

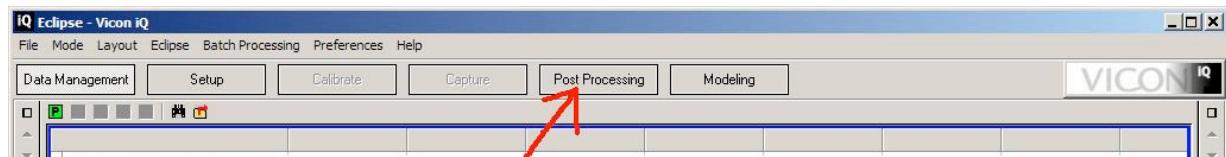
Recapturing Life

Chris Bregler and Jean-Marc Gauthier – CIMS / Tisch / New York University

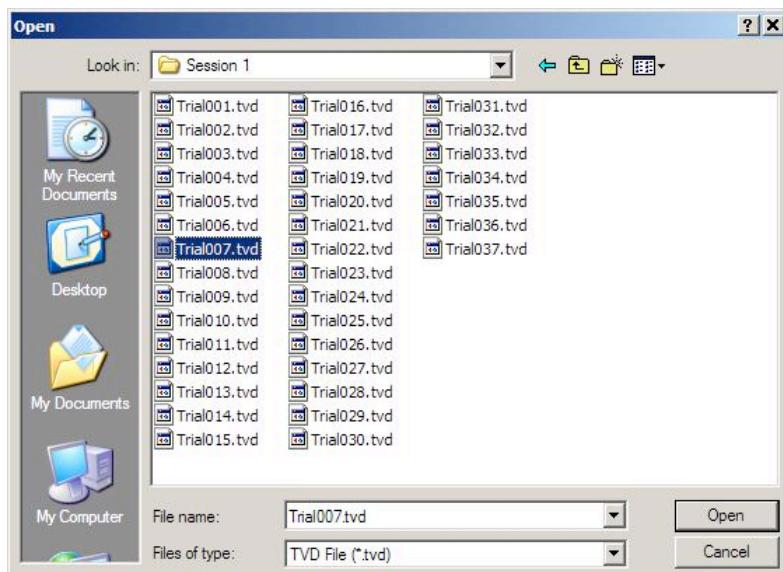
VICON Motion Capture “Clean Up” (Subject Calibration and Automatic Labelling)

Chris Bregler – Fall 2006

1. Copy your motion capture data into a local directory on your PC. The first recordings from Sep 20 are currently stored in <\\3D\\3D\\RecapturingLife\\MocapRecordingSep20> (It's a huge directory, just copy the *.vst files, *.cp file, *.msk file, sho920.vsk, and for now only Trial007.tvd)
2. Start VICON iQ 2.5. If there is no short-cut on the desktop for iQ 2.5 yet, go to C:\\Program Files\\Vicon\\VICON 2.5 and click on ViconIQ 2.5 (exe).
3. We are not using the Eclipse Database in this example. If it asks for “Open Databases”, just click [CANCEL]. Despite an Eclipse Error message, you should see at the top of the screen following menus and buttons:

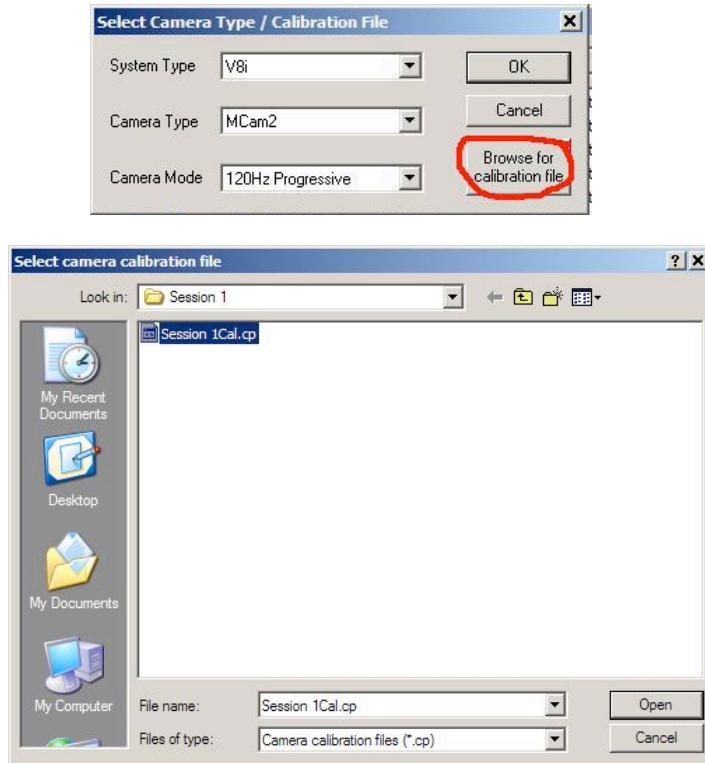


4. Click on the [Post Processing] button at the second top row.
5. Click on [File] (top row), and then [Open] (pull down menu). In the Open Dialog, set Files of type to “TVD File”. That's the raw video input file type. Find in the local copy of the mocap recordings the tvd file that had the “Range of motion” recordings of your subject. In the case of the Sep 20 recordings double-click on Trial007.tvd (this is the raw data of the Range of Motion we recorded for Julie.)

