

Quintic Software

Tutorial 7a

Manual Digitisation

V35

Contents Page

- 1. Digitisation**
- 2. Calibration**
- 3. Custom Origin**
- 4. Create a Frame Template**
 - a. Default Digitisation Template
- 5. Manual Digitisation**
- 6. Review/Editing an Existing Digitisation Trace**
 - a. Editing a digitised trace
 - b. Re-calibrating an already digitised video
 - c. Filtering a digitised trace.



1. Digitisation

Digitisation allows you to track the location of certain parts of the body or pieces of equipment throughout the duration of a video clip. Quintic software can then calculate linear and angular distances, velocities and accelerations of the points you have tracked.

The 3 different levels of software will allow you to digitise a different number of points:

Quintic Sports v35 – 1 Point Manual Digitisation

Quintic Coaching v35 – 2 Point Manual Digitisation

Quintic Biomechanics v35 – 21 Point Manual Digitisation

2. Calibration

To begin digitisation, you must first calibrate the video clip. This means that the computer can then convert a distance on the computer screen (pixels) to its relative distance in the real world. Video recording speed also needs to be set so that time-based data e.g. velocity and acceleration, can also be calculated accurately.

Open the video you wish to digitise within Quintic software.

Click on the '**Digitisation**' tab and then on the '**Digitisation**' menu.

Create Frame Templates

Default Frame Template >

Default Learnt File >

Video File Calibration >

Custom Origin >

Load External Calibration File (Repeatable Trials)

Manual Digitisation of a New Trace

Automatic Digitisation of a New Trace (White or Black Markers)

Intelligent Digitisation of a New Trace (White Markers)

Either:

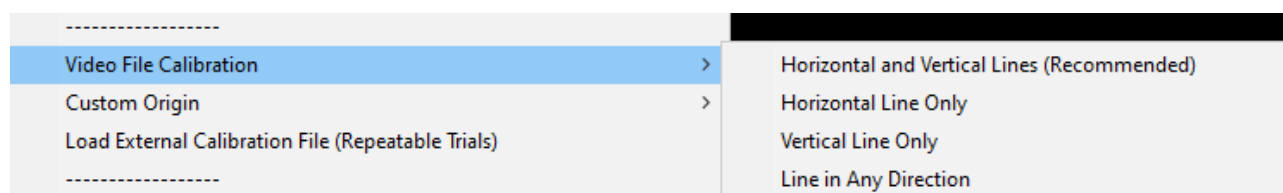
a) Select **'Video File Calibration'** from the drop down menu, if you know the length of something that is part of the action (e.g. a javelin, cricket bat, leg length or stump height).

Choose one of the options presented:

- If you know certain distances in both the horizontal and vertical directions then choose **'Horizontal and Vertical Lines'**
- If only the horizontal distance is known then choose **'Horizontal Line only'**
- If only the vertical distance is known then choose **'Vertical Line only'**
- If any other distance is known then choose **'Line in any Direction'**.

Hold the cursor over one end of the known distance, click the left mouse button and drag the cursor to the other end. Enter the distance and click **'Accept'**

Once the distance has been completed, the software will ask for the frames per second (FPS) of the video. If a Quintic High Speed Camera is used, this will be the true frames per second of the video. If a mainstream camera is used, you may be required to input the frames per second that was used.



Or

b) Select **'Load an external calibration file'** if you have used the same background and camera position as a previous video that has already been calibrated.

Important: The camera must not have been moved between the filming of the two clips.

An accurate video recording speed is required to calculate accurate velocity and acceleration. Please make sure this is correct before using the linear or angular analysis functions.

PRACTICAL EXAMPLE

Open the video **'Bowling – Side view'** from the **'Cricket'** folder.

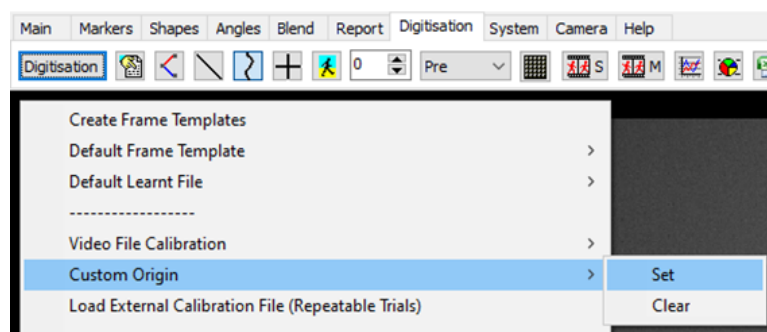
Click on the **'Digitisation'** tab and then on the **'Digitisation'** menu.

3. Custom Origin

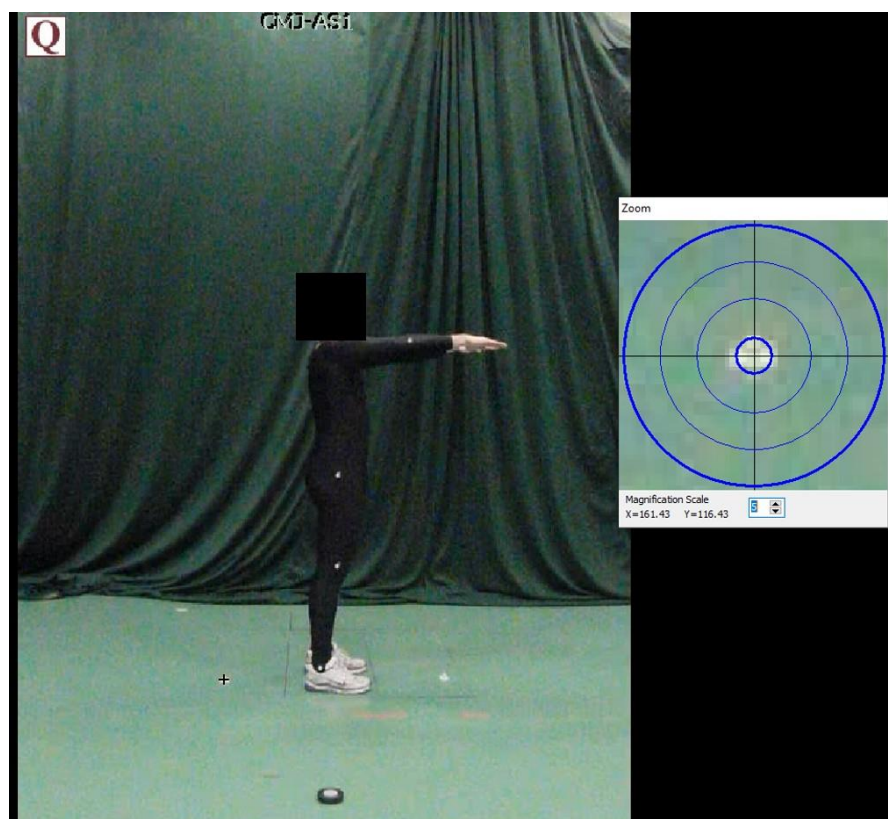
Users are able to set their own custom origin point for the video. This is ideal for users who would like their linear data to be relative to the floor for example.

