The MotionMonitor xGen Software Guide:
A Guide to Extracting Trials

This document reviews the process of using the Extract Trials function to truncate an existing Activity or to divide it into multiple, shorter, Activities using events defined in an Analysis file. The Extract Trials function is available in The MotionMonitor xGen version 3.77d or later and can be found within the Live Window under the Analyze menu or through the script function ExtractTrials().

The Extract Trials function can be used in several ways, including: 1) to trim recorded activities to a shorter length, 2) to extract periods of a recorded activity that have discrete start and stop events, such as a series of jumps or throwing tasks, and 3) to extract cyclical sections of a recorded activity that use the same event for the end of one section of interest as the start of the next, such as cycling or running. No data would be left out in between cyclical sections in this scenario.

Boolean variables are used to indicate where an Activity should be trimmed or where the start or end of a new Activity should occur.

The following examples will use the Gait walk1.iac and Bike Ride.iac activities found within the Sample Scholastic Files user folder.

1. **Trimming Trials That Are Too Long**
    Opening the Gait walk1 activity from the Sample Scholastic Files user folder you will see there are analysis variables defined for "**RightHeelStrike**" and "**RightToeOff**", both are Boolean variables and are True at two separate instances in time. These events can be used to trim the activity to a length between these two events, so right stance in this example. Note: Pay attention to the exact name of these Boolean variables.
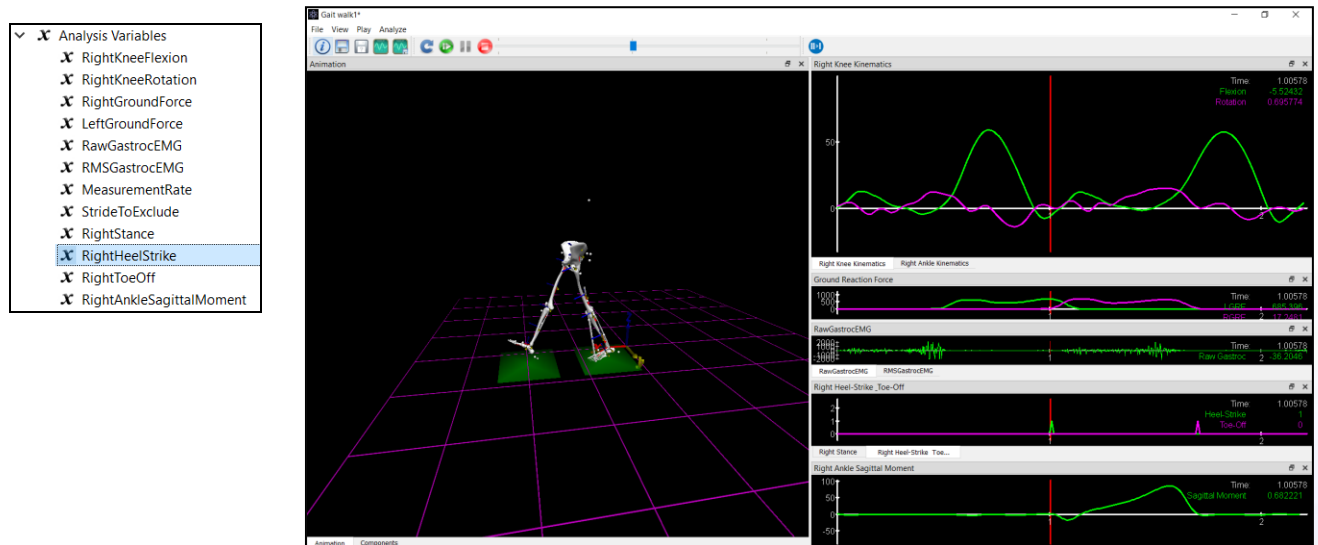
From the Live window, click on Analyze from the top menu item, click ⚙ Extract Trials…

The Trial Extraction Parameters window will open.
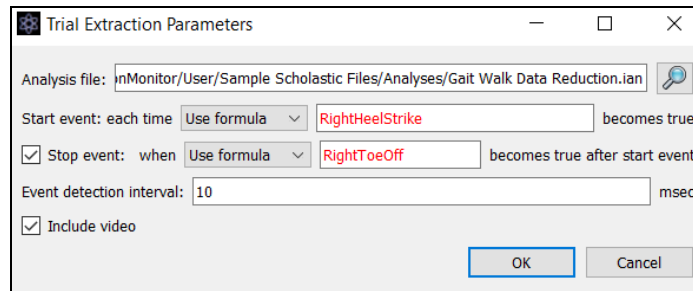
The Analysis file to be loaded should contain the definition for the Boolean variables that will be used for the start and stop events. For the Gait Walk activities there is an Analysis File named, "Gait Walk Data Reduction.ian", this is located within the Sample Scholastic Files Analyses folder. Browse to this file. Note that this analysis file is only applied to the Activity for the purpose of extracting new files, the original Activity and any resulting Activities that are generated will contain the same analyses as were in the original Activity file.