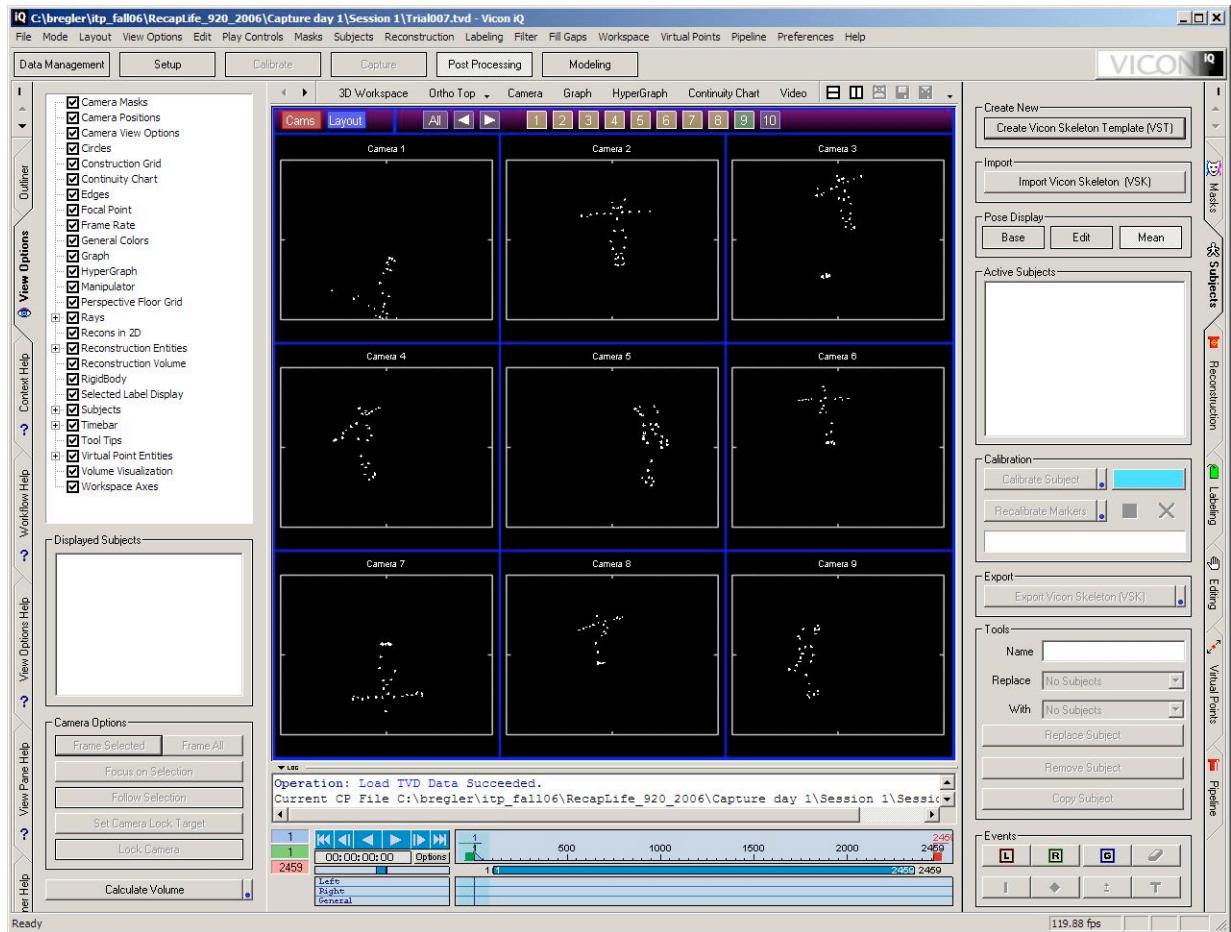


6. Click [Open]. It asks you now for Camera Type and Calibration File: Select System Type V8i, Camera Type MCam2, Camera Mode: 120Hz Progressive. VERY IMPORTANT!! After selecting the camera

