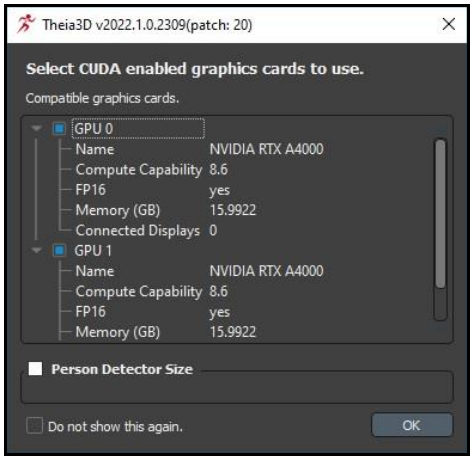
The MotionMonitor xGen Hardware Guide: Theia3D configuration and Real Time workflow

This document reviews the real time workflow options for The MotionMonitor xGen and Theia3D's markerless mocap system. Although The MotionMonitor xGen can be used in a purely post processing capacity, where videos captured using any application and the resulting C3D files generated by Theia3D can be imported into The MotionMontior xGen, this guide will focus on the automated processes of sending video files captured using The MotionMonitor xGen to Theia3D. The data generated by Theia3D is then automatically imported back into the original Activity where a biomechanical model is applied and this data is synchronized with any other peripheral data such as force plates, EMG, EEG, eye tracking, or data from other kinematic tracking systems that were captured along with the original video files in The MotionMonitor xGen.

1) The Theia3D application will first need to be installed and configured on your computer with CUDA enabled graphics cards. The first dialog after launching the application will configure the graphics card/s to be used. Installers for some graphics cards can be provided by Theia3D, otherwise the graphics engine can be generated when launching Theia3D for the first time.

