Experiments in Motion Capture, Spring 2006, Assignment #1
Vicon iQ 2.0: Subject Calibration and Automatic Labelling

1. Don't get scared about 3 pages of text here, I just tried to be as detailed as possible, because you might be a Mac person, or/and maybe have never used a 3D graphics package. If stuck, watch/search the class video (we will email you where the video is), or catch me in my office, ask a classmate, or email me to chris.bregler@nyu.edu . Also let me know about all the mistakes in this document. (It's quiet late here already when I typed this -- also remember, I mix up left and right all the time…. ☺).

2. Use one of the 4 PCs in the open area on the other side of the lab. (They are labelled with "mocap") Login in with your given mocap ID and password. (Please don't post this password on the web or anywhere, it might turn into a security problem for our lab then). When you login, make sure the domain "CAT" is chosen (on the 3rd line of the login window.) If you don't see the login window, somebody is already logged in. Log her/him out first.

3. Mount the mocap database: Click in Windows on [START] (lower left corner). Click on [RUN], and type in: \\neu.cs.nyu.edu   Now search in there for the directory "read_only" and copy the folder mocap06s_assgn1 into C:\temp\

4. Start VICON iQ 2.0. If there is no short-cut on the desktop for iQ 2.0 yet, go to C:\Program Files\Vicon\VICON 2.0 and click on ViconIQ 2.0 (exe).

5. We are not using the Eclipse Database in this example. If it asks for "Open Databases", just click [CANCEL].

6. Once iQ launched, click on the [Post Processing] button at the second top row.

7. Click on [File] (top row), and then [Open] (pull down menu). In the Open Dialog, set Files of type to "TVD File". That's the raw video input file type. Type in File name c:\temp . Click on mocap06s_assng1 and double-click on ROM.tvd (this is the raw data of the Range of Motion we recorded in class.)

8. It asks you now for Camera Type and Calibration File: Select System Type V8i, Camera Type MCam2, Camera Mode: 120Hz Progressive, [Browse for calibration file]: choose there "Session 2Cal.cp" or any appropriate .cp file. Click on [Open] then.

9. [This step is not necessary, but fun if you use the tool the first time] Now just out of curiosity you can look at all 10 camera inputs of the original recording. Click on [Camera] in the second top row. If you click on [2] (third top row) you see camera input 2. Press play button (white arrow on blue) on the bottom row, and you see the 2D dots moving around.   You can also "scrub" around, in dragging the blue time cursor back and forth. This is similar to other animation packages and video editing tools. If you press down [Shift] you can select a range of cameras (i.e. 1-10), if you press down [Ctrl] you can select arbitrary sets of cameras. Try it, and play or "scrub" around.

10. Now click on [3D Workspace] (third top row). Click on [View Options] Pane, all the way on the left column. Unclick in there the [Reconstruction Volume].

11. Now press on the [Reconstruction] pane on the very right side of iQ. A full menu/pane shows up. Hit in there the [Run] button. It takes now all 10 camera views and reconstructs the 3D data through "triangulation". It can take a while, just watch the progress bar. Once done, if you see a big mess of rays and points, go to the left again, and unclick the "Rays" in the "View Options".

12. Now inspect the 3D point data. If you press down the [Alt] button and left-click and drag the mouse around, you can rotate the 3D view. With [Alt] and right-click you can change with the mouse the zoom. With [Alt] and right+left-click you can translate the view with the mouse. Just play around a bit. You might be used to this from some other 3D package. As in the camera view, you can also press the play button (bottom white arrow on blue), and "scrub" around the darker blue time pointer. Make sure the motions make sense. There might be additional clutter from some other markers, or a second person, but we don't deal with that now. You can eliminate that later, when it becomes more challenging.

13. Now go to the [Subject] pane. (all the way on the right again). Click on [Create Vicon Skeleton Template] (top right corner). In the pop up menu, click on [Change Dir] and go to C:\temp\mocap06s_assng1 and hit [OK] Now the Template box shows you options. Chose FullBodyHeadBand. This is a pre-defined marker set for one of the students we recorded in class. Type in SubjectName the name of the recorded student. Lets call him freddy. It will load a initial body model into the scene, centred at the origin. For now you don't need to see it, on the left side under "view option" un-select "Subjects"

14. Make sure your time slider (bottom) is on frame 1. You should see your subject be in a T-Pose. Let's start with the labelling of the markers. Click on the "Labelling" pane on the right side. You see all label names for "teddy" now. Consult the label chart (a XEROX copy) we gave you that shows the same names and the body locations. For example LFHD means Left-Fore-Head. At the "Labelling" pane, click under [Modes] (top right) on "Sequence". And under [Rules] on "whole".

