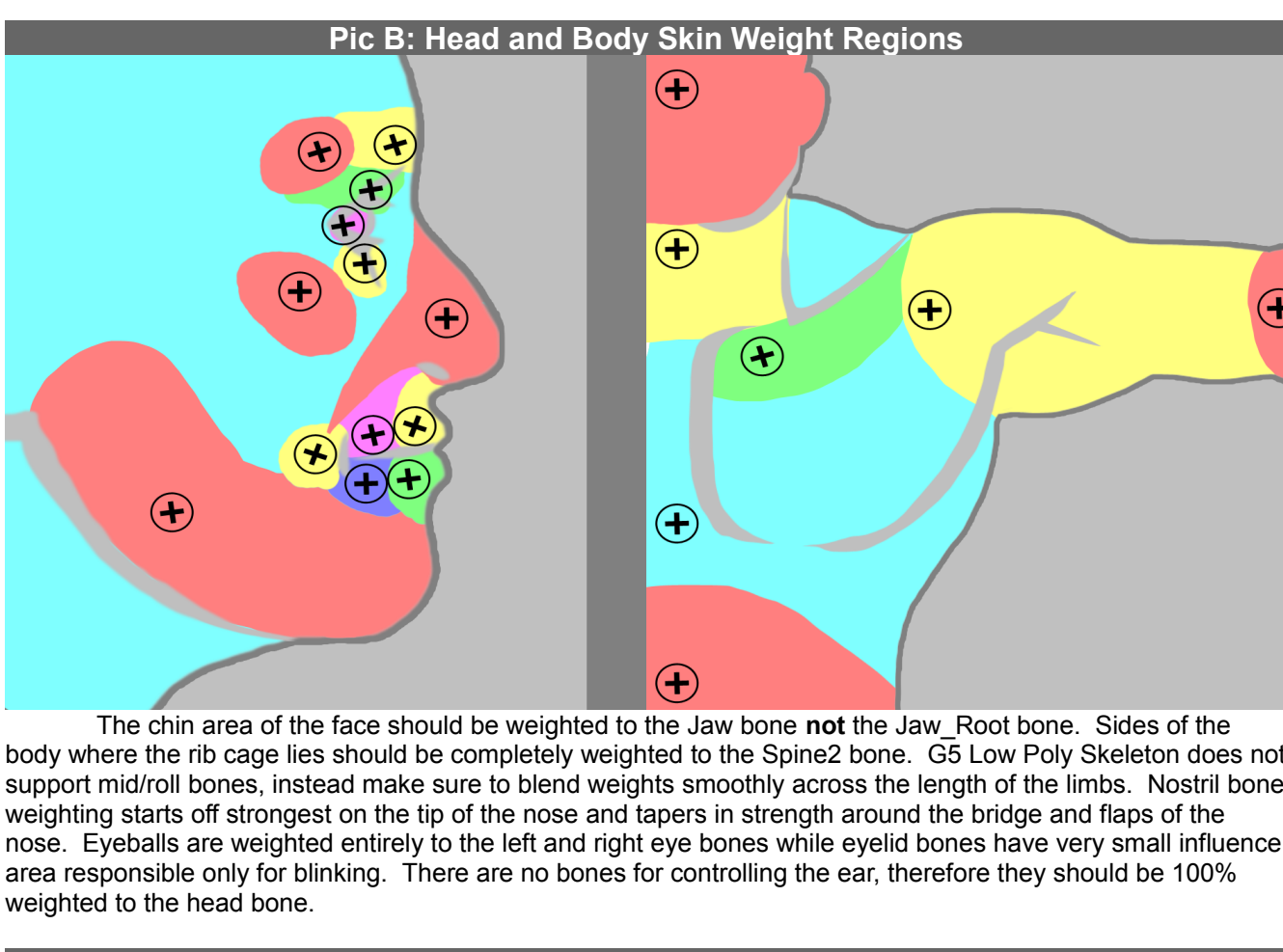
inversion. Example areas that are prone to this mistake are the hips and legs, fingers and wrists. If one does



