Quintic Software Tutorial 8c

Intelligent Digitisation

V31

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1. Introduction to Intelligent Digitisation

Intelligent Digitisation is able to automatically find, relocate and interpolate lost markers which get obscured or go out the field of view. There is no need for any manual intervention, making analysis quicker, easier and more accurate than Manual or Automatic 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 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 v31 – Intelligent Tracking is not available

Quintic Coaching v31 – 2 Point Intelligent Tracking

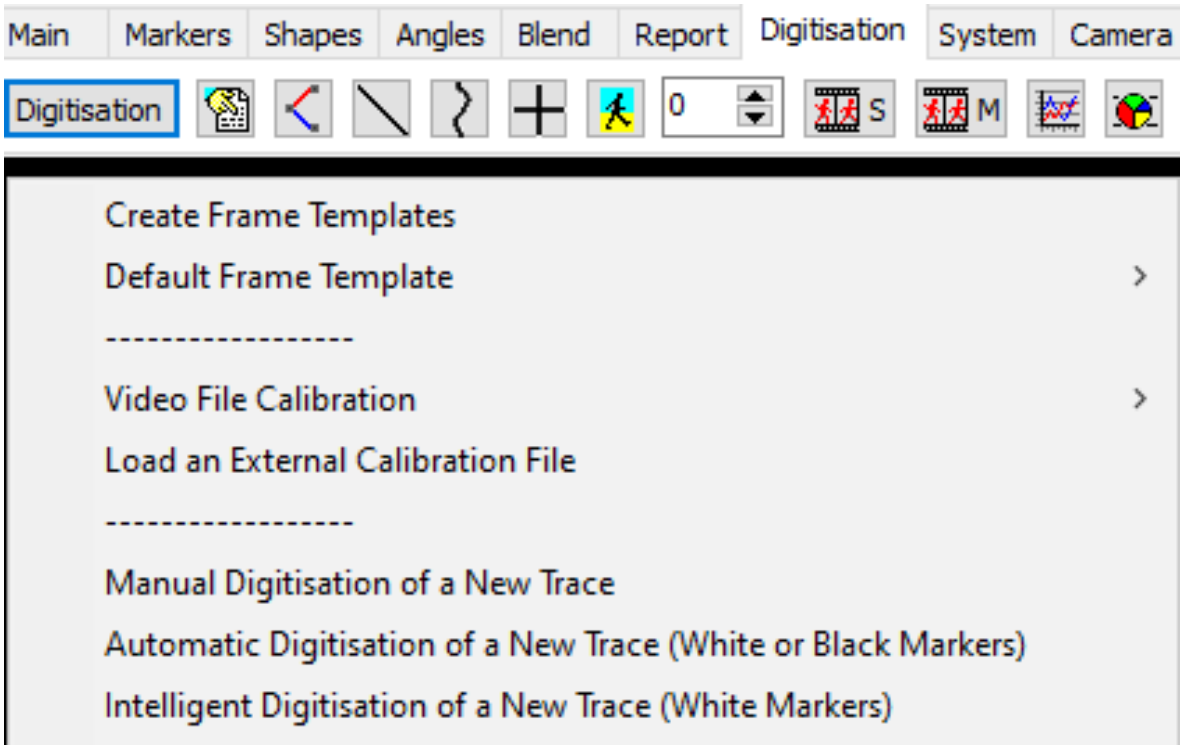
Quintic Biomechanics v31 – 3 Point Intelligent Tracking or any of our specific templates we have available for Equine Gait, Human Gait, Cycling or Golf Putting

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.