Please note that the video must already be calibrated before the user is able to move the origin.

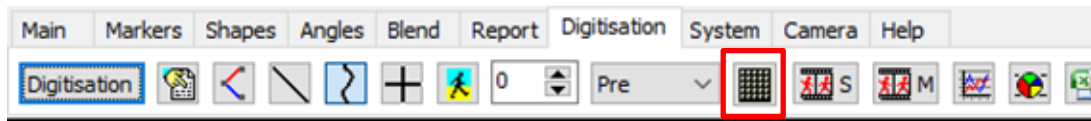
The Custom Origin can be changed by going into the Digitisation Tab > Digitisation > Custom Origin > Set.



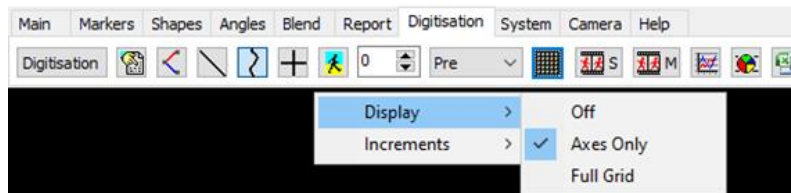
The user then simply clicks on the video where they would like their new origin point to be. A magnifier will appear on the screen so that the user is able to click their origin precisely.



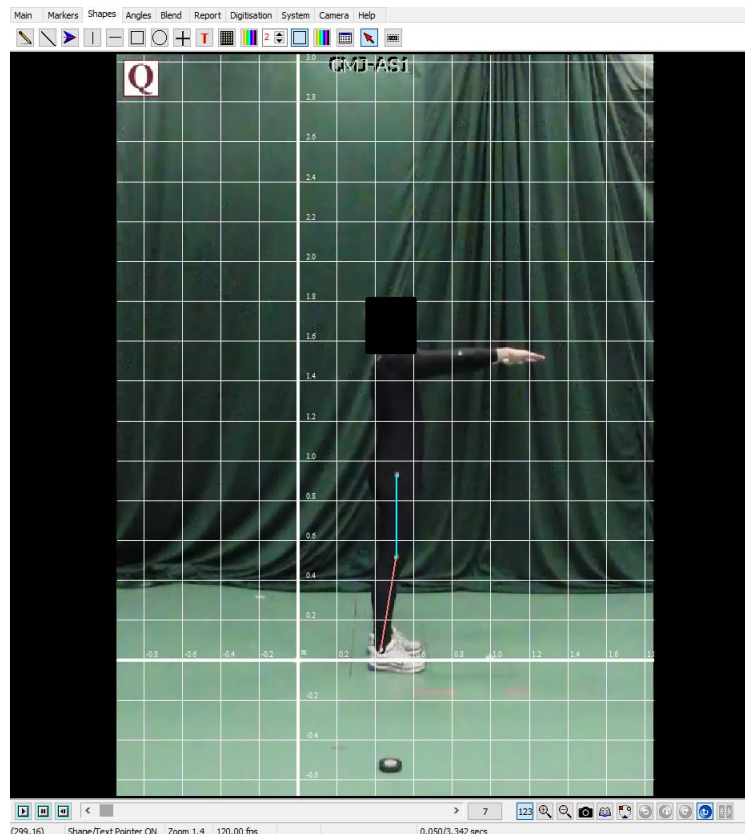
Once the origin of the video has been changed, users are able to check the new origin point by selecting the 'Calibrated Grid' option within the Digitisation tab.



Users can then go to Display > Axes Only, which will display the new origin point on the video in a graphical format. Users can also show the Full Grid if they prefer and change the increments of the grid.



Please see below an example of the custom origin, with the full grid displayed.



Once you have digitised your video, you are then able to use your custom origin within the linear analysis windows (single or multi). Please see Tutorial 8b & 8c for further information on how you are able to use the Custom Origin within the Linear Analysis.

4. Create a Frame Template

N.B. Only one point is available in Quintic Sports, 2 points in Quintic Coaching and 21 points in Quintic Biomechanics. The following template has been created in Quintic Biomechanics.

Quintic have already created a range of templates that you are able to use, depending on which level of Quintic software you are using. You are able to find these within your '**Quintic Sample Videos**' folder then '**Templates**'.

Should you wish to create your own template, please see below.

From the '**Digitisation**' menu click '**Create Frame Template**'. The following window will appear

The screenshot shows a window titled 'Digitisation' with a close button (X) in the top right corner. Below the title bar is a section labeled 'Create Templates'. It contains the following elements:

- Model Title:** A text box containing 'Reference Model A'.
- Link Colour:** A red color swatch.
- Link Width:** A numeric input box set to '2' with up and down arrows.
- Points:** A numeric input box set to '6' with up and down arrows.
- Step Size:** A numeric input box set to '1' with up and down arrows.
- Point Selection:** A row of six colored boxes labeled 2, 3, 4, 5, and 6. Box 2 is green, 3 is yellow, 4 is blue, 5 is magenta, and 6 is cyan.
- Point List:** A table with 6 rows and 2 columns. The first column contains numbers 1 through 6. The second column contains text boxes for point names and a color swatch.

Point	Name	Color
1	Point1	Red
2	Point2	Green
3	Point3	Yellow
4	Point4	Blue
5	Point5	Magenta
6	Point6	Cyan

To the right of the point list is a diagram showing a grid of red-outlined boxes. The boxes are arranged in a triangular pattern, representing the connections between the points. The top row has 5 boxes, the second row has 4, the third has 3, the fourth has 2, and the fifth has 1. The boxes are connected by red lines, forming a mesh.

Model: Name your model so that in the future you can use it again.