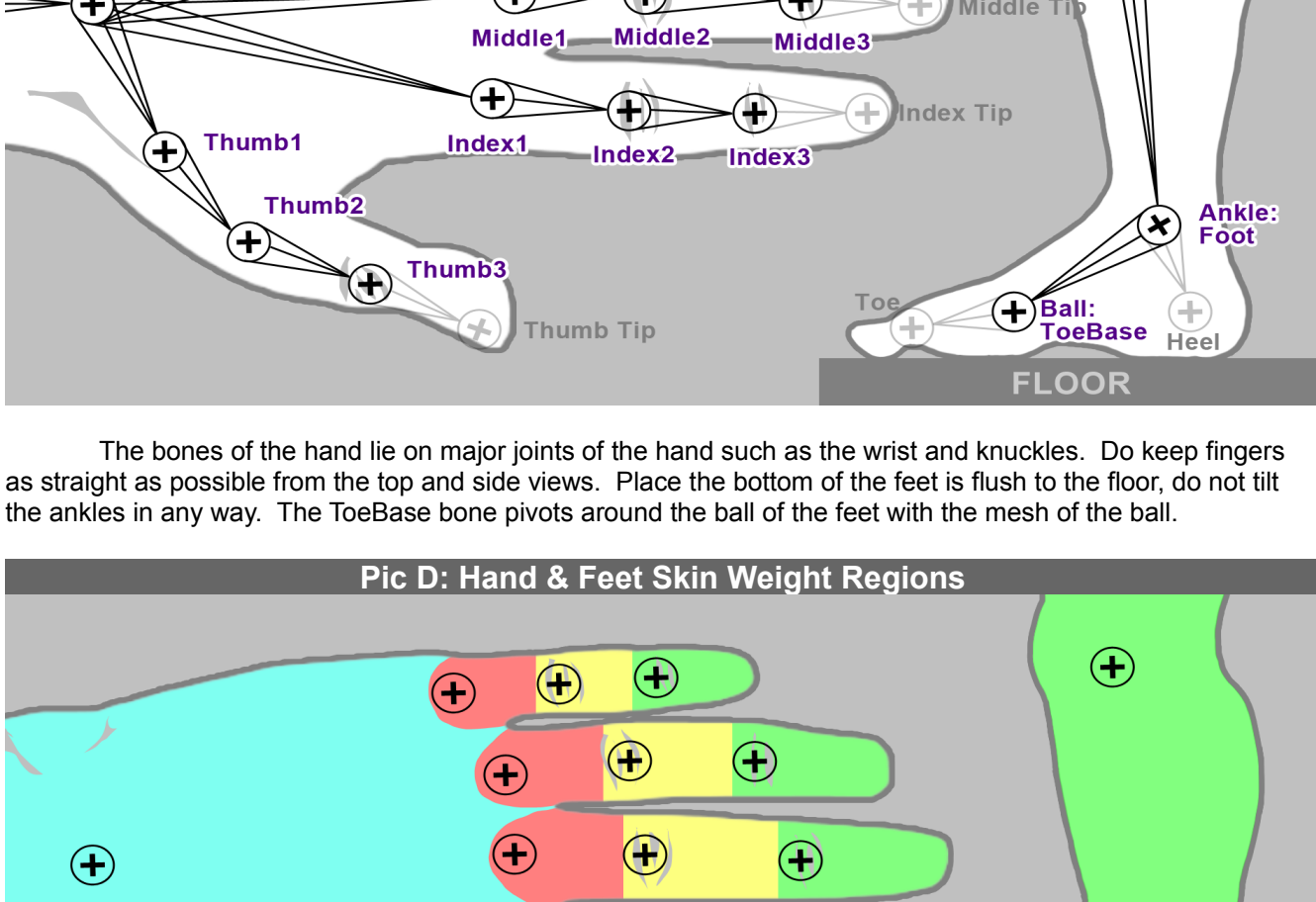
Browinner

Elbow:

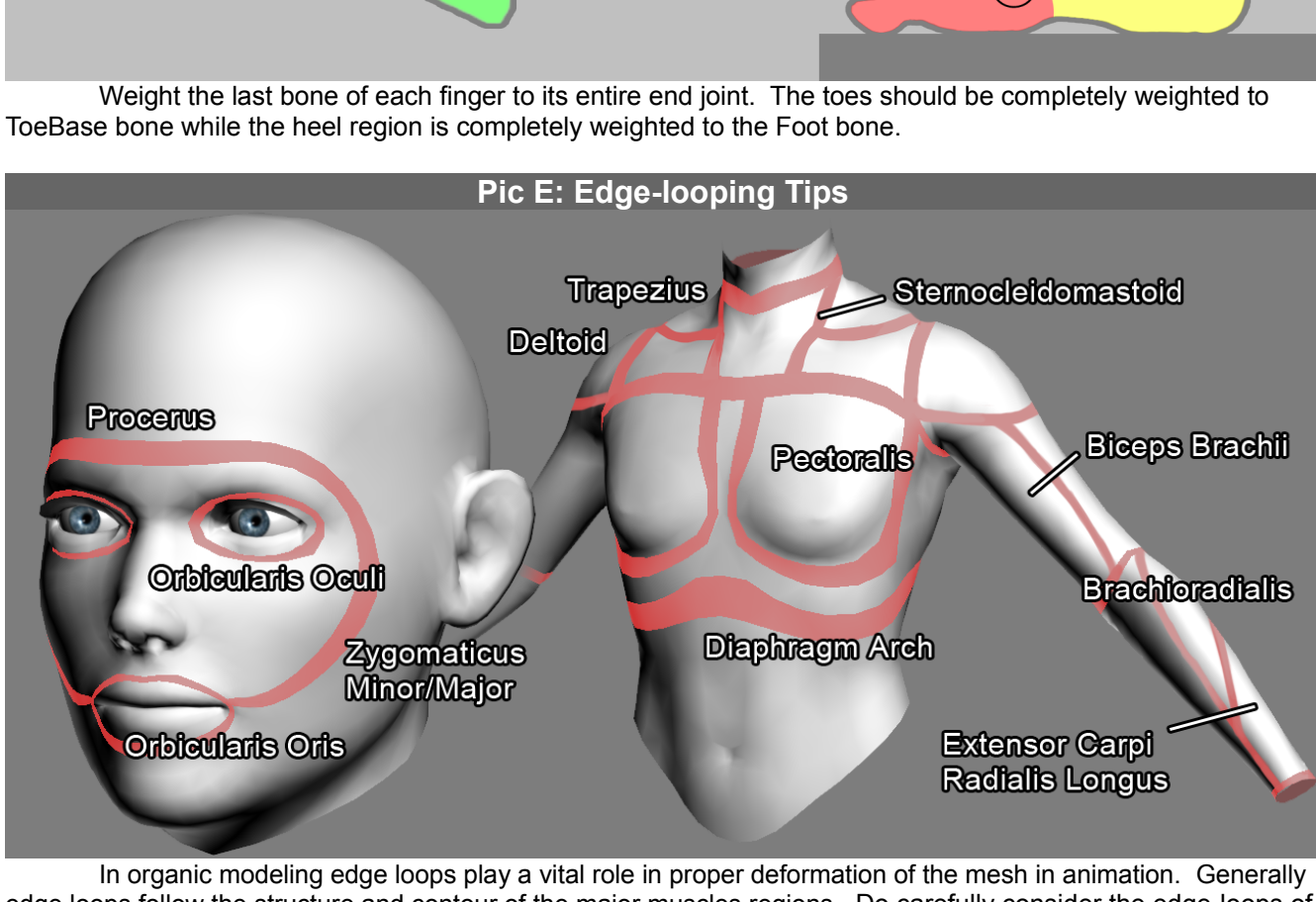
LipUpper



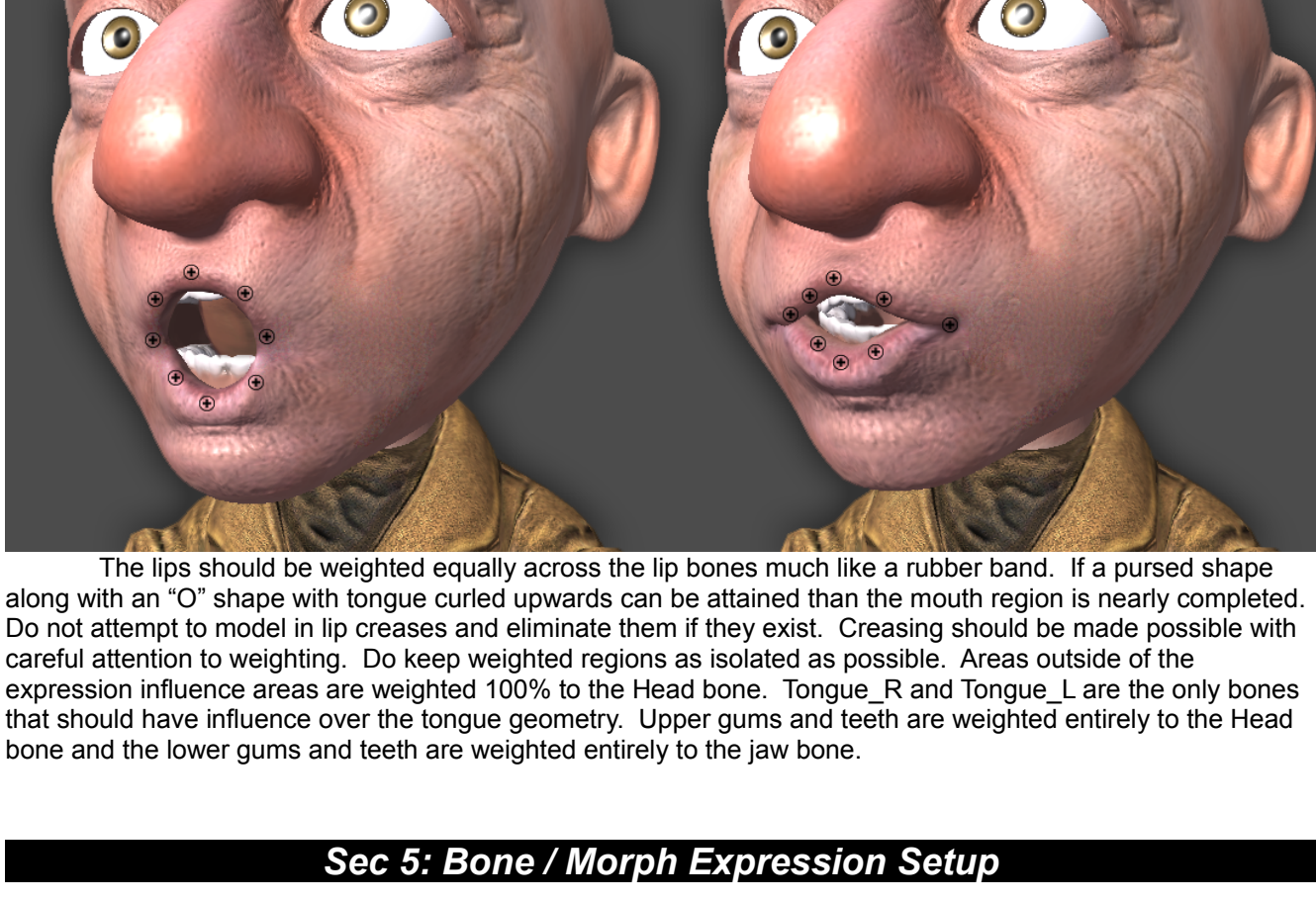
The chin area of the face should be weighted to the Jaw bone **not** the Jaw Root bone. Sides of the body where the rib cage lies should be completely weighted to the Spine2 bone. G5 Low Poly Skeleton does not support midroll bones, instead make sure to blend weights smoothly across the length of the limbs. Nostril bone weighting starts off strongest on the tip of the nose and tapers in strength around the bridge and flaps of the nose. Eyeballs are weighted entirely to the left and right eye bones while eyelid bones have very small influence area responsible only for blinking. There are no bones for controlling the ear, therefore they should be 100% weighted to the head bone.