For the Start event, type "RightHeelStrike" in the formula field. Note this should exactly match the variable name that is defined within the analysis file being applied.

For the Stop event, type "RightToeOff" exactly as written in the analysis being applied. When this Stop event is checked, the activity will be trimmed to the period of Right Stance between RightHeelStrike and RightToeOff. If the Stop event is unchecked, the file will only be trimmed at the beginning and not at the end unless RightHeelStrike becomes True again.

Note: the start and stop events defined in the formula field will stay red unless they have been defined within the live workspace, it is not necessary to do this when they are defined within the analysis file. The Boolean expression must either be defined in the original Activity under the Setup Tab or within the Analysis file being applied.

The default Event detection interval of 10 msec is suitable for this activity but may need to be changed depending on the duration for when the Boolean is triggered as True. This sets the resolution at which the data is evaluated for the Boolean condition.

There is no video data included in the Gait walk1 activity so this may be left checked but it will not do anything. When checked, if video data is available the video would also be trimmed and would create a video file ".mp4" along with the activity ".iac" in the Activities folder.

Clicking OK, the user is prompted to browse to the activities of interest. You may select multiple activities here. There are three Gait walk activities provided in the Sample Scholastic Files user folder.

The software processes the extraction for each activity. The extracted activity files are saved to the same directory as where the original activity was located. The new files will contain the base file name "Gait walk1", "Gait walk2", "Gait walk3" plus the iteration number it was able to extract "_1" for all of the activities selected where these start and stop events occur. In the instance the Extract Trials function was performed on the original Activity again the activity files that are generated would be overwritten. So, it may be desirable to save the original activity with a new name or to move the extracted files to another location for further processing, as might be the case if performing a left and right side analysis on the same activity file.
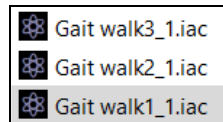
Upon Opening the "Gait walk1_1.iac" extracted file you can see it has been trimmed to the period of right stance. The time displayed within each extracted activity will start at 0 seconds. As the total duration for this activity is less than a second there are no time increments visible on the X axis. Scrolling through the trial you can see the time within the activity in the top right of each graph.
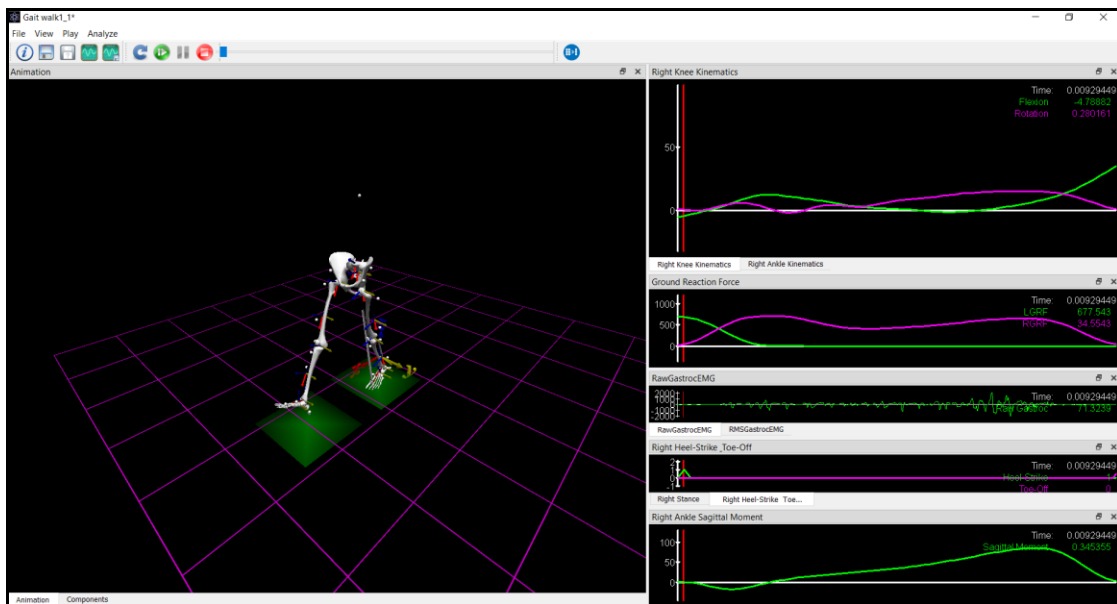
For the next section of this guide, The "Bike Ride.iac" activity from the Sample Scholastic Files user folder can be used to illustrate the trimming of trials with discrete start and stop events and trimming trials using the same event to define the end of one trial and the beginning of the next.