Points: Select the number of points you are going to track in the movement. Sports is able to do 1 point, Coaching 2 points and Biomechanics 21 points.

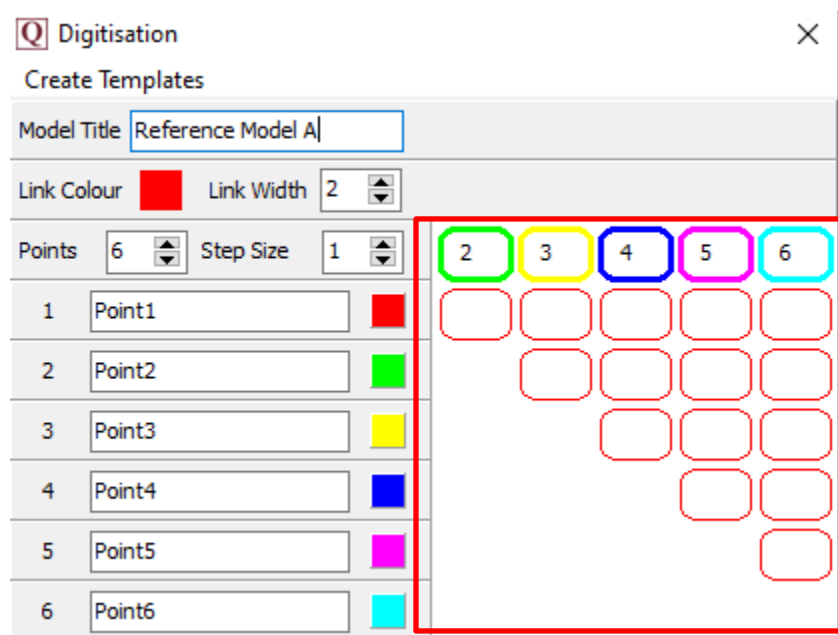
Step Size: This states how frequently frames will be digitised (1 = every frame, 5 = every 5th frame etc).

Link Width: This is the width of the lines that join up the points. 1 = Thin line, 10 = Thick line.

Point Names: You can change the names from '**point 1**', '**point 2**' etc to specific names of the anatomical points you are going to use.

Point Colour: Left click on the coloured box next to each point and select a colour from the palate. This will allow you to change the colour of each point.

Links between points: To join points together simply click on the box which links the two points you wish to join together. You can find this next to the named points. If you click the coloured box next to '**Default Colour**' this will control what colour you would like the link to be between each point. To remove the colours from one of the squares, right click on it.



To save the template Click '**Create templates**' in the top-left of this window and click '**Save As**'.

N.B. This will replace any previous traces with the same name.

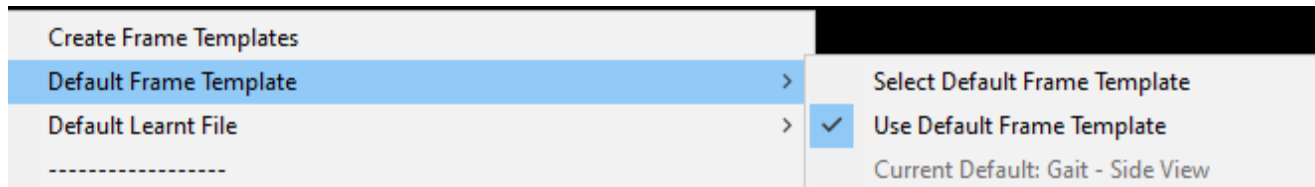
PRACTICAL EXAMPLE

Create a 4-point template. We will be digitising every frame so have the step size set to 1. We want a thin line to be drawn so have the link width set to 1. The 4 points we will be digitising are the 'Hip', 'Knee', 'Ankle' and 'Toe' therefore name the points as such. We would like to connect the hip, knee, ankle and toe together - this can be done by connecting points 1 to 2, 2 to 3 and 3 to 4. You could also change the colour of each link just so this is easily identifiable.

Save the template as 'Bowler leg – 4 point' and save it in the 'Cricket' folder.

a. Default Digitisation Template

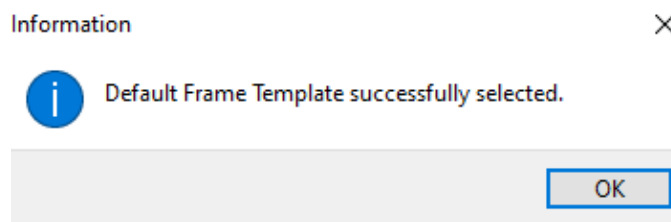
Users also have the option to choose a default digitisation template, removing the need to select it each time. Ideal for users who use the same digitisation template on a regular basis.



To begin, click on 'Default Frame Template' within the Digitisation Menu.

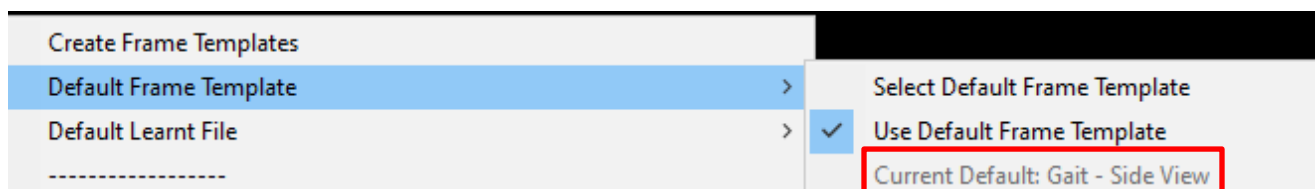
Then click 'Select Default Frame Template' and choose your preferred template.

Once you have selected your preferred digitisation template, the following pop up will appear, confirming you have selected your default digitisation template:



To use the default template, simply click 'Use Default Frame Template' if you want this to be used all the time.

The current default template is shown at the bottom of this menu:



5. Manual Digitisation

Once you have calibrated the video and you have created/located the digitisation template you would like to use, you are ready to manually digitise.

To do this, open the video you are looking to digitise within Quintic software.

Click on '**Digitisation**' tab then the '**Digitisation**' menu and then click on '**Manual Digitisation of a New Trace**'

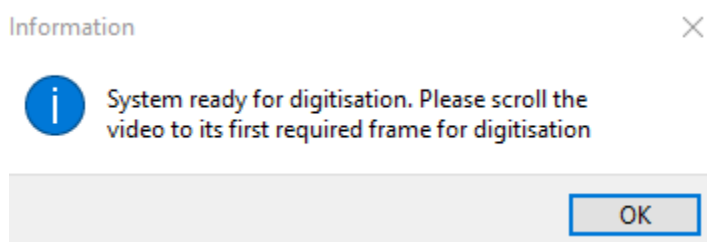
This will pop up a new window where you will be required to find the template you are going to use for manual digitisation.