The bones of the hand lie on major joints of the hand such as the wrist and knuckles. Do keep fingers as straight as possible from the top and side views. Place the bottom of the feet is flush to the floor, do not tilt the ankles in any way. The ToeBase bone pivots around the ball of the feet with the mesh of the ball.

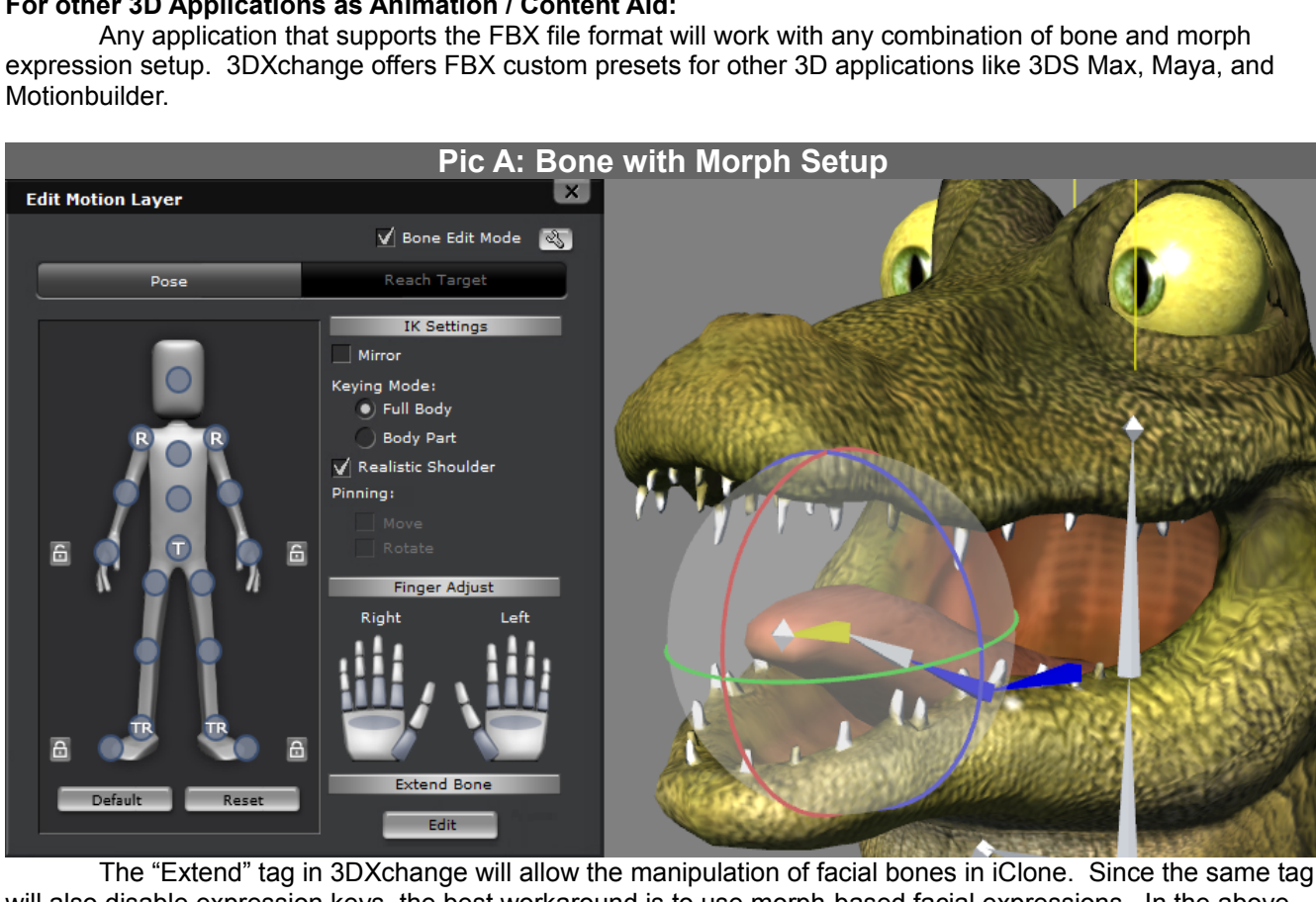


Weight the last bone of each finger to its entire end joint. The toes should be completely weighted to ToeBase bone while the heel region is completely weighted to the Foot bone.



In organic modeling edge loops play a vital role in proper deformation of the mesh in animation. Generally edge loops follow the structure and contour of the major muscles regions. Do carefully consider the edge-loops of the mesh, especially in the face and chest areas and keep the following tips in mind:

- T trapezius muscle should be clearly defined from the deltoid muscle.
- Pectoralis should lead smoothly into the deltoid muscles.
- At least two or more bands for good bending results around limb joints.
- Consider edge-looping a ring around the mouth and eyes.
- Try to strike a balance between poly count and proper edge-looping.