Either:

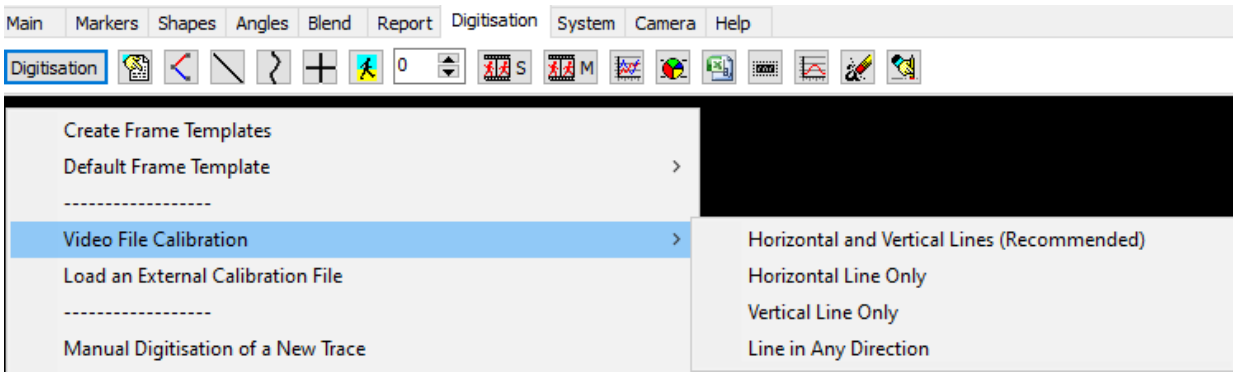
a) Select **'Video File Calibration'** from the drop down menu, if you know the length of something that is part of the action (e.g. a javelin, cricket bat, leg length or stump height).

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.

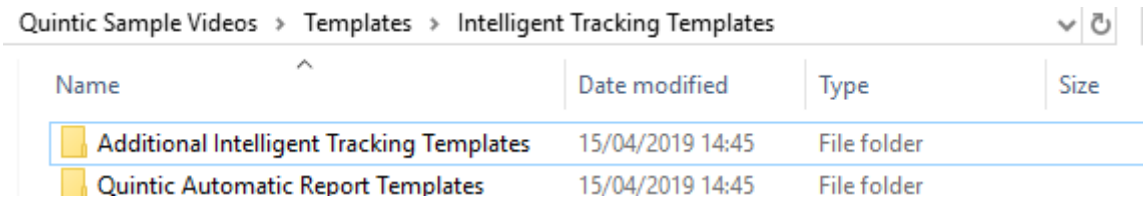
3. Digitisation Template

In order to start Intelligent Digitisation, an Intelligent Tracking template must be used. Please note that the user is unable to create their own Intelligent Tracking template or use any other template within Intelligent Tracking i.e. Automatic Tracking templates.

You are able to find the Intelligent Tracking templates within your **'Quintic Sample Videos'** folder **'Templates'** then **'Intelligent Tracking Templates'**.

This will then bring up two options, either **'Additional Intelligent Tracking Templates'** or **'Quintic Automatic Report Templates'**. Simply click the folder where the Intelligent Tracking template you are going to use is located.

N.B. Only one or two point Intelligent Tracking templates are able to be used within Quintic Coaching v31.