N.B If the video has not been calibrated a window will pop-up asking you to calibrate the video.

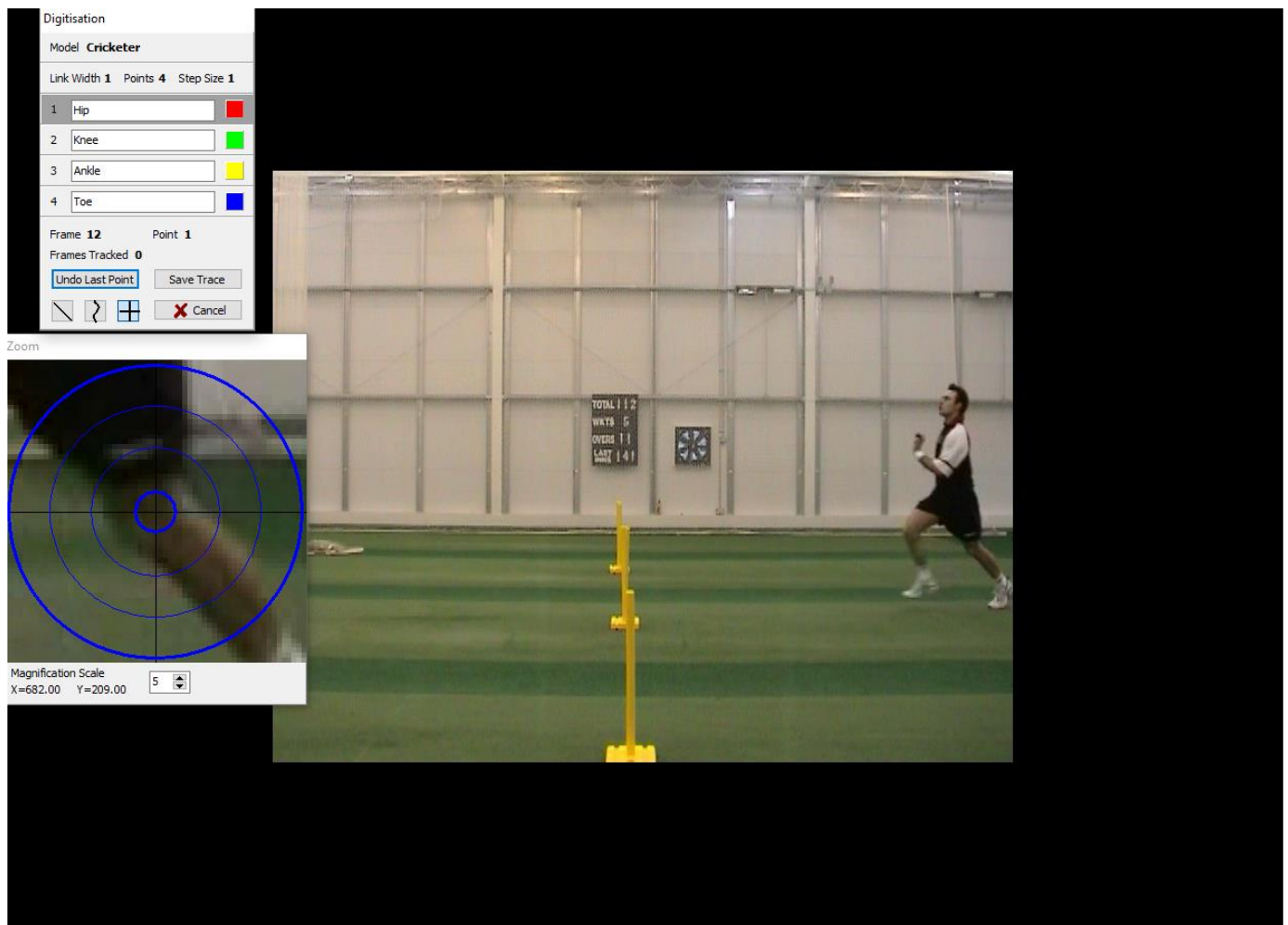
N.B If a video has already been digitised, a window may pop-up asking if you want to overwrite the existing trace.

For the practical example, please navigate to the cricket folder and open '**Bowler leg – 4 point**' template.

Once you have selected the template, this will pop up

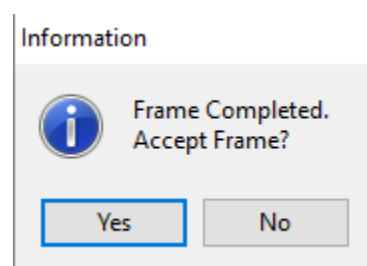


We are going to digitise the left leg of the bowler so scroll to the first frame in which their whole left leg is visible (Frame 12). Now we are ready to digitise.



As the cursor moves across the screen, the zoom window shows a larger version of the area under the cursor. Use this to pinpoint the exact locations of the hip, knee, ankle and toe, per frame.

To manually digitise, simply click on the relevant points on the video. This must be done in the correct order as the template and as accurately as possible. Once you have completed a frame, this pop up will appear asking to accept the frame.



If they are correct, click '**Yes**' and the video will automatically advance to the next frame ready for digitisation.

If you make a mistake, click the **'Undo Last Point'** button.

The following buttons can be used to change how the trace is viewed during digitisation:



- Show/hide figure lines



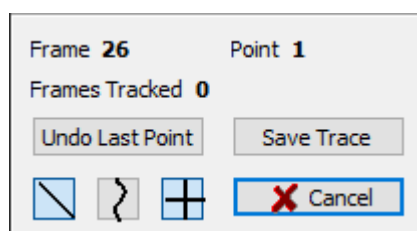
- Show/hide smoothed trace



- Show/hide crosses

Continue to digitise until the bowler moves off the screen or until you do not wish to digitise any further, then click **'Save Trace'**.

If you click the Cancel button, this will quit the Manual Digitisation and any digitisation that has taken place up to that point will be lost.



You are able to save a digitisation trace and then carry on Manually digitising it at a later point. This can be done by clicking the Digitisation button within the Digitisation tab, then clicking **'Continue Manual Digitisation of an Existing Trace'**.