The lips should be weighted equally across the lip bones much like a rubber band. If a pursed shape along with an "O" shape with tongue curled upwards can be attained than the mouth region is nearly completed. Do not attempt to model in lip creases and eliminate them if they exist. Creasing should be made possible with careful attention to weighting. Do keep weighted regions as isolated as possible. Areas outside of the expression influence areas are weighted 100% to the Head bone. Tongue_R and Tongue_L are the only bones that should have influence over the tongue geometry. Upper gums and teeth are weighted entirely to the Head bone and the lower gums and teeth are weighted entirely to the jaw bone.

Sec 5: Bone / Morph Expression Setup

3DXchange and iClone support both bone and morph animations. It is up to individual preference whether when and where either method is used. The target application and end usage should also be taken into account. For this paper we'll discuss three popular iClone usage and how it will impact your setup method.

For Game SDK / Interactive Media Applications:

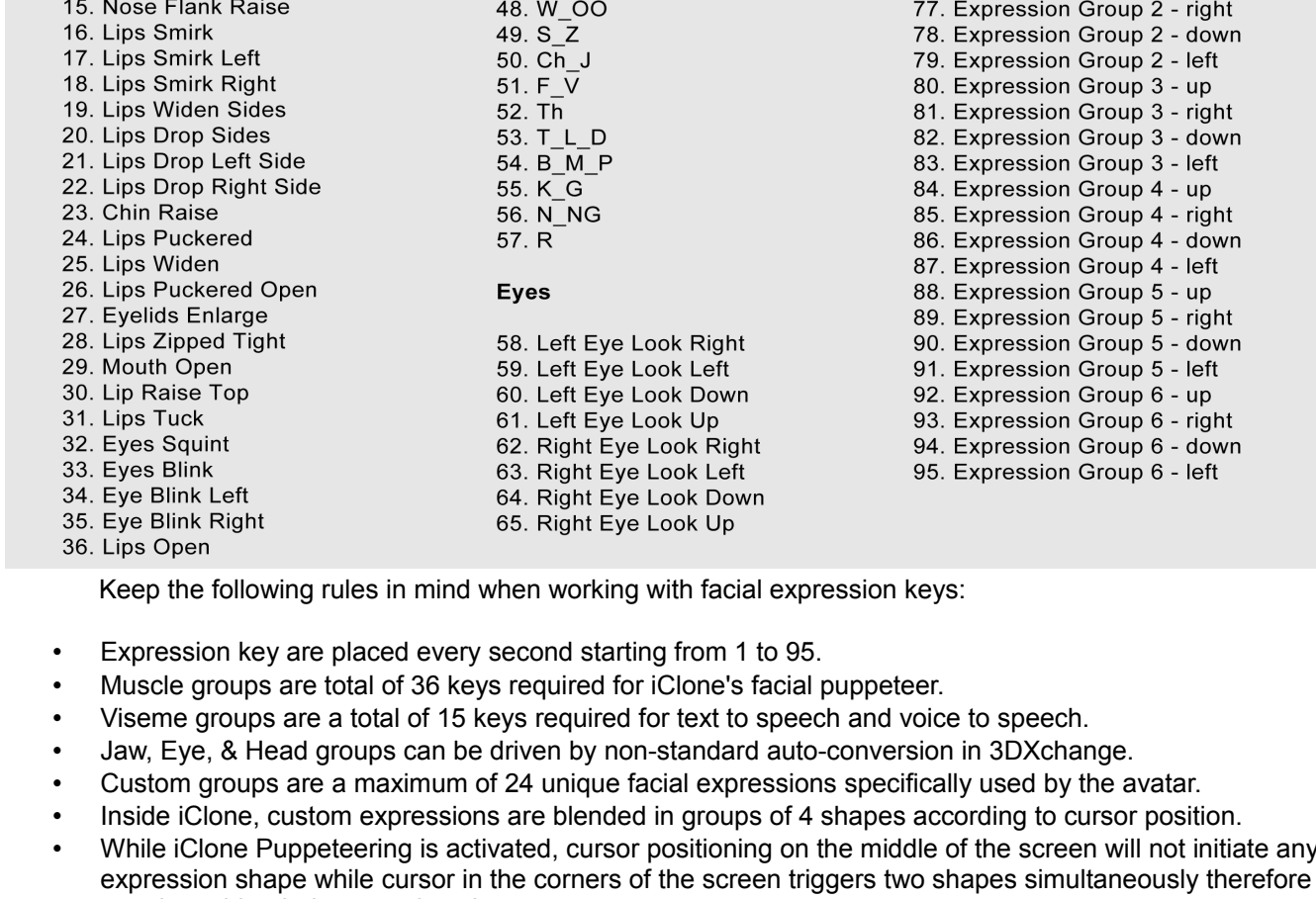
It is safer to keep all facial expressions and lip-syncing as bone-based animations as that is generally supported. Individual applications may vary and one must verify with the product vendor whether morph targets are supported. Most of the popular gaming SDKs will have some form of morph target plug-in available for purchase. 3DXchange offers FBX custom presets for game SDKs like Unity 3D and Unreal Editor.