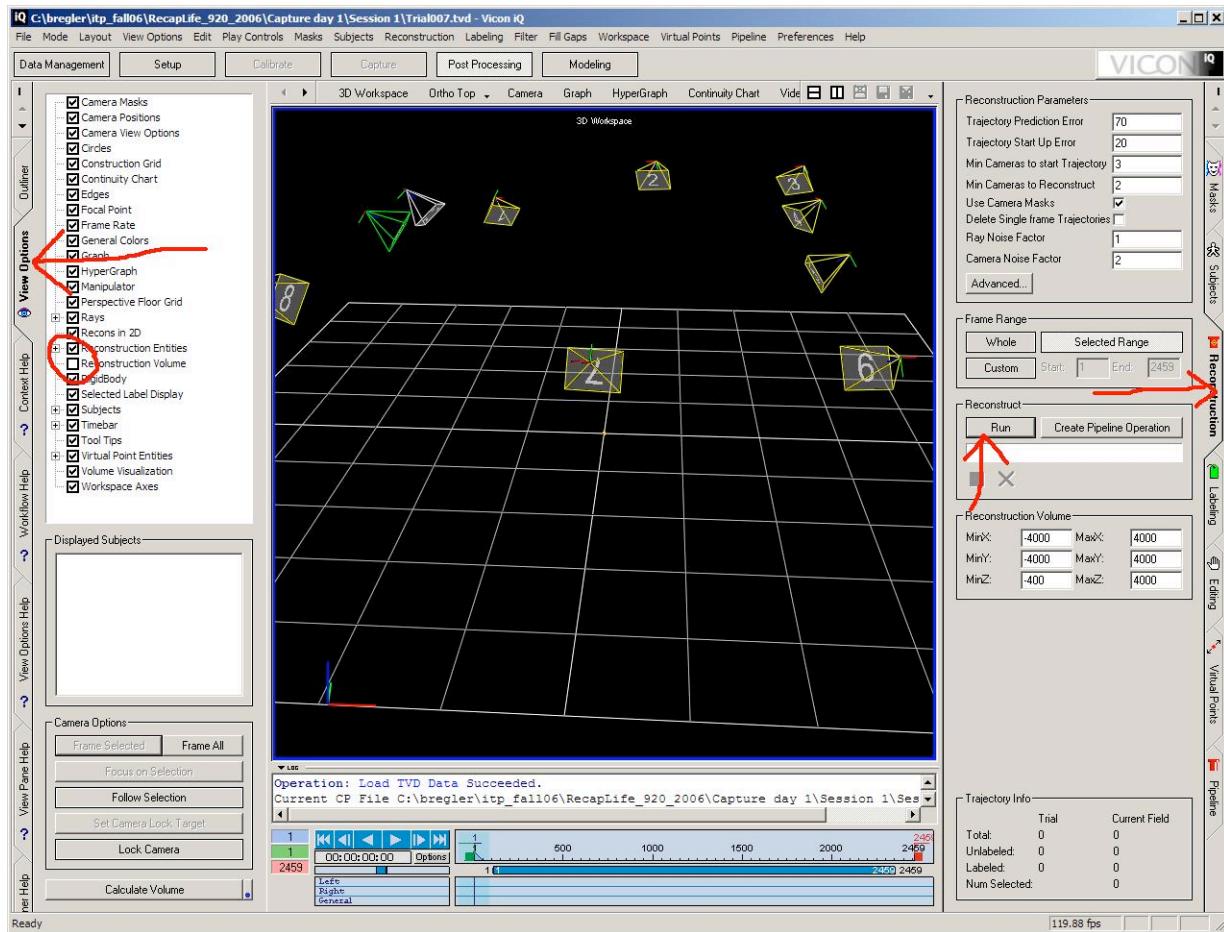
config you need to load the calibration file in clicking on [Browse for calibration file]. Choose there "Session 1Cal.cp" or any appropriate .cp file. Click on [Open] then.



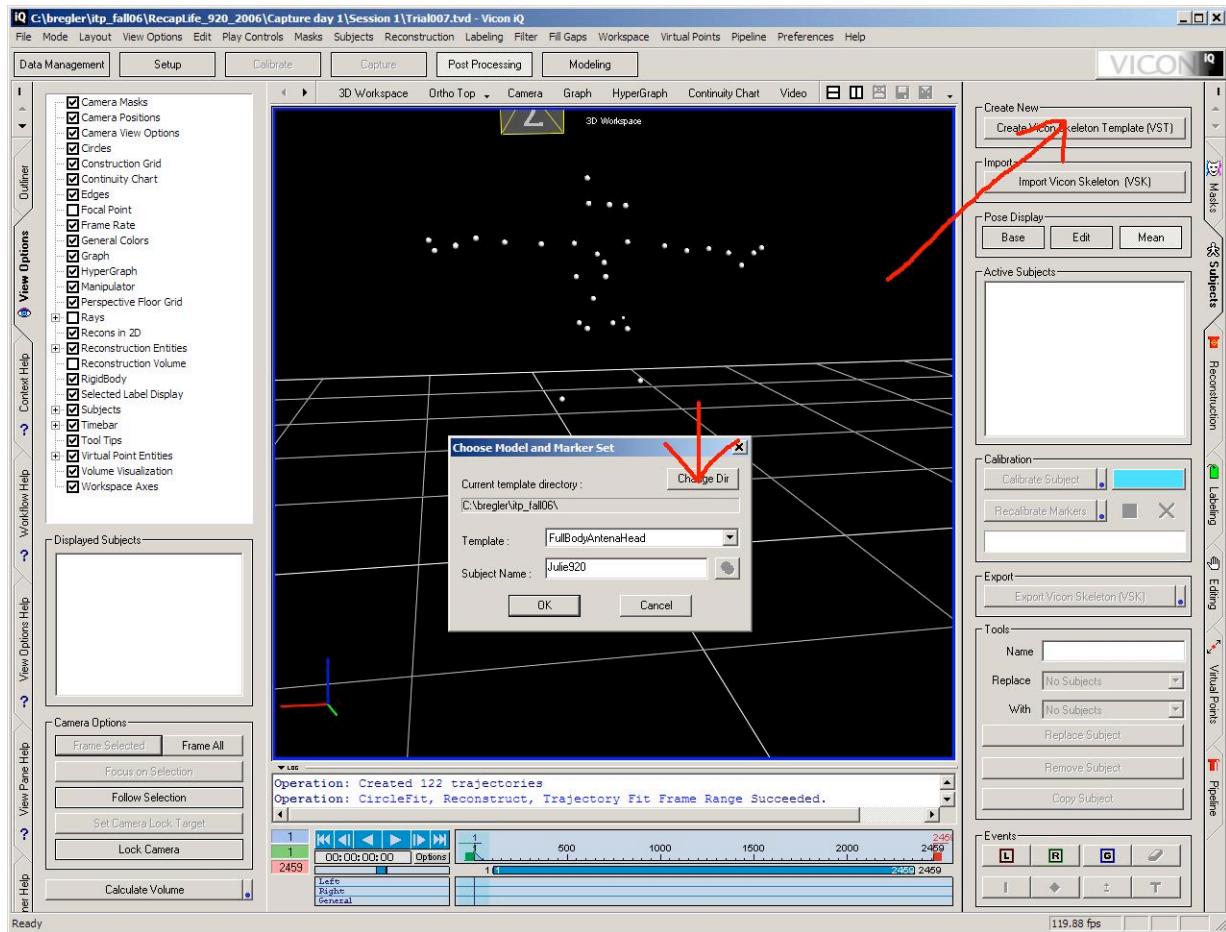
7. [This step is not necessary, but fun if you use the tool the first time] Now just out of curiosity you can look at all 10 camera inputs of the original recording. Click on [Camera] in the second top row. If you click on [2] (third top row) you see camera input 2. Press play button (white arrow on 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.