2. **Extracting Trials with Discrete Start and Stop Events**

Open the Bike Ride.iac activity from the Sample Scholastic Files user folder. In the Analysis Tab under the Analysis Variables node note there is not a Boolean variable defined. We will use the already defined RightKneeFlexion variable to define the start and stop Boolean variable required for the Extract Trials function.

Right click on Analysis Variables and select Add> Boolean Variable, this will populate at the bottom of the variable list. Select the new **B1** variable in the Analysis variable list, change the variable name to "**LocalMax**", change the Expression drop-list selection from Use drop-lists to Use formula, and in the formula field type the following formula:

*islocalmax(RightKneeFlexion,1,0.01) && (FinalTime - now())>0.1*
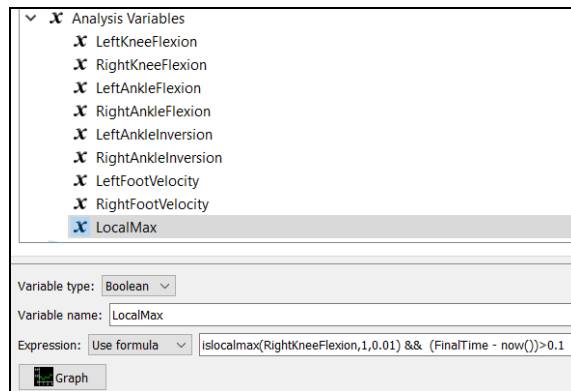
Details about the operators used in this example can be found in Appendix A of TMM xGen Elements Guide which may be found on our support page.

In brief, *islocalmax(RightKneeFlexion,1,0.01) && (FinalTime - now())>0.1* means: Indicate a True event if a local max event occurs for the RightKneeFlexion variable at frequency greater than 1 second at a measurement interval of 0.01ms, and when FinalTime (a default time variable) minus the time now is greater than 0.1 seconds.

When graphed, the Boolean events align with the peaks in the Right Knee Flexion graph.
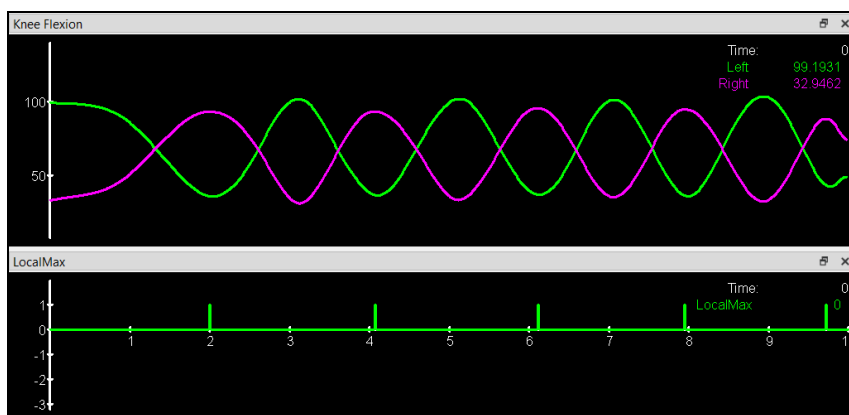
Note: If the latter portion of the formula is removed from the LocalMax variable definition the graph will have an extra erroneous event at the end of the activity. We do not want the extra erroneous event included in trial extraction as it is an incomplete cycle.
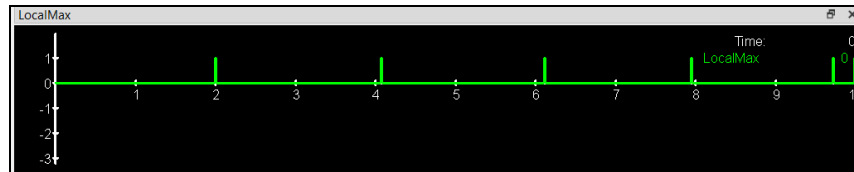
Save the activity using the save icon or by clicking File from the top menu item and clicking save. Save the analysis by clicking on the Save Analysis As icon if available or from Analyze menu item and clicking Save Analysis As. You may write over the Bike Ride.ian found within the Sample Scholastic Files Analyses folder or create a new analysis file. The activity may be closed or minimized.

From the Live window, click on Analyze from the top menu item, click Extract Trials…

The Trial Extraction Parameters window will open.
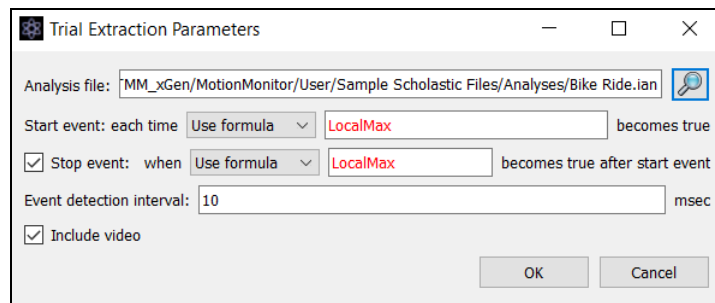
Browse to the newly saved analysis file "Bike Ride.ian" in this example. Using the "LocalMax" written exactly as it was for the variable name in the Analysis for the Start and Stop events.