For iClone / Machinima / Compositing:

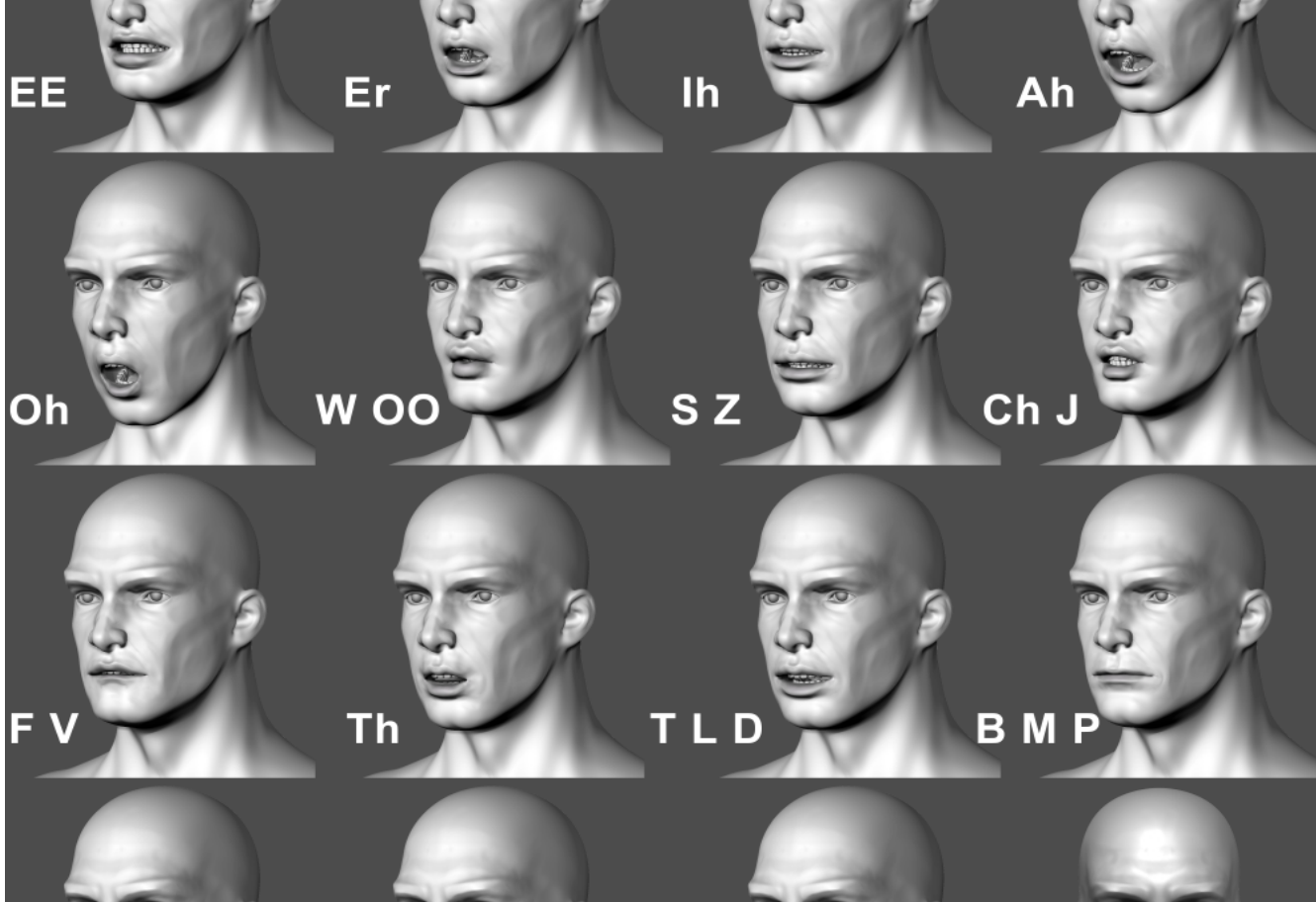
Since facial keys in Puppeteering conflicts with manual manipulation of joints, it is preferable for facial expressions to strictly use morph targets as this will free up "extend" bones in iClone for direct inverse and tagged kinematic manipulation. Tagged extend bones will deactivate any bone based expressions which can be overcome by baking expressions into morph targets. Another method is to have two versions of the same character, one that requires manual animation of the extend bones and the other that uses expression keys.

For other 3D Applications as Animation / Content Aid:

Any application that supports the FBX file format will work with any combination of bone and morph expression setup. 3DXchange offers FBX custom presets for other 3D applications like 3DS Max, Maya, and Motionbuilder.



The "Extend" tag in 3DXchange will allow the manipulation of facial bones in iClone. Since the same tag will also disable expression keys, the best work around is to use morph-based facial expressions. In the above example, one can still hand key the tongue even when it is activated in morph based lip-sync animations. For spring dynamics make sure to tag proper extend bone chains as "spring" in 3DXchange. Any bone not tagged as "face" will disappear from the 3DXchange view-port when the expression editor is open.



Place morph keys just as one would place bone-based expression keys at every second mark. Although initiating only one morph shape at a time is recommended, one can also combine morph shapes together to create other expression shapes.

Keep in mind that iClone does not have a specific "face" region, therefore morph animations can be used on the body and mapped to expressions if so desired. The same can be said about facial bones that have weight influences outside of the facial area. Therefore full body morphs are possible with puppeteering.