This will allow the user to carry on digitising from the next frame after the last frame previously digitised. Please note, you are unable to re-edit previously digitised frames within this window.

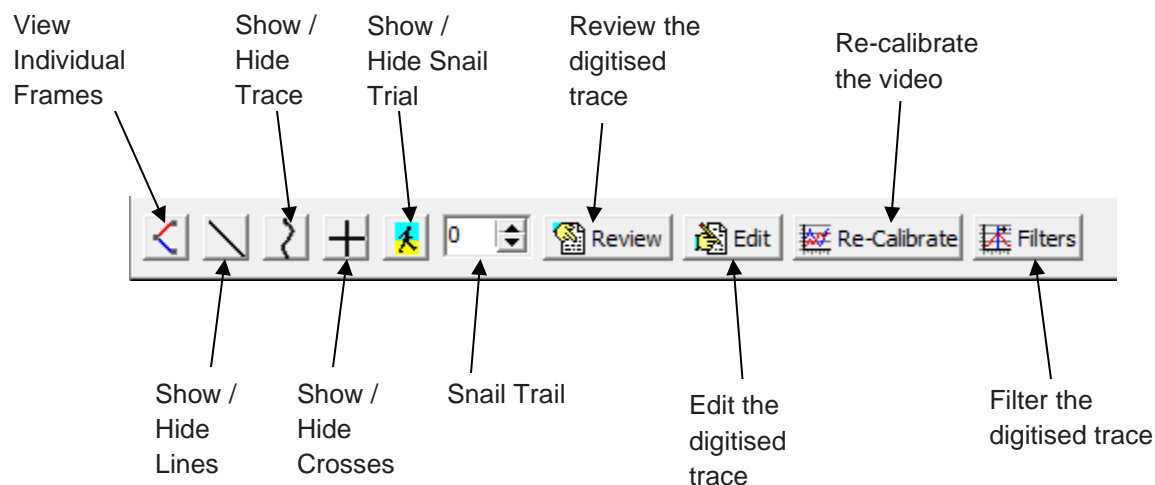
6. Review/Editing an Existing Digitisation Trace

Should you like to edit a trace, you are able to do this by clicking on the 'Review/Edit an Existing Trace' button which is found by clicking the Digitisation button, within the Digitisation Tab.

This will pop up the following window, where you are able to Review, Edit, Re-Calibrate or Filter the digitisation trace.

IT MUST BE A SINGLE STEP TRACE IN ORDER FOR IT TO BE EDITED.





View Individual Frames – Shows the digitisation trace at that particular frame. If there are any links joining the points together, this will be displayed.

Show / Hide Lines – Shows the lines between the digitisation points. This will also include the current and all previous digitised frames (depending on whether the snail trail is in use).

Show / Hide Trace – Shows the smoothed digitisation trace. This will also include the current and all previous digitised frames (depending on whether the snail trail is in use).

Show / Hide Crosses – Shows the crosses of where the software has tracked each point. This will also include the current and all previous digitised frames (depending on whether the snail trail is in use).

Show / Hide Snail Trail – Shows a snail trail, where the user is able to control how many previous frames are to be displayed.

Snail Trail – Allows the user to control how many frames are to be displayed behind the current frame.

Review the digitised trace – This will allow the user to review the digitised trace.

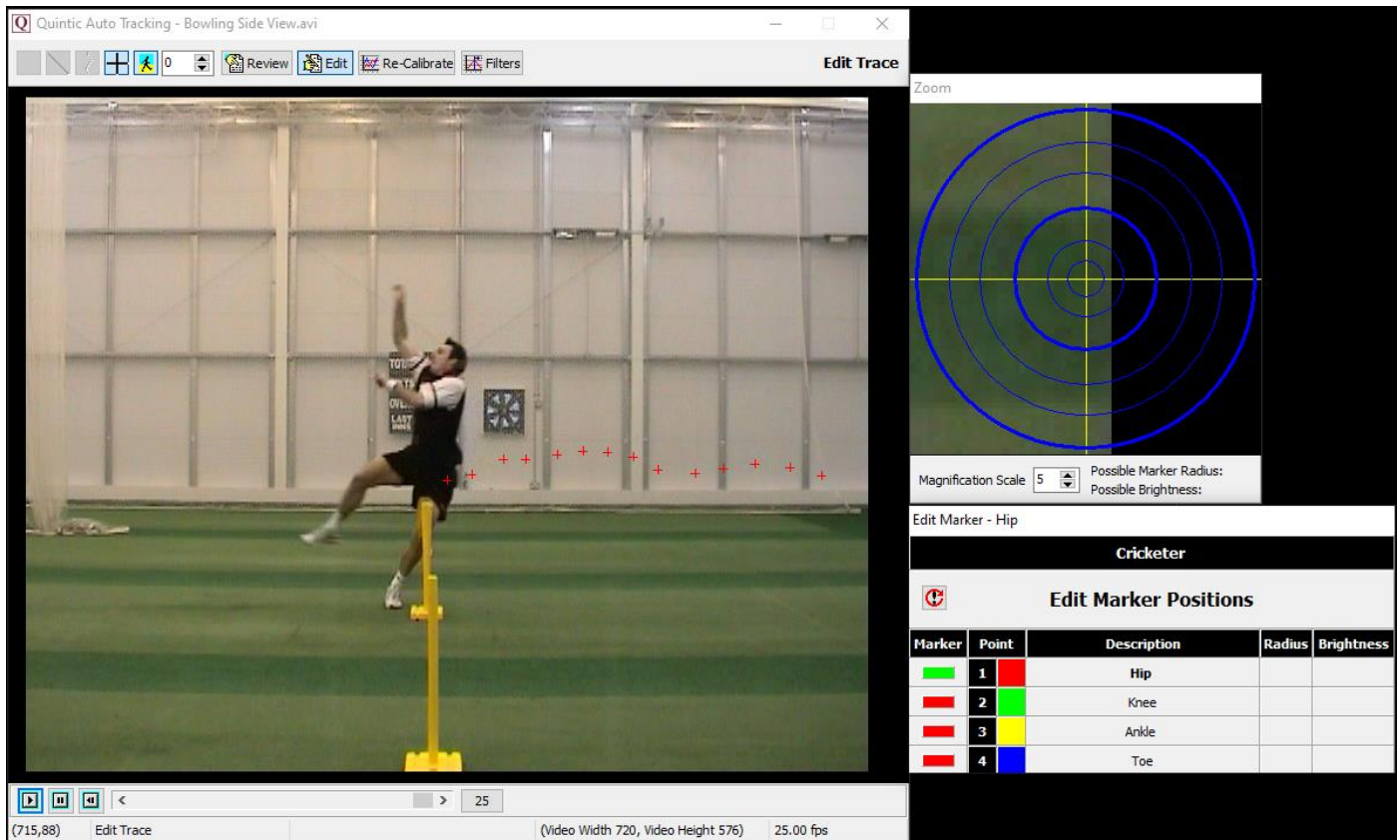
Edit the digitised trace – This will allow the user to edit the digitisation trace. Please see the heading 'Editing a Digitised Trace' below for more information on how to do this.