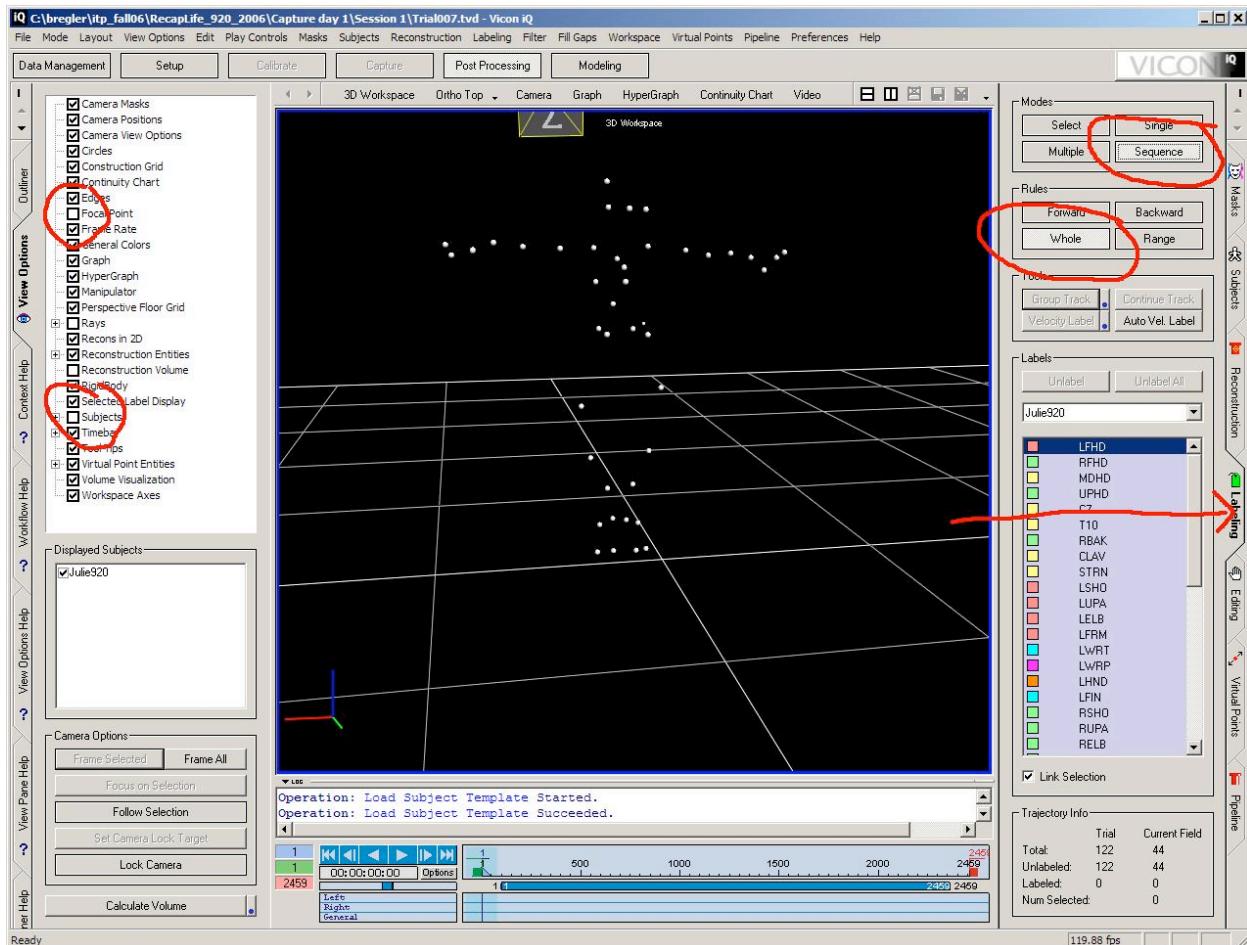
- Now click on [3D Workspace] (third top row). Click on [View Options] Pane, all the way on the left column. Unclick in there the [Reconstruction Volume].