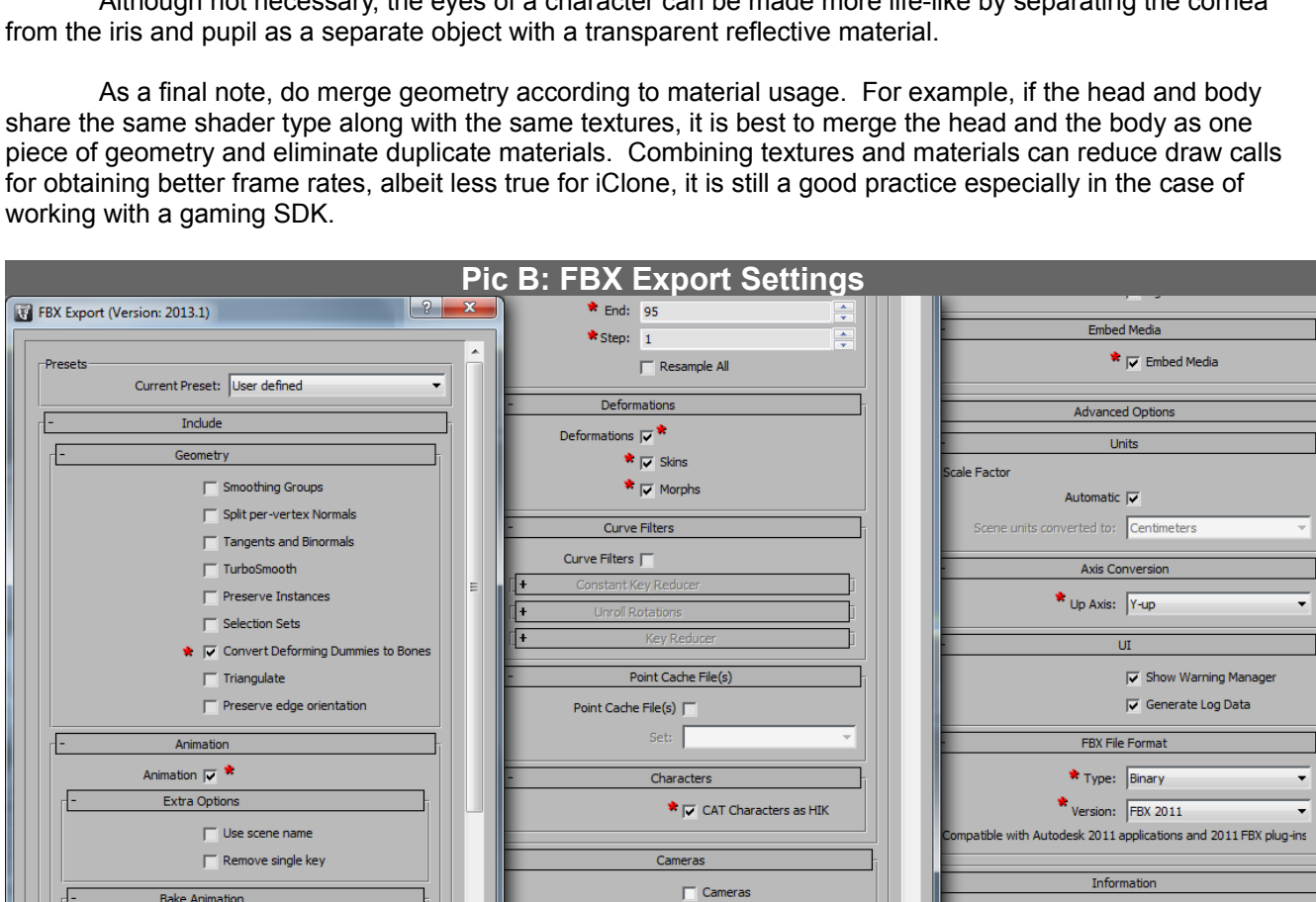
Sec 6: Facial Expression Keys

Facial expression keys are relied upon for face puppeteering and lip-syncing in iClone. Key-frame animations in a 3D application can be used for auto-conversion in 3DXchange for bone-based, morph-based, or combinations thereof. Simply follow the time-line guide below when placing keys in a third-party application.

Pic A: Facial Expression Key-frame Listing		
Muscles 1. Brow Raise Inner Left 2. Brow Raise Inner Right 3. Brow Raise Outer Left 4. Brow Raise Outer Right 5. Brow Drop Left 6. Brow Drop Right 7. Brow Raise Left 8. Brow Raise Right 9. Cheek Raise Left 10. Cheek Raise Right 11. Lips Drop 12. Nose Scunch 13. Nose Flank Raise Left 14. Nose Flank Raise Right 15. Nose Flank Raise 16. Lips Smirk Left 17. Lips Smirk Right 18. Lips Smirk Left 19. Lips Smirk Right 20. Lips Drop Sides 21. Lips Drop Left Side 22. Lips Drop Right Side 23. Chin Raise 24. Lips Puckered 25. Lips Widen 26. Lips Puckered Open 27. Eyelids Enlarge 28. Lips Zipped Tight 29. Mouth Open 30. Lip Raise Top 31. Lips Tuck 32. Eyes Squint 33. Eyes Blink 34. Eye Blink Left 35. Eye Blink Right 36. Lips Open	Jaw 37. Jaw Rotate Downward 38. Jaw Rotate Leftward 39. Jaw Rotate Rightward 40. Jaw Move Down 41. Jaw Move Left 42. Jaw Move Right Viseme 43. EE 44. Er 45. Ih 46. Ah 47. Oh 48. W_OO 49. S_Z 50. Ch_J 51. F_V 52. Th 53. T_L_D 54. B_M_P 55. K_G 56. N_NG 57. R Eyes 58. Left Eye Look Right 59. Left Eye Look Left 60. Left Eye Look Down 61. Left Eye Look Up 62. Right Eye Look Right 63. Right Eye Look Left 64. Right Eye Look Down 65. Right Eye Look Up	Head 66. Head Orient Upward 67. Head Orient Downward 68. Head Orient Leftward 69. Head Orient Rightward 70. Head Tilt Left 71. Head Tilt Right Custom 72. Expression Group 1 - up 73. Expression Group 1 - right 74. Expression Group 1 - down 75. Expression Group 1 - left 76. Expression Group 2 - up 77. Expression Group 2 - right 78. Expression Group 2 - down 79. Expression Group 2 - left 80. Expression Group 3 - up 81. Expression Group 3 - right 82. Expression Group 3 - down 83. Expression Group 3 - left 84. Expression Group 4 - up 85. Expression Group 4 - right 86. Expression Group 4 - down 87. Expression Group 4 - left 88. Expression Group 5 - up 89. Expression Group 5 - right 90. Expression Group 5 - down 91. Expression Group 5 - left 92. Expression Group 6 - up 93. Expression Group 6 - right 94. Expression Group 6 - down 95. Expression Group 6 - left