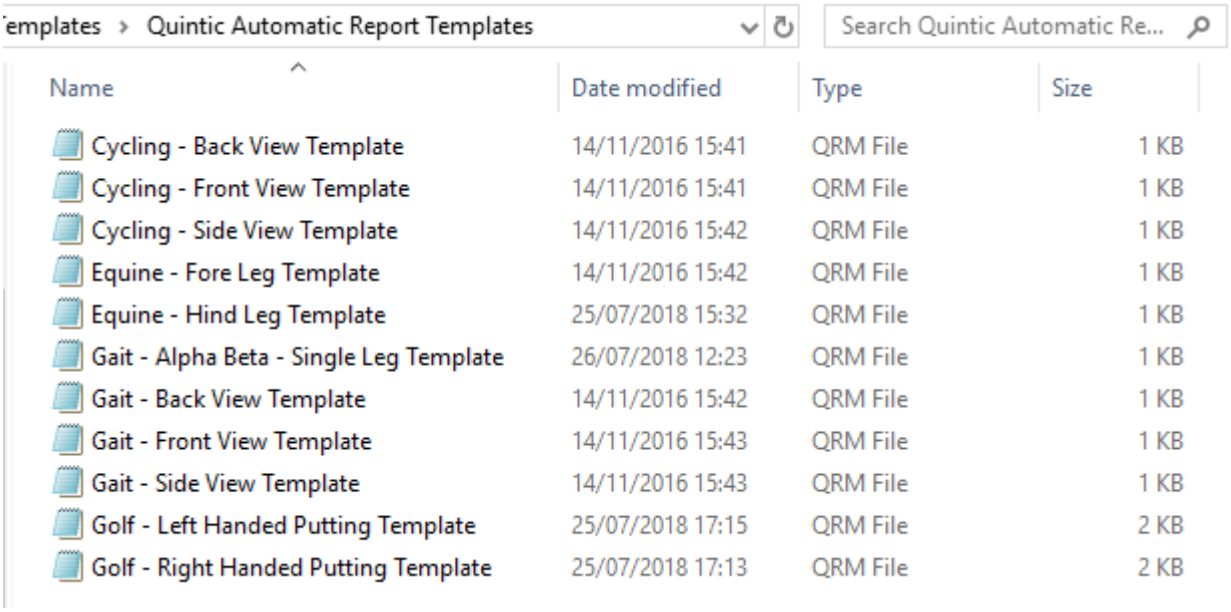
Quintic Automatic Report Templates - These Intelligent Tracking templates are to be used within the Quintic Biomechanics v31 software and are also compatible with the Quintic Automatic Report Software (Equine Gait, Human Gait, Cycling or Golf Putting).

Additional Intelligent Tracking Templates - These Intelligent Tracking templates are to be used solely within the Quintic Coaching v31 (1 or 2 point only) or Biomechanics v31 software.

Please see below for more information on the Intelligent Tracking templates, including marker names and positions.

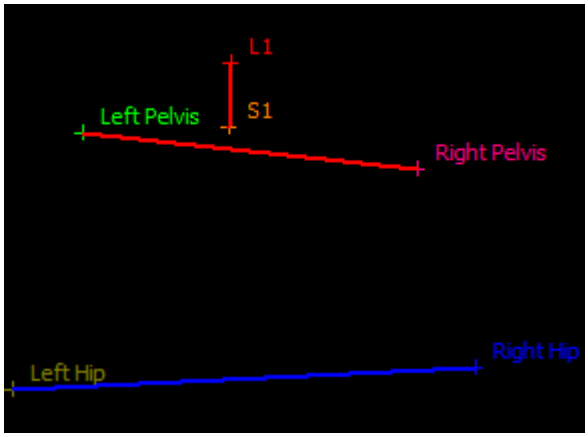
a. Quintic Automatic Report Templates

The Quintic Automatic Report Templates are as follows:



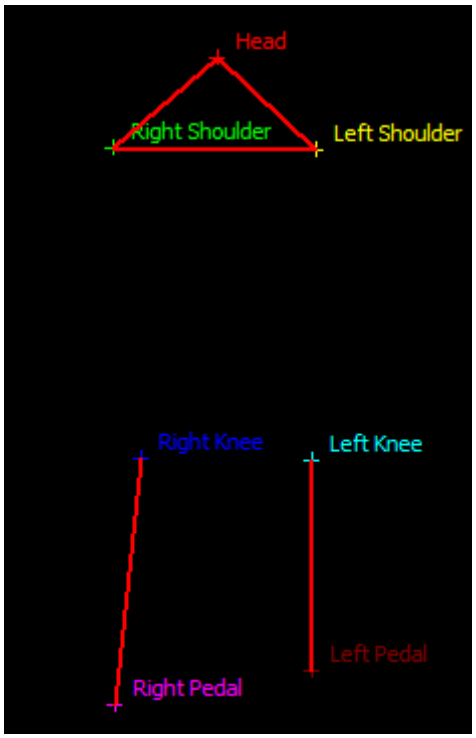
Cycling – Back View Template (6 Points)

This template is to be used for cycling analysis from a rear-view camera position. The points which should be identified are as follows: L1 (1st Lumbar Vertebrae), S1 (1st Sacral Vertebrae), Left Pelvis (Posterior Iliac Crest), Right Pelvis (Posterior Iliac Crest), Left Hip (Greater Trochanter) and Right Hip (Greater Trochanter). This template is only available in Quintic Biomechanics v31.