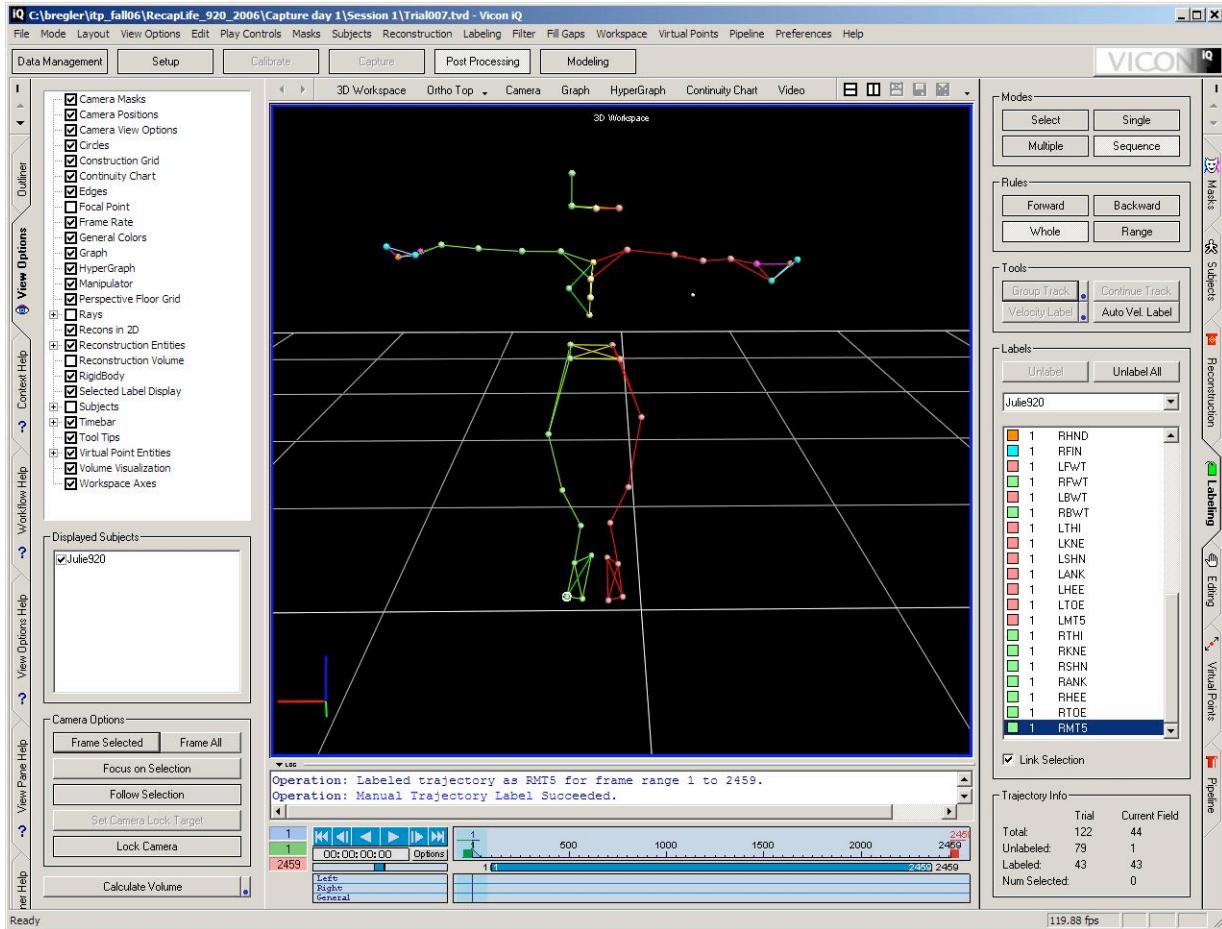
9. Now press on the [Reconstruction] pane on the very right side of iQ. A full menu/pane shows up. Hit in there the [Run] button. It takes now all 10 camera views and reconstructs the 3D data through “triangulation”. It can take a while, just watch the progress bar. Once done, if you see a big mess of rays and points, go to the left again, and unclick the “Rays” in the “View Options”.
10. 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.
11. 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 the data directory and hit [OK]. Now the Template box shows you options. Choose FullBodyAntennaHead. This is a pre-defined marker set for one of the students we recorded in class. Type in SubjectName the name of the recorded performer. Lets call her Julie920. It will load an 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”