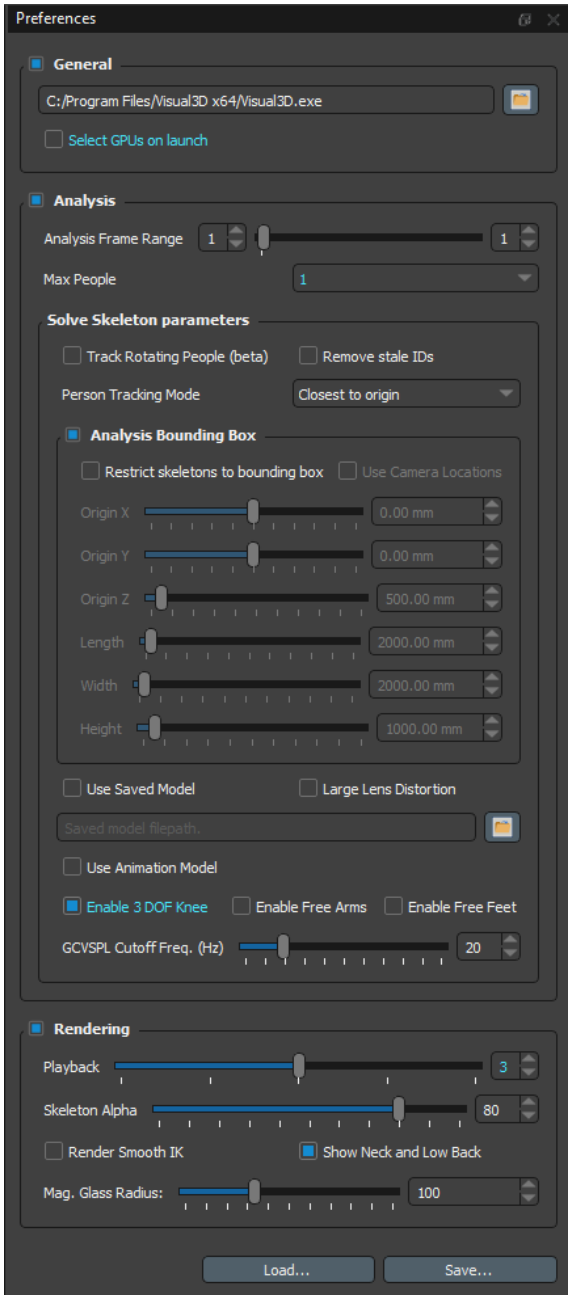


When selecting graphics cards to use, careful consideration will need to be made to determine the optimal configuration for which GPUs Theia3D will use. Depending on the number of GPUs and whether The MotionMonitor xGen and Theia3D will be running on the same computer and if the applications will be running concurrently will determine whether Theia3D can use all the GPUs or if it will need to share GPU resources with The MotionMonitor xGen. In the latter case, the GPUs assigned to each application would ideally be different.

When the GPU for Theia3D to use has been selected, the "Do not show this again" checkbox can be enabled to prevent this dialog from opening when the Theia3D application launches. This will ensure that Theia3D uses the desired graphics cards for processing when videos are provided by The MotionMonitor xGen. Care should be taken as the indexing method used to determine the GPU ordering in The MotionMonitor xGen and Theia3D may differ from what Windows uses when looking in Task Manager. It may be helpful to monitor the GPU usage through Task Manager when the applications are running to ensure that the configured settings are optimized. On computers configured by Innovative Sports Training, Inc, this process will have already been completed.

Note that the process of generating this graphics engine will take several minutes and needs to be repeated if the Theia3D application is updated. Before updating Theia3D versions, current graphics card drivers should be installed through the manufacturer's website.

2) Within Theia3D the Preferences settings can be optimized for your application through the Settings|Edit Preferences menu. The following settings are the default recommendations that should be applicable for most applications.