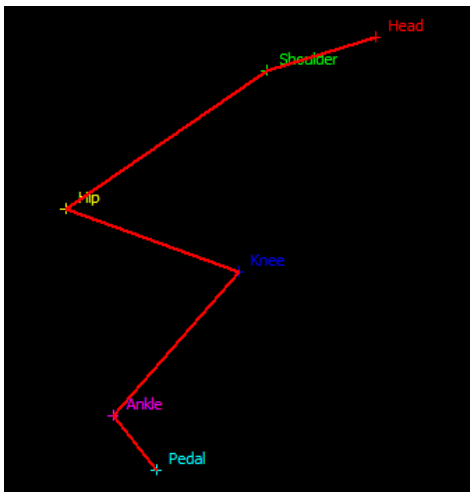
Cycling – Front View Template (7 Points)

This template is to be used for cycling analysis from a front-view camera position. The points which should be identified are as follows: Head (or Helmet), Right Shoulder (Lateral Deltoid), Left Shoulder (Lateral Deltoid), Right Knee (Lateral Femoral Condyle), Left Knee (Lateral Femoral Condyle), Right Pedal Spindle (or 5th Metatarsal) and Left Pedal Spindle (or 5th Metatarsal). This template is only available in Quintic Biomechanics v31.



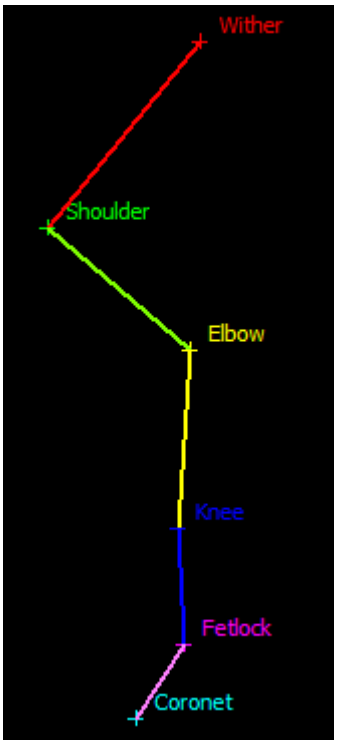
Cycling – Side View Template (6 Points)

This template is to be used for cycling analysis from a side-view camera position. This template is able to be used on both the left and right side. The points which should be identified are as follows: Head (or Helmet), Shoulder (Lateral Deltoid), Hip (Greater Trochanter), Knee (Lateral Femoral Condyle), Ankle (Lateral Malleolus) and Pedal Spindle (or 5th Metatarsal). This template is only available in Quintic Biomechanics v31.



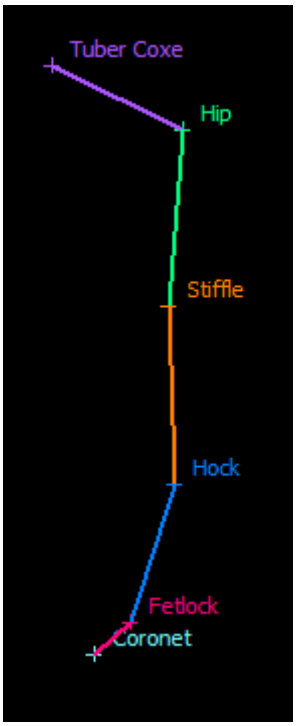
Equine – Fore Leg Template (6 Points)

This template is able to be used on both the left and right side of the horse. The points which should be identified are as follows: Wither, Shoulder, Elbow, Knee, Fetlock and Coronet. This template is only available in Quintic Biomechanics v31.