15. Now you're ready to label the t-pose. This might take you a bit longer the first time, but you will be much faster after a few different subjects. Consult the video on how this goes. Use the mouse and [Alt] keys to orient and re-orient your 3D video of the markers. Start from the top marker. Click on the right side in the "Labels" list on "LFHD". Now you have to click in the 3D view on the corresponding 3D reconstruction point that is the real "LFHD". As soon as you click on a 3D point, it will highlight the next marker name in the list on the right side. Go ahead and find the next 3D point and click on it. If you made a mistake, undo it with ctrl-z. Always double check on the marker list where you are. The marker list I gave you is a bit strange… it first lets you mark the first 3 points on the head, and the 4th point of the head is all the way on the bottom of the markers list. Just scroll down there and select the fourth marker name "LBHD" and click on the 3D point. And the go up again, and continue with C7. Be very very "detail oriented" on this. Its important you hit all the right dots. Once Artificial Intelligence research has progressed much more, maybe the computer can do this automatically, but for now, we still need the human brain for this. Watch the video for some odd things in the data you need to be careful about.

16. Once you're done with all points and are happy, save your results. [File] [Save As] will save a ".trial" file (that contains everything you've already done. Save it in your own mocap directory. If you're account mocap7, you write into the \\neu.cs.nyu.edu\mocap7 directory.

17. Now its time to automatically track those initial labels over the entire sequence. There is a very specific routine that can do it for the "RANGE OF MOTION" recordings. Go to the "Pipeline" pane (all the way on the right), and click on "+". Choose "Autolabel Range of Motion" [Done], and it appears in the pipeline window. Now go to the pipeline and right click on "Autolabel …" and choose "Run Selected Op". It will take a while, there is a progress bar on the right bottom. Once done, check with the play button (and "scrubbing") if the entire sequence is labelled.

18. Now go back to the "Subjects" Pane (on the right). You will "calibrate" the bones of your subject. Move the time slider to frame 1. On the lower right under "Events" hit the [G] button (for general event) , and the [T] button. The [T] button might not be visible on smaller screens. Enlarge the right pane in moving the pane boundary with the mouse. Once you hit the [T] button, you see a small blue T at frame one on the time slider. If the subject didn't start with a T pose, but assumes the T pose at a later frame, just select that frame instead. After that hit the "Calibrate Subject" button on the right middle side. It will take a while now to figure out the bone lengths etc. you'll see the progress bar, and it should go down to an error below 15 mm. (It can take a very long time, 5min or so in extreme cases)

19. Save your new skeleton (bones) with the "Export Vicon Skeleton (VSK)" button. It saves a VSK file, that you need later for fully automatic labelling of all other recordings of the same subject.

20. Now go back to "Pipeline" and complete your pipeline commands. Click "+" again there, and double click "Trajectory Labeller", and double click "Kinematic Fit", and double click "Fill Gaps using Kinematic Model", and double click "Export C3D file", and double click "Save Trial File" (if you wish you can automate lots of other things…. But don't need that yet here) hit [Done]

21. Move the red-pointer to Trajectory Labeller, and hit the play button in the Pipeline control. It will fit a skeleton to the entire sequence. After its done, go to "View Options" (on the left), and select subject. You'll see now the model over-layed to the data. Play it and check on everything.

22. Save the trial file.

23. Now redo everything reported in here for the next sequence (next .tvd file). But since it's the same subject, you do NOT need to label by hand anymore, and do NOT have to do a subject calibration. Instead – after loading the TVD file, go to "subjects" and hit "Import Vicon Skeleton (VSK)" and choose your subject skeleton. It will display it at the origin (miss-aligned) first. Just go to pipeline, and add "Circlefit, Reconstruct, Trajectory Fit Frame Range" as another automatic pipeline command. It will add it at the end of the pipeline, but just move it up. Move the red-arrow to the top. VERY IMPORTANT, de-select now the Autolabel Range of Motion. You don't need that anymore with a given skeleton. And then hit the play button in the pipeline control window, and magically it will label and fit the model fully automatic to your new sequence. Just 2 years ago, this took lots of labor with lots of hand clicking on lots of points, but since the new software came out, we can now fully automatically label 3D points. There will be some mistakes, (like in take2 of our example) and in one of the future assignments we might teach you how to deal with this…. But at simpler motions, the software should automatically do a very good job without any hand-re-labelling.