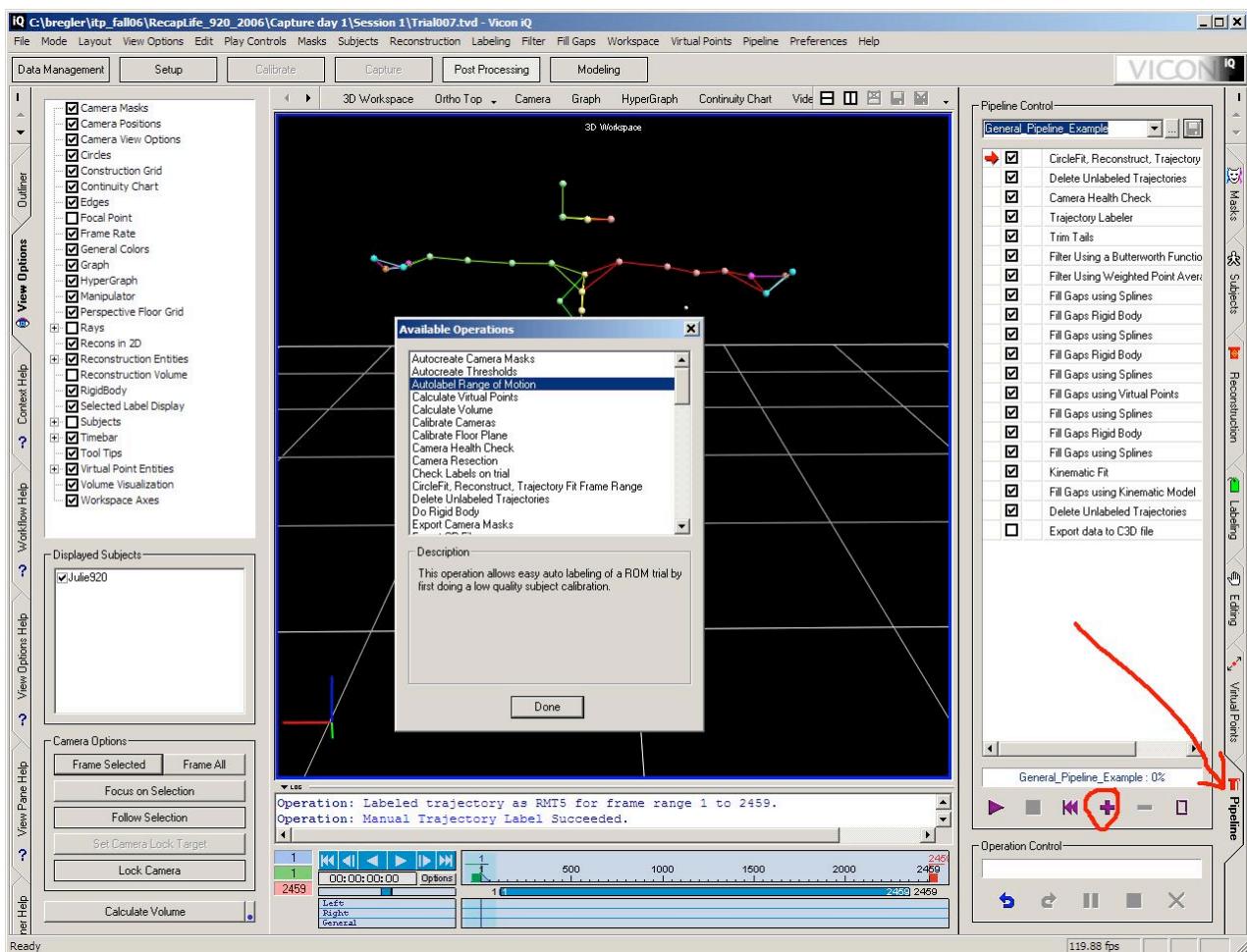
12. Make sure your time slider (bottom) is on frame 1. You should see your subject be in a T-Pose. Let's start with the labelling of the markers. Click on the "Labelling" pane on the right side. You see all label names for "Julie920" now. Consult the label chart (mocap_labelchart.pdf) we gave you that 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".



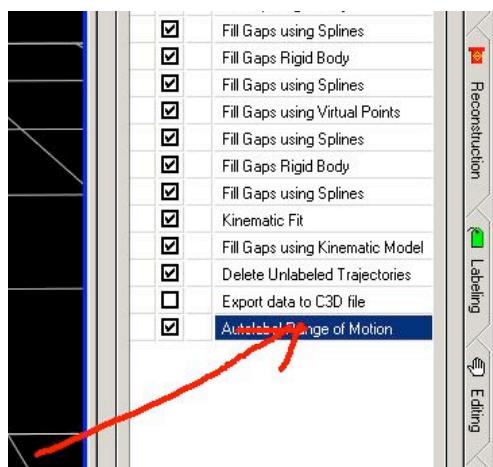
13. Now you're ready to label the t-pose. This might take you a bit longer the first time, but you will be much faster after a few different subjects. . Use the mouse and [Alt] keys to orient and re-orient your 3D video of the markers. Start from the top marker. Click on the right side in the "Labels" 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.