Click OK and select the Bike Ride activity from the Sample Scholastic user Activities folder. If the start and stop event names cannot be found during the extraction process an error message will pop up. In this instance check the correct Analysis file is selected or update the analysis file as necessary.

When the Trial Extraction function is run with the above settings, two additional trials are created within the Sample Scholastic Files Activities folder with base name "Bike Ride" and "_1" and "_2" indicating trial part 1 and 2, respectively.
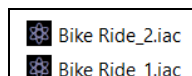

In this example only 2 trials were created because the stop event was checked (irrespective if it had the same name or not). This means that in the edited Bike Ride.iac activity the software looked for the first instance of LocalMax as the start event (at ~2s) it then looked for the first stop event named LocalMax after the start (at ~4s). It then looked for the next instance of LocalMax to become the start

of the next trial (at ~6s) and the next stop (at ~8s). The third trial could not be completed because there was not another stop event defined.
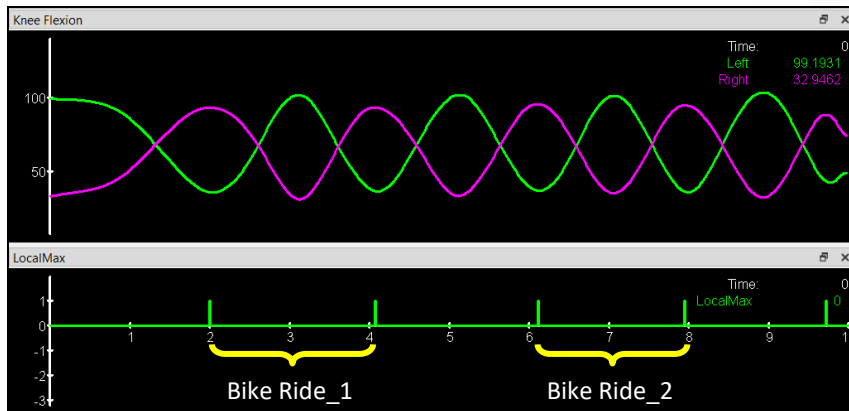
3. Extracting Trials That Are Cyclical

Using the same Bike Ride activity and analysis as above, by unchecking the stop event in the Trial Extraction parameters, the software will extract 4 consecutive activities. The start event will be used as the start and stop event and the stop event from the previously extracted activity will be used for the start of the subsequent activity.
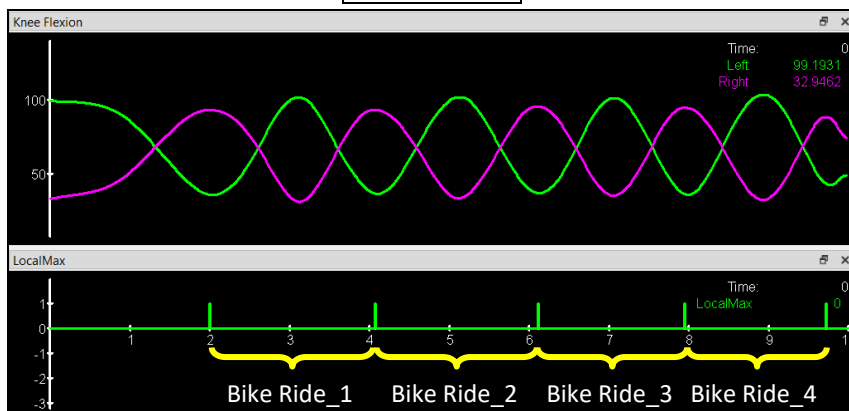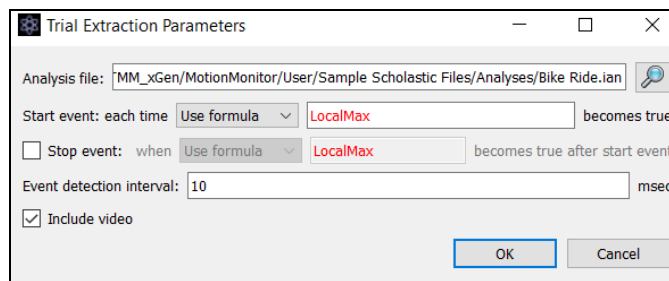
4.

Now that the shorter activities have been created either further processing can be completed, or these trials are now suitable to be used with Data Reduction for ensemble averaging. Please see the Data Reduction Guide for more information on this process.