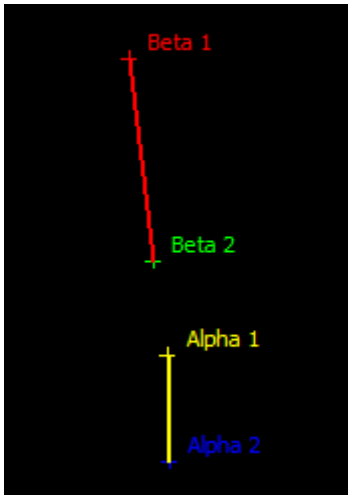
Equine – Hind Leg Template (6 Points)

This template is able to be used on both the left and right side of the horse. The points which should be identified are as follows: Tuber Coxe, Hip, Stifle, Hock, Fetlock and Coronet. This template is only available in Quintic Biomechanics v31.



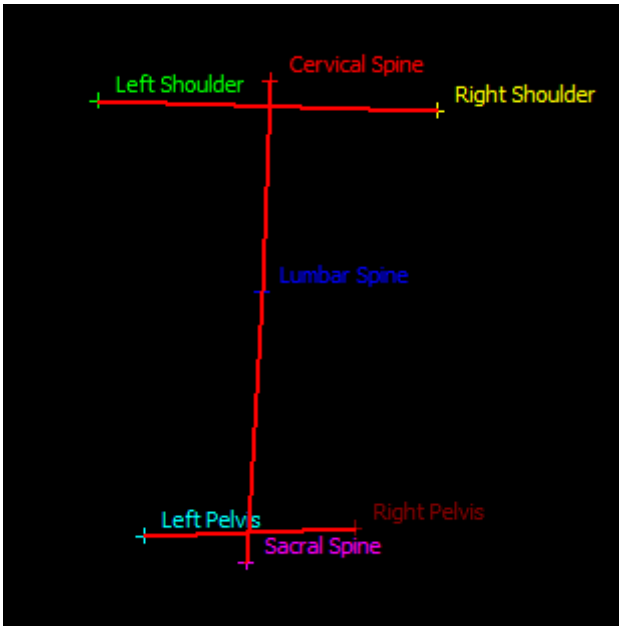
Gait – Alpha Beta – Single Leg Template (4 Points)

This template is to be used for human gait analysis and is able to analyse both the left and right leg (on separate videos), from a rear-view camera position. The points which should be identified are as follows: Beta 1 (Below Calf Belly), Beta 2 (Above Shoe), Alpha 1 (Top of Shoe), Alpha 2 (Above Sole of Shoe). This template is only available in Quintic Biomechanics v31.



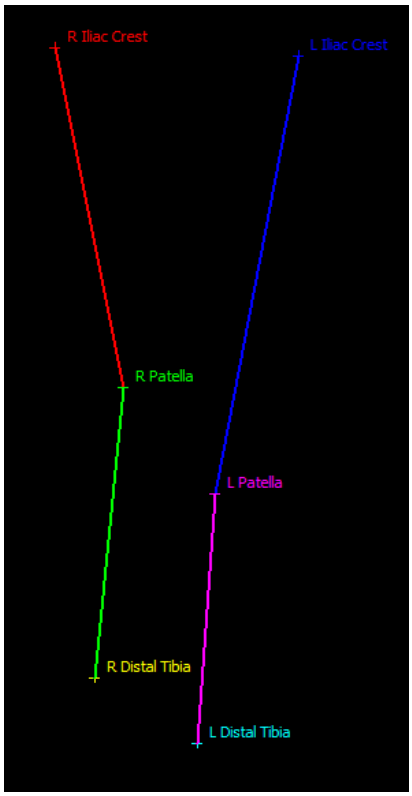
Gait – Back View Template (7 Points)

This template is to be used for human gait analysis from a rear-view camera position. The points which should be identified are as follows: Cervical Spine, Left Shoulder (Posterior Acromion), Right Shoulder (Posterior Acromion), Lumbar Spine (L1), Left Pelvis (Posterior Iliac Crest), Right Pelvis (Posterior Iliac Crest) and Sacral Spine (S1). This template is only available in Quintic Biomechanics v31.