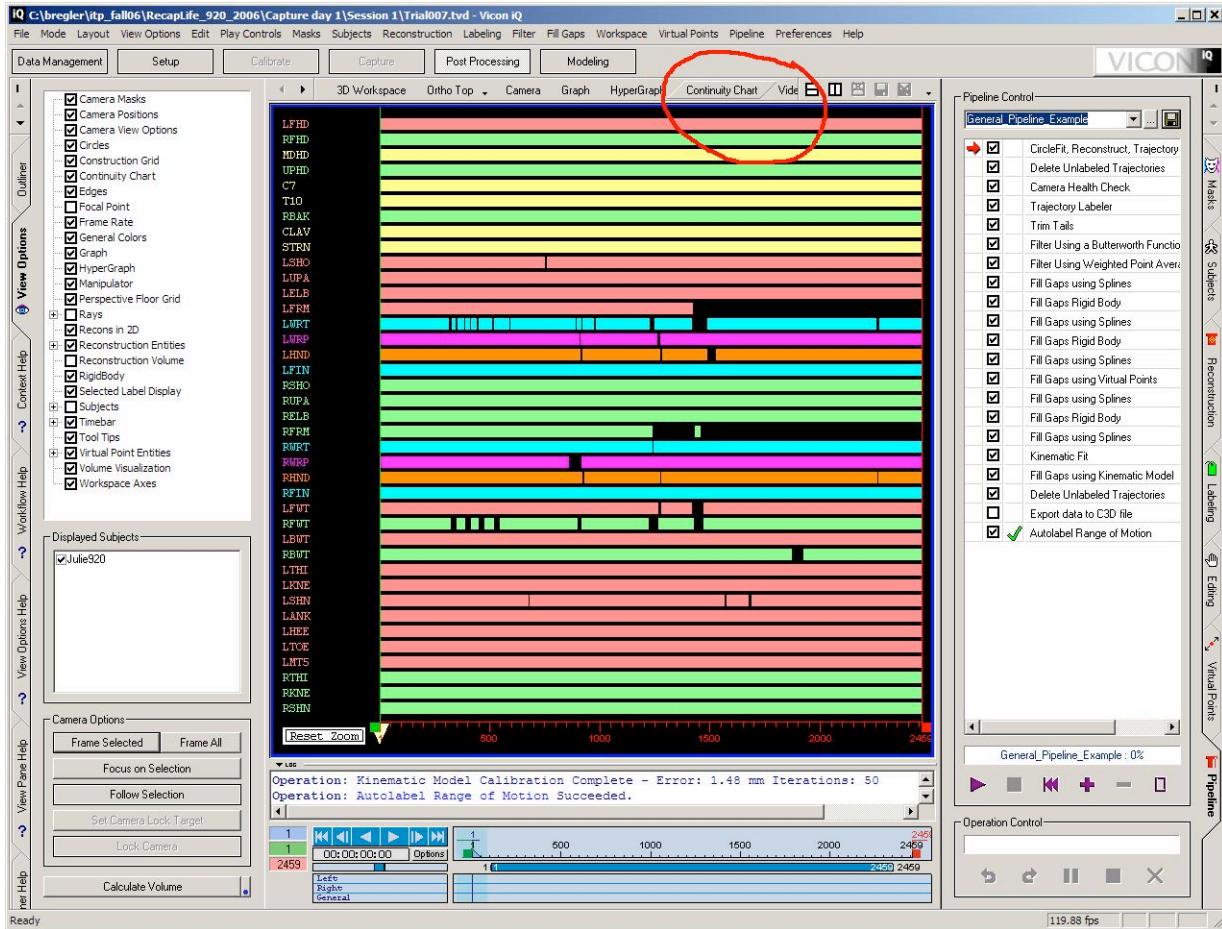
14. Once you're done with all points and are happy, save your results. [File] [Save As] will save a ".trial" file (that contains everything you've already done).
15. Now its time to automatically track those initial labels over the entire sequence. There is a very specific routine that can do it for the "RANGE OF MOTION" recordings. Go to the "Pipeline" pane (all the way on the right), and click on "+". Double-Click on "Autolabel Range of Motion" [Done], and it appears in the pipeline window.



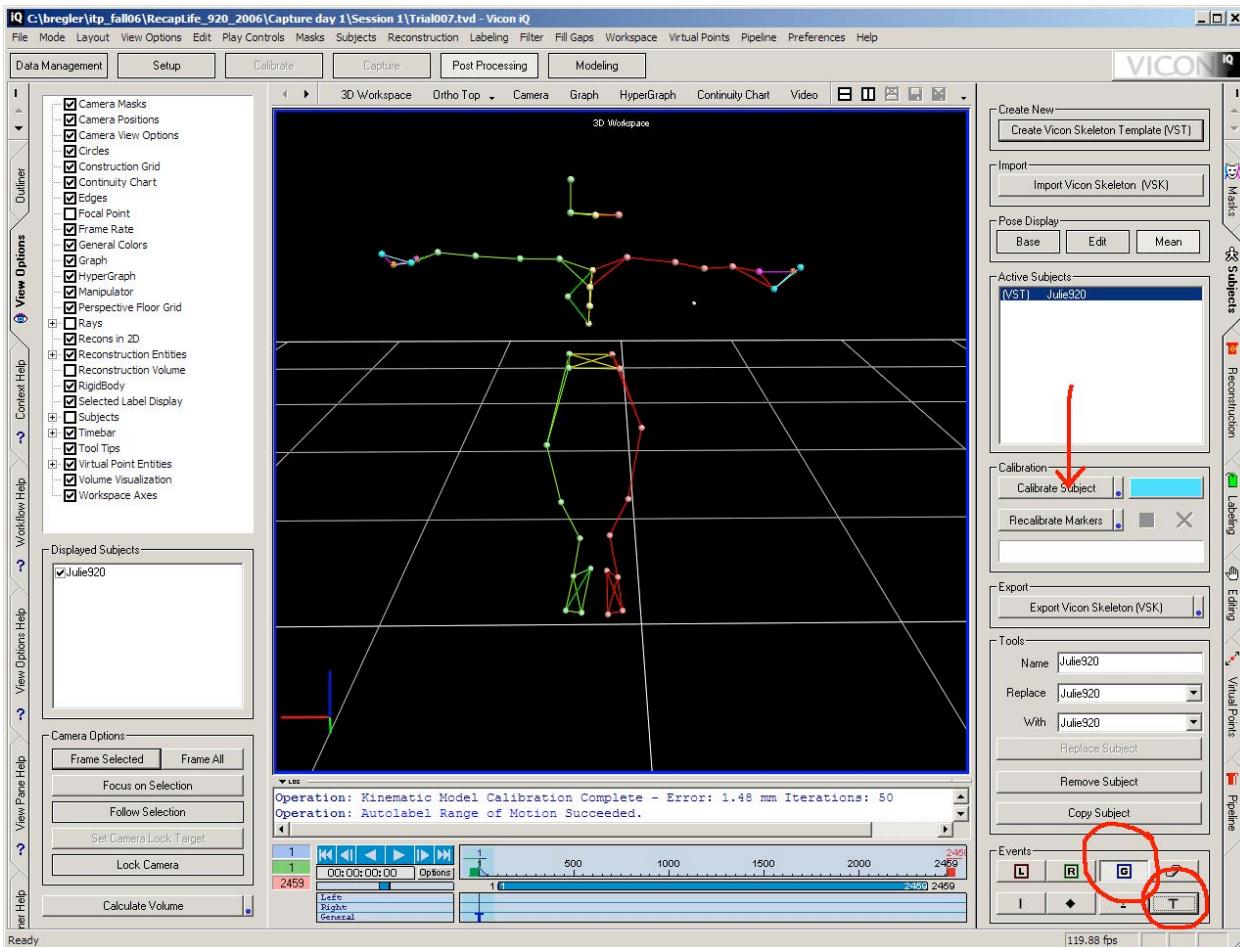
16. Now go to the pipeline and right click on “Autolabel ...” and choose “Run Selected Op”. It will take a while, there is a progress bar on the right bottom. Once done, check with the play button (and “scrubbing”) if the entire sequence is labelled.