Re-calibrate the video – This will allow the user to re-calibrate the video. Please see the heading 'Re-Calibrating an already Digitised Video' below for more information on how to do this.

Filter the digitised trace – This will allow the user to filter the digitisation trace using a Butterworth filter. Please see the heading 'Filtering a Digitised trace' below for more information on how to do this.

a. Editing a Digitised Trace

Press 'Edit' within the Edit Trace Data Window, which will pop up the 'Edit Marker Position' window.

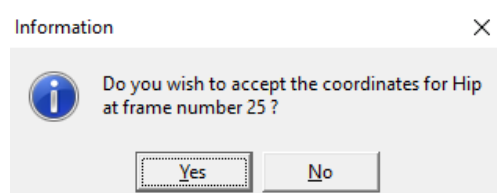


This will bring up all of the digitisation points for every frame that has been digitised, one point at a time. The point that is currently active will be displayed in green, so for the example above, the hip point is displayed. All the other points in the marker set will be highlighted in red within the Edit Marker Positions box.

N.B. You can only edit one trace at a time.

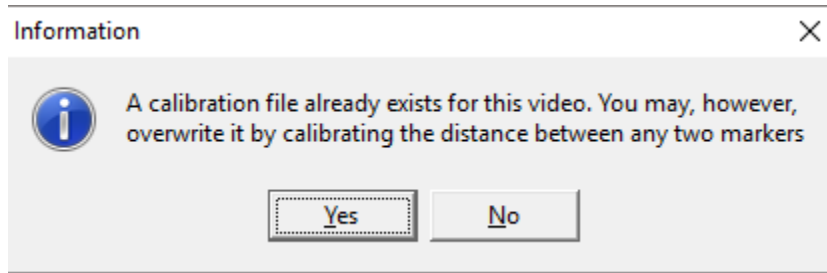
To edit, simply click on the marker point of interest and scroll to the frame(s) of which you want to edit and click on the screen to overwrite that digitisation point for that frame.

Once clicked, it will bring up a pop up to confirm that you are happy to accept the new point in the digitisation trace. Simply click YES if you are or NO to locate that point again.

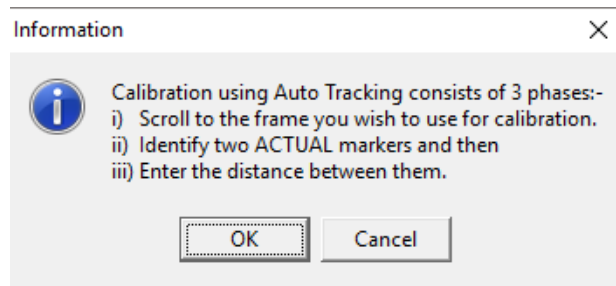


b. Re-Calibrating an Already Digitised Video

Should you ever be required to re-calibrate a digitised video, please select the 'Re-Calibrate' Button within the Edit Window. This will pop up a new window stating this video already has a calibration file and asking if you would you like to Re-Calibrate. If you would like to, simply click yes, if not, click no and this will continue to use the existing calibration file.