Keep the following rules in mind when working with facial expression keys:

- Expression key are placed every second starting from 1 to 95.
- Muscle groups are a total of 36 keys required for iClone's facial puppeteer.
- Viseme groups are total of 15 keys required for text to speech and voice to speech.
- Jaw, Eye, & Head groups can be driven by non-standard auto-conversion in 3DXchange.
- Custom groups are a maximum of 24 unique facial expressions specifically used by the avatar.
- Inside iClone, custom expressions are blended in groups of 4 shapes according to cursor position.
- While iClone Puppeteering is activated, cursor positioning on the middle of the screen will not initiate any expression shape while cursor in the corners of the screen triggers two shapes simultaneously therefore creating a blended expression shape.



Visemes are best kept subtle. The shapes should be exaggerated just enough to read well and not over done. Extreme exaggerations will cause viseme keys to "pop" when they are placed in close proximity in iClone's Viseme animation track.

The degree to which the details of the viseme shapes are attended to can mean a world of difference in the consequent facial performance in iClone. The following are a few of the intricacies to look out for:

- The jaw has a degree of opening in most visemes with the exception of "EE", "S_Z", "Ch_J", "BMP", and "N_NG".
- For "R" the tongue slightly touches the roof mouth, while in "T_L_D" the tongue reaches upward in a more pronounced way, and the tongue is sandwiched between the teeth in "Th".
- Pay special attention to the way teeth are revealed, typically in the case of "FV" and "N_NG" the top portion of the teeth are revealed while the bottom hidden, for shapes like "R" and "KG" the opposite is true, while "Ch_J", "EE", and "T_L_D" are example visemes where both top and bottom portions of the teeth are equally revealed.



Modify Panel → Face Setup → Expression Editor

All face expression keys can be set directly in 3DXchange through the Expression Editor after a Non-Standard conversion. Although bone-based expressions can be made in the 3DXchange by simply moving the bones of face and keying, morph target based expressions still have to be made in a third-party application.

Sec 7: Export Settings

Phong materials are recommended for the most accurate result in iClone. Within the material settings set ambient color from 50% to 95% gray, diffuse color to white, glossiness to 33 and up depending on the reflectivity of the material. In Autodesk Maya, glossiness of 33 is equivalent to cosine power of 10, and diffuse white is equivalent to diffuse value of 1.0. Without ambient and diffuse support, characters tend to look very dark in iClone's default lighting.

Although not necessary, the eyes of a character can be made more life-like by separating the cornea from the iris and pupil as a separate object with a transparent reflective material.

As a final note, do merge geometry according to material usage. For example, if the head and body share the same shader type along with the same textures, it is best to merge the head and the body as one piece of geometry and eliminate duplicate materials. Combining textures and materials can reduce draw calls for obtaining better frame rates, albeit less true for iClone, it is still a good practice especially in the case of working with a gaming SDK.

Keep the following tips in mind when exporting a FBX file to 3DXchange.

- Dummy deformers are not recognized by iClone therefore must be converted to bones.
- Facial keys have to be baked with deformation settings including Skins and Morphs.
- Character Animation Tools (CAT) in 3DSMax must be converted to HKC conventions upon export.
- Embedding media will allow textures to conveniently carry over to 3DXchange without linking to a texture file path. However, make sure to delete the "fbm" folder that 3DXchange creates in the FBX file directory upon 3DXchange import or press the "Embed Texture" button under the "Material(Y)" menu in the Modify panel.
- iClone and 3DXchange are both Z-up 3D applications just like 3DS Max. Some applications like Maya and Unity have Y-up coordinates.
- Subsequent iClone file size will be a factor of the FBX file size, therefore it is highly recommended to save the FBX in Binary format as this will reduce the iClone file size significantly.
- Export only what is needed, leave out lighting, environments, camera objects, and complex shader functions when exporting props or avatars.

3DXchange supports morph keys starting from version 5.5, however only morph information from FBX version 2011 and below are recognized. Files exported in FBX version 2012 and above will only work with bone based animations. Within iClone one should apply foot and/or hand contacts, name and save the avatar, and adjust iAvatar thumbnail by uploading an image. These features will likely be integrated in newer versions of 3DXchange.