17. Now you can also check in the Continuity Chart how many labels were automatically found:



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. Load the new TVD file. VERY IMPORTANT: Don’t forget to hit [Browse for calibration file]. (Very easy to forget this). After that go to “subjects” and hit “Import Vicon Skeleton (VSK)” and choose your subject skeleton. You got already Julie920.vsk and I also copied Sho920.vsk from yesterday’s class. Choose the appropriate one. Or choose both, if we recorded both subjects together. It will display skeleton(s) (vsk) 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 Trial016 of our example, when Sho moves close to the capture border, and some markers are missing). 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.

24. Here are all the trial files with their description. Find your own story-boarded trial files, and clean them:

The screenshot shows the Vicon iQ software interface running on a remote desktop from neu.cs.nyu.edu. The main window displays a list of 37 trials under a session named "Session 1" on 9/20/2006. The trials are listed in rows, with columns for Trial ID, Status (green circle), Take Number (blue circle), Classification, Motion Type, and Description. Some trials have green circles with a black dot next to them, indicating they are selected. The descriptions provide context for each trial, such as "Sho and Juliana Swing Dance" or "Sho - reverse evolution take 01". The interface includes a toolbar at the top with buttons for Data Management, Setup, Calibrate, Capture, Post Processing, and Modeling. On the left, there's a vertical toolbar with icons for Context Help, Workflow Help, Eclipse Help, and a Log button. The bottom of the screen shows a log message: "Log Ready...".

Session 1		9/20/2006	37 Takes		
Trial001	Y		Unclassified	Dance	
Trial002	Y		Unclassified	Dance	ROM
Trial003	Y		Unclassified	Dance	ROM
Trial004	Y		Unclassified	Dance	ROM - Sho
Trial005	Y		Unclassified	Dance	ROM - Sho
Trial006	Y		Unclassified	Dance	ROM - Juliana
Trial007	Y		Unclassified	Dance	ROM - Juliana
Trial008	Y		Unclassified	Dance	ROM - Sho
Trial009	Y		Unclassified	Dance	ROM - Sho
Trial010	Y	●	Unclassified	Dance	Sho and Juliana Swing Dance
Trial011	Y		Unclassified	Dance	Sho and Juliana Swing Dance take 02
Trial012	Y		Unclassified	Dance	Sho and Juliana Swing Dance take 03
Trial013	Y		Unclassified	Dance	Sho and Juliana Swing Dance take 04
Trial014	Y	●	Unclassified	Dance	Sho - evan dance take 01
Trial015	Y		Unclassified	Dance	Sho - evan dance take 02
Trial016	Y		Unclassified	Dance	Juliana - hand stand to bridge 01
Trial017	Y		Unclassified	Dance	Sho - reverse evolution take 01
Trial018	Y		Unclassified	Dance	Sho - reverse evolution take 02
Trial019	Y		Unclassified	Dance	Sho and Juliana - Sword and Gun fight take 01
Trial020	Y		Unclassified	Dance	Sho and Juliana - Sword and Gun fight take 02
Trial021	Y		Unclassified	Dance	Sho and Juliana - Sword and Gun fight take 03
Trial022	Y		Unclassified	Dance	Juliana - Sword and Gun fight take 04
Trial023	Y		Unclassified	Dance	Sho - Sword and Gun fight take 05
Trial024	Y		Unclassified	Dance	Sho - sho's dance take 01
Trial025	Y		Unclassified	Dance	Sho - sho's dance take 02
Trial026	Y		Unclassified	Dance	Sho - sho's dance take 03
Trial027	Y		Unclassified	Dance	Sho - sho's dance take 04
Trial028	Y		Unclassified	Dance	Sho - sho's dance take 05
Trial029	Y		Unclassified	Dance	Juliana and Sho - animation take 01
Trial030	Y		Unclassified	Dance	Sho - Sam take 01
Trial031	Y		Unclassified	Dance	Sho - Sam take 02
Trial032	Y		Unclassified	Dance	Sho - wall flips take 01
Trial033	Y		Unclassified	Dance	Sho - wall flips take 02
Trial034	Y		Unclassified	Dance	Sho - wall flips take 03
Trial035	Y		Unclassified	Dance	Sho - wall flips part 2 take 01
Trial036	Y		Unclassified	Dance	Sho - wall flips part 2 take 02
Trial037	Y		Unclassified	Dance	