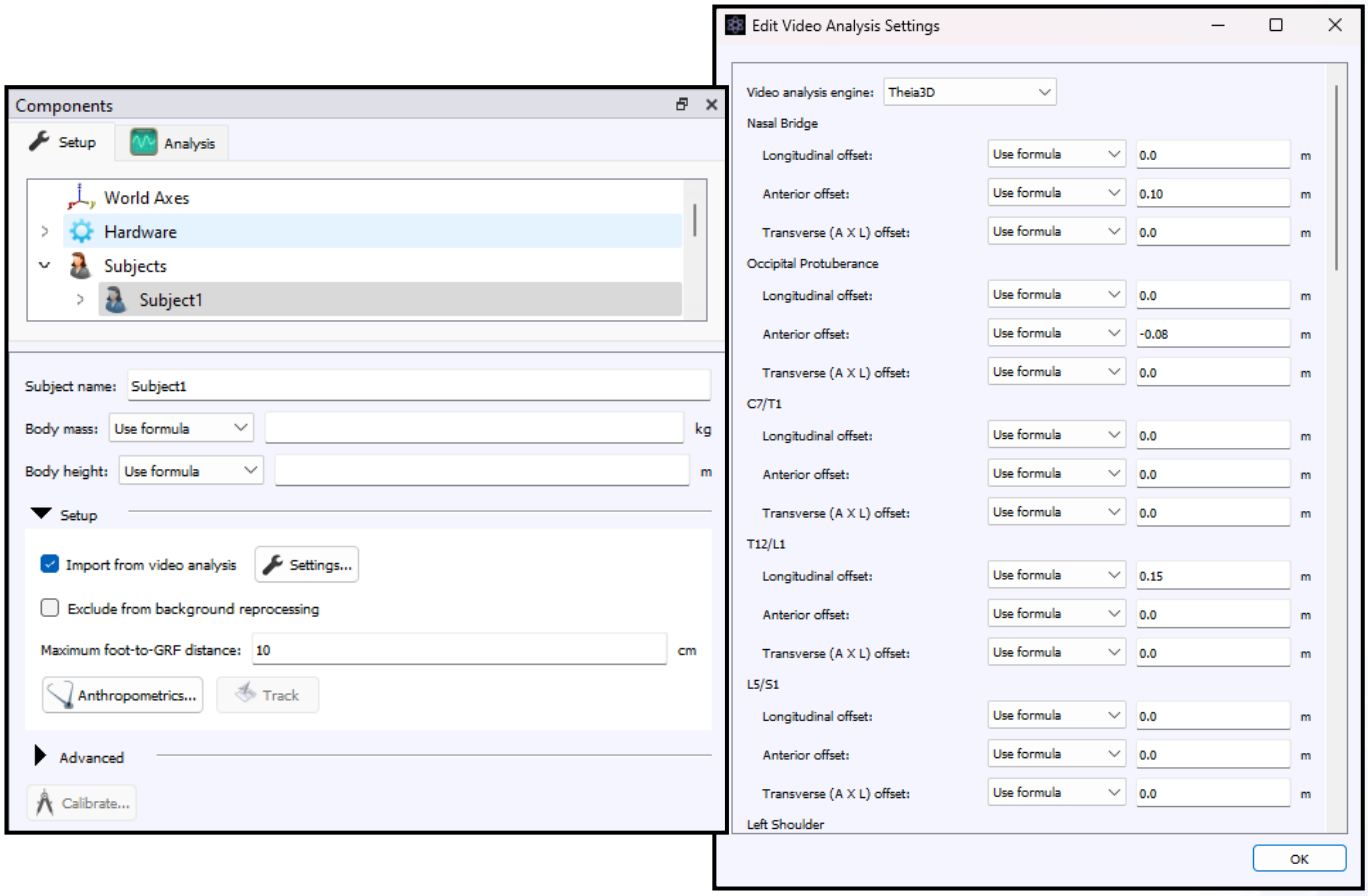


The Analysis Bounding Box settings allows users to restrict person tracking to within a specified 3D volume. When “Restrict skeletons to bounding box” is enabled, person tracking will not be performed outside of the defined bounding box. This can result in improved tracking and reduced processing times. The X, Y, and Z origin positions determine the center of the bounding box, and the length, width, and height settings determine the dimensions of the bounding box, in the X, Y, and Z directions, respectively.

After these settings have been configured, Theia3D can be closed and does not need to be run again unless different processing settings are desired. The MotionMonitor xGen will use the existing settings from when the Theia3D application was closed, so care should be made whenever modifying these settings. The settings should also be confirmed any time the Theia3D application is updated. When videos are processed through The MotionMontior xGen, Theia3D will be automatically spawned and should not be opened manually beforehand. The Select GPUs on launch dialog from the previous step can be re-enabled through this dialog, if needed.

3) Within The MotionMonitor xGen, the camera devices will need to be calibrated. Refer to the Knowledge Base article for Calibrating Cameras for instructions on how to perform this process. Only Basler cameras that have been calibrated will be used for markerless tracking. Webcam videos will not be sent to the Theia3D application even if they have been calibrated.

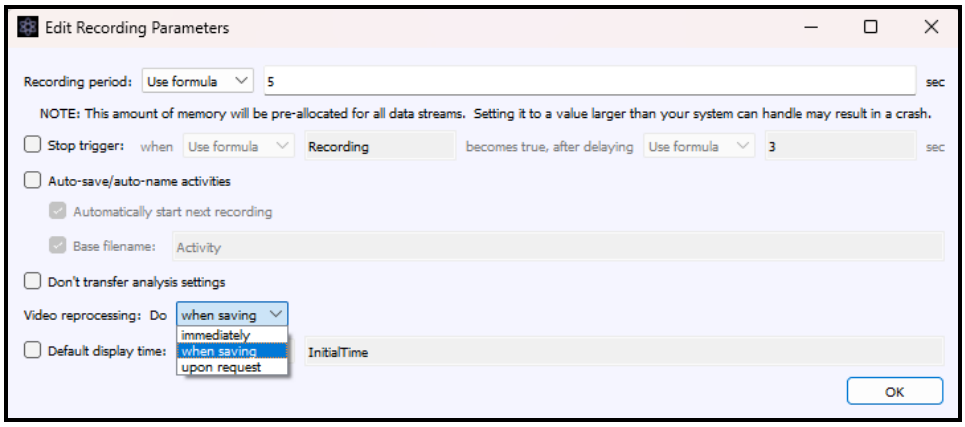
4) A Subject will need to be added to the Live Workspace before performing data collections.