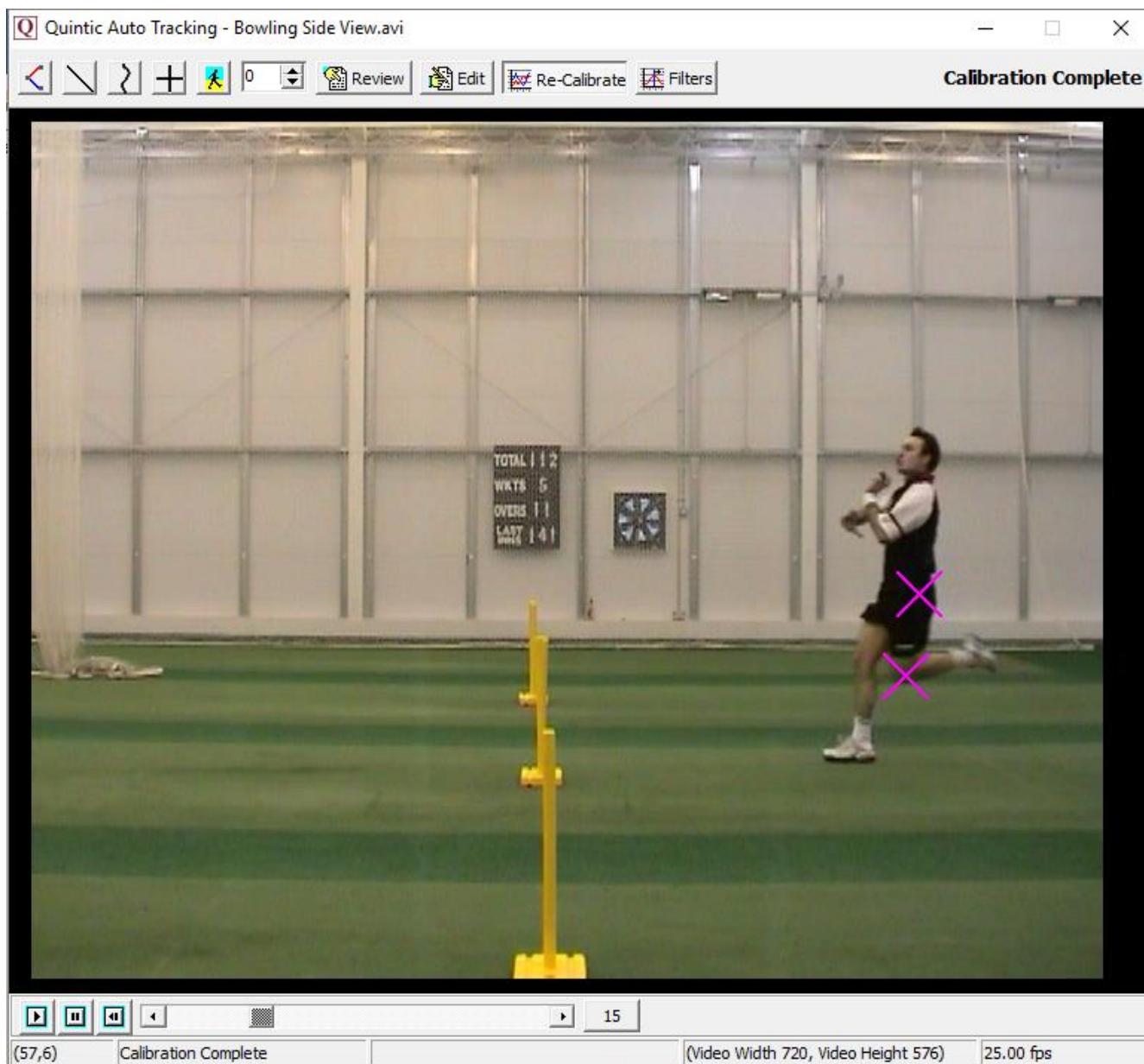


If you clicked yes, you will be brought to the following pop up window, where you will be required to scroll to the frame you wish to use for re-calibration, identify the two markers you wish to use for re-calibration, then enter the distance between them.



When re-calibrating, the software will only calibrate between two markers that have been digitised. Once you have selected the two markers and entered the distance between them, it will say calibration complete. Please see example below.

The software will 'lock on' to the nearest real marker point to where the user clicks.

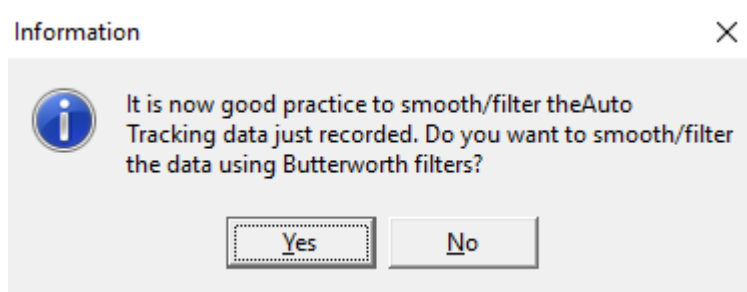


c. Filtering a Digitised Trace

It is important to smooth data that has been produced by digitising to remove any errors that may have occurred during the digitisation process, e.g. marker /skin / clothing movement errors.

If you would like to filter the digitised data, please select the 'Filters' Button within the Edit Window.

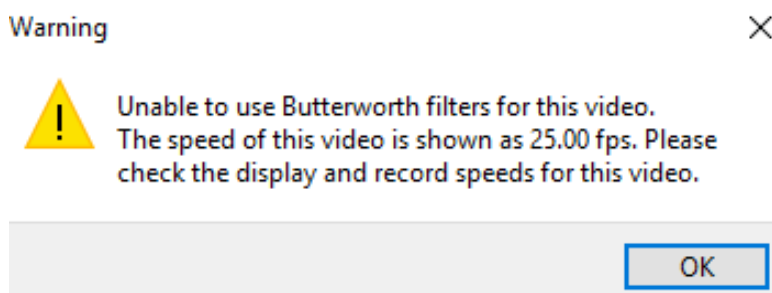
This will bring up the following window.



N.B The recording speed of the video has to be above 25 fps in order for that video to be filtered.

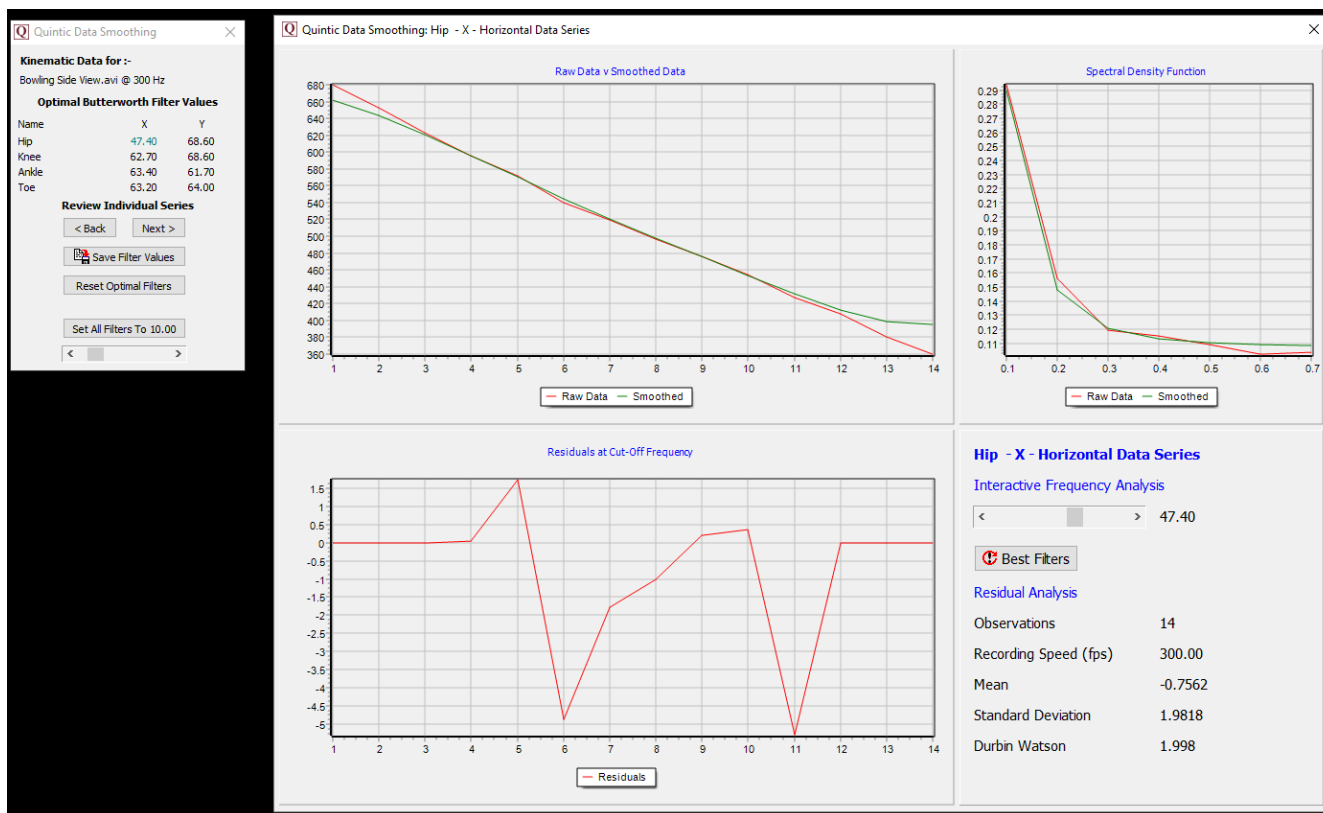
If you click No, no Butterworth filters will be applied.