Expand the Setup node in the Subject parameters panel and enable the “Import from video analysis” check box. This is the setting that will indicate to the software that any calibrated Basler videos should be sent to Theia3D. Click on the “Settings” button to open the “Edit Video Analysis Settings” dialog and select “Theia3D” from the “Video analysis engine” drop list. Joint center offset translations can be specified in order to move the joint center locations for the biomechanical model from the axes positions generated by Theia3D to the desired location for the joint centers.

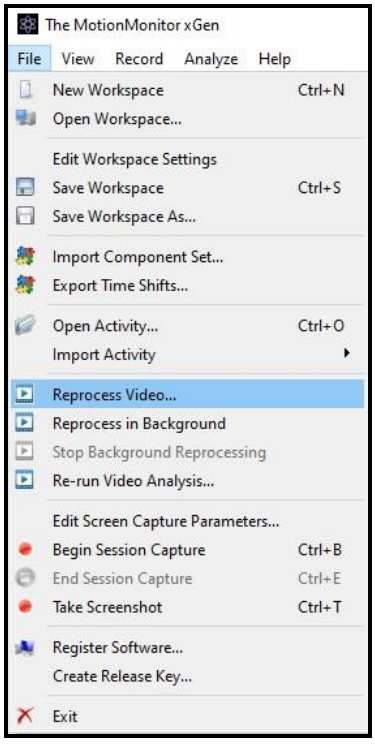
The “Exclude from background reprocessing” checkbox will prevent the recorded Activity file from being reprocessed when using the Reprocess in Background option, which will be described later. For instance, this might be the desired behavior when using the Analyze|Extract trials processing feature to separate longer Activities into several shorter Activities, thus reducing the total processing time. There may be any number of reasons why it would be desired to prevent an Activity from being reprocessed, but this setting can be modified after an Activity has been recorded and saved.

5) When performing recordings, the method in which video is reprocessed will determine when The MotionMonitor xGen will send the video files to Theia3D for processing. The method in which video files are processed is selected from the Edit Recording Parameters dialog prior to data collection. Click on the Record|Edit Recording parameters menu or Edit Recording parameters icon to open the Edit Recording Parameters dialog.



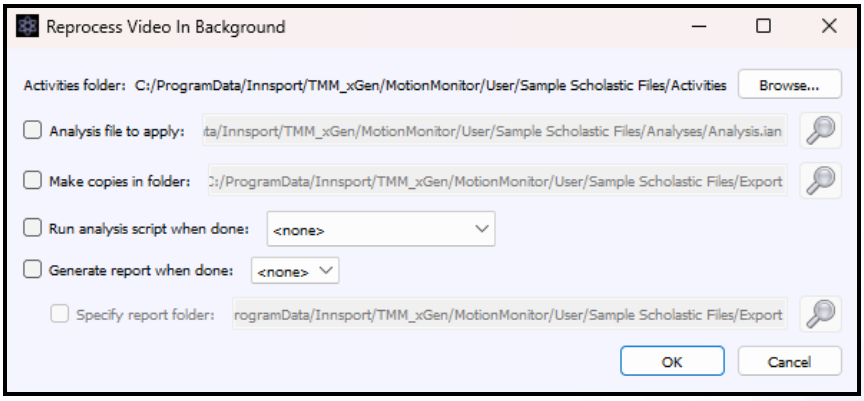
When processing “immediately” is selected, the videos will be immediately sent to Theia3D for processing upon completion of the recording and The MotionMonitor xGen application will wait for the data to be retrieved from Theia3D before proceeding. When processing “when saving” is selected, the videos will not be sent to Theia3D for processing until the Activity is saved. Other data captured in the Activity can be reviewed before saving and sending the video files to Theia3D for processing or the video files will be discarded if the Activity is not saved. When the Activity is saved, The MotionMonitor xGen application will wait for the data to be retrieved from Theia3D before proceeding. When processing “upon request” is selected, the user will be prompted to send the video files to Theia3D for processing each time the activity is opened, until the reprocessing has been performed.