If you click Yes but your video is less than or equal to 25 fps, the following message will appear.



If you clicked Yes and your video is greater than 25 fps, you will be brought to the screen below, to begin the data filtering procedure.

The '**Quintic Data Smoothing**' window will now load, illustrating the optimal Butterworth Filter values that have been placed on the data to smooth any data anomalies that may have occurred during the digitisation process.



Quintic Data Smoothing

Kinematic Data for :-
Bowling Side View.avi @ 300 Hz

Optimal Butterworth Filter Values

Name	X	Y
Hip	47.40	68.60
Knee	62.70	68.60
Ankle	63.40	61.70
Toe	63.20	64.00

Review Individual Series

< Back Next >

Save Filter Values

Reset Optimal Filters

Set All Filters To 10.00

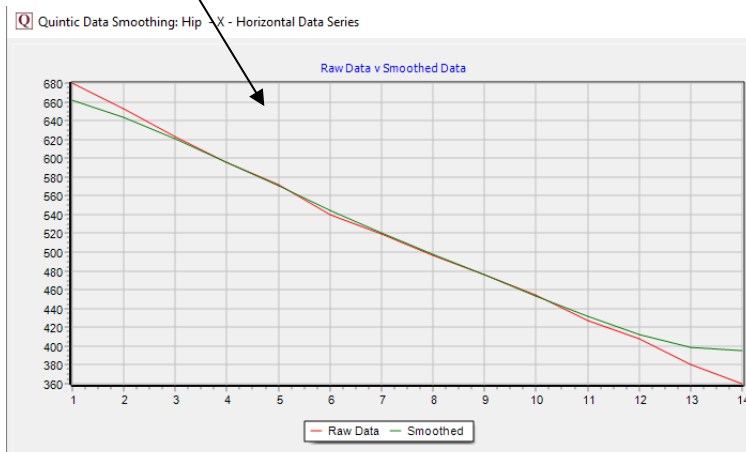
< >

Each point that has been digitised has its X and Y co-ordinates smoothed independently. These smoothing values are shown in the Quintic Data Smoothing window above, e.g. 47.40.

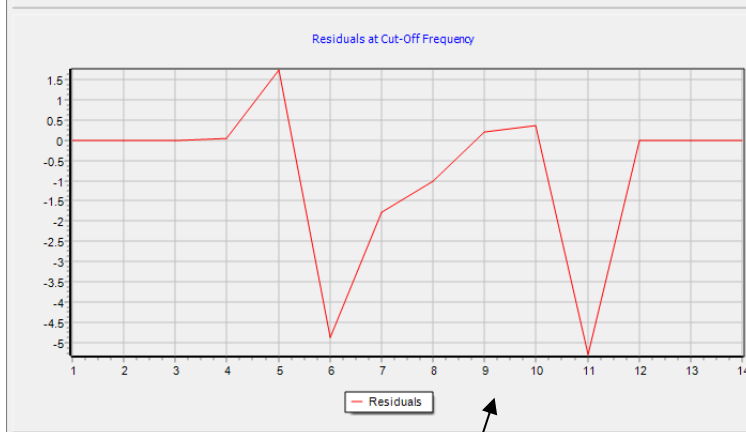
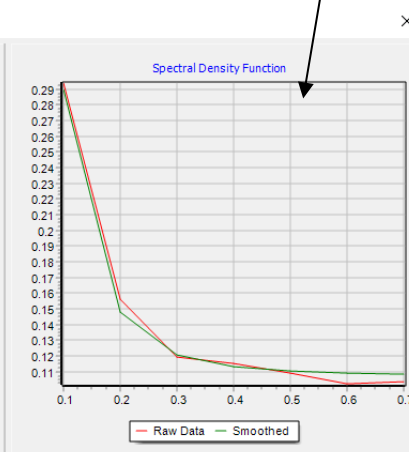
To move between each filter value, please click on the Next or Back buttons.

Should you like to review the filter settings to confirm optimal filters have been used, you are able to consider these values in the additional window. Please see below for more information on this window.

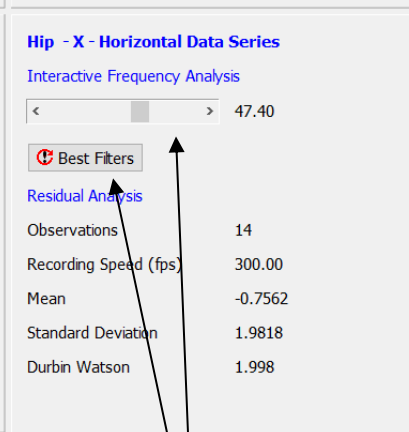
Raw Data v Smoothed Data



Spectral Density Function



Residuals at Cut Off Frequency




Interactive Frequency Analysis

Raw Data v Smoothed Data - This graph illustrates values for both the raw and smoothed data.

Spectral Density Function - Describes how the energy (or variance) of a signal or a time series is distributed with frequency. In physics, the signal is usually a wave, such as an electromagnetic wave, random vibration, or an acoustic wave. The spectral density of the wave, when multiplied by an appropriate factor, will give the power carried by the wave, per unit frequency.

Residuals at Cut off Frequency - This illustrates the difference between the raw and smooth data. Good values should oscillate around 0. If predominantly positive or negative values are produced, an incorrect filter value has been used.

Interactive Frequency Analysis - This function allows the user to control the level of filtering that is placed upon the raw data, by using the scroll bar. To reset the filters back to their optimum value, click on the 'Best Filters' button.

Once you are happy with the filter values that have been applied, simply click the Save Filter Values  button and close the smoothing window(s).