Individual or batch processing of activity files with the video reprocessing set to “upon request” can be performed through the File|Reprocess Video or File|Reprocess in Background menus from the Live Workspace window.



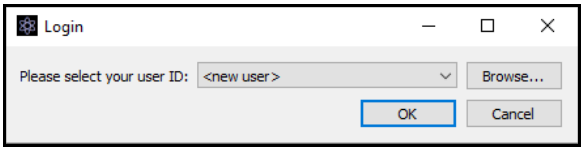
The Reprocess Video option will open a file browser window where the desired Activities to be processed can be selected. You will not be able to perform other operations within the application until the processing has run to completion or unless the process has been cancelled.

The Reprocess in Background option allows for video files to be sent to Theia3D in the background while subsequent Activities can be recorded or while performing other tasks within The MotionMonitor xGen. This can be run from another instance of The MotionMonitor xGen software on the same computer or on a networked computer. Running from a separate instance of The MotionMonitor xGen will help ensure that any data collection threads aren’t interfered with by the background processing threads. Consideration of the GPU selection, as mentioned previously, is important to ensure available GPU resources for The MotionMonitor xGen and Theia3D when running concurrently on the same computer.



The Reprocess Video In Background dialog includes a file browser selection button for selecting the target directory where the application will look for files that need to be reprocessed. There are also optional settings that can be applied to the Activity files when being reprocessed. If the "Analysis file to apply" option is enabled, the specified Analysis file will be applied to each Activity after the reprocessing step. This feature can ensure that the appropriate analysis settings are applied to Activities for when they are subsequently opened, allowing you to keep any analyses applied in the Live workspace to a minimum. If the "Make copies in folder" option is enabled, a copy of the Activity will be created in the target directory after the reprocessing step. If the "Run analysis script when done" option is enabled, the selected analysis script will run after the background reprocessing has completed. If the "Generate report when done" option is enabled, the selected report will be generated after the background reprocessing has completed, and you may also specify the folder to which this report is exported. The selections for the analysis script to run and generate report refer to what's in the current workspace, not the Activities.

When initially performing data collections or when selecting to run Reprocess Video or Reprocess in Background from another computer, the "Browse" button can be selected from The MotionMonitor xGen "Login" screen when first opening the software. This will allow you to work from and save Activity files to a shared or networked directory. The MotionMonitor xGen will default to this directory until another directory is selected when starting the software.



If logging into the same User directory, care should be taken when making any modifications to the workspace while running a separate instance of The MotionMonitor xGen since both instances will be modifying the same Current.iws workspace file for that User ID.

Note that the first time video data are processed within Theia3D during a session with The MotionMonitor xGen, the Theia3D application will take longer to initialize, but subsequent processing will occur more quickly.

6) When Theia3D data are brought into The MotionMontior xGen Activity files, biomechanical data can be analyzed and displayed in graphs or visualized in the Animation window and as an overlay in video windows, if enabled.

7) Activities and their associated video files can be processed through Theia3D again using the File|Re-run Video Analysis menu item. This option will open a file browser window where the desired Activities to be re-processed through Theia3D can be selected. The new Activity files will overwrite the existing files, so backup copies should be created first, if desired.