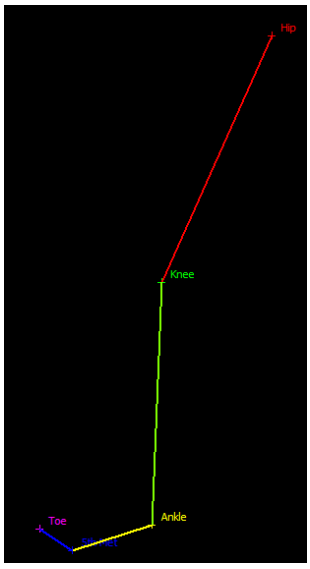
Gait – Front View Template (6 Points)

This template is to be used for human gait analysis and is used to analyse both the left and right leg at the same time, from a front view camera position. The points which should be identified are as follows: Right Iliac Crest, Right Patella, Right Distal Tibia, Left Iliac Crest, Left Patella and Left Distal Tibia. This template is only available in Quintic Biomechanics v31.



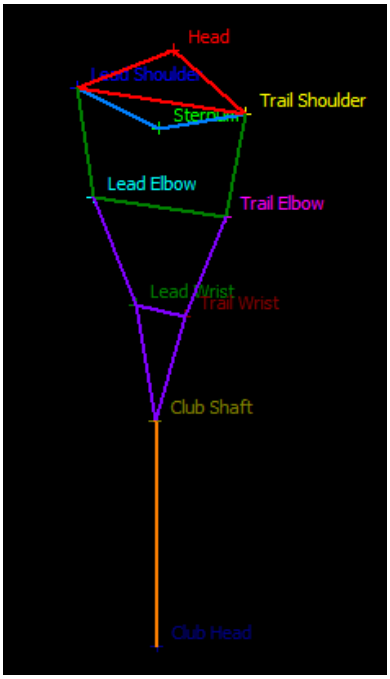
Gait – Side View Template (5 Points)

This template is to be used for human gait analysis and can be used to analyse both the left or right leg, from a side view camera position. The points which should be identified are as follows: Hip (Greater Trochanter), Knee (Lateral Femoral Condyle), Ankle (Lateral Malleolus), 5th Metatarsal and Toe (Tip of Shoe). This template is only available in Quintic Biomechanics v31.



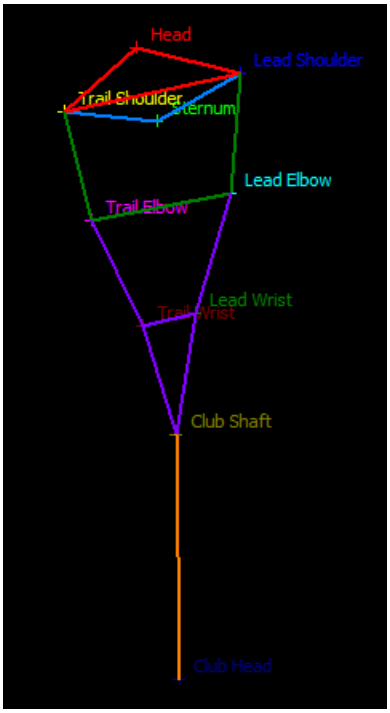
Golf – Left Handed Putting Template (10 Points)

This template should only be used on the left handed golfers i.e when putting across the video right to left. The points which should be identified are as follows: Head, Sternum, Lead Shoulder, Trail Shoulder, Lead Elbow, Trail Elbow, Lead Wrist, Trail Wrist, Club Shaft and Club Head. This template is only available in Quintic Biomechanics v31.



Golf – Right Handed Putting Template (10 Points)

This template should only be used on the right handed golfers i.e when putting across the video left to right. The points which should be identified are as follows: Head, Sternum, Lead Shoulder, Trail Shoulder, Lead Elbow, Trail Elbow, Lead Wrist, Trail Wrist, Club Shaft and Club Head. This template is only available in Quintic Biomechanics v31.



b. Additional Intelligent Tracking Templates

The Additional Intelligent Tracking templates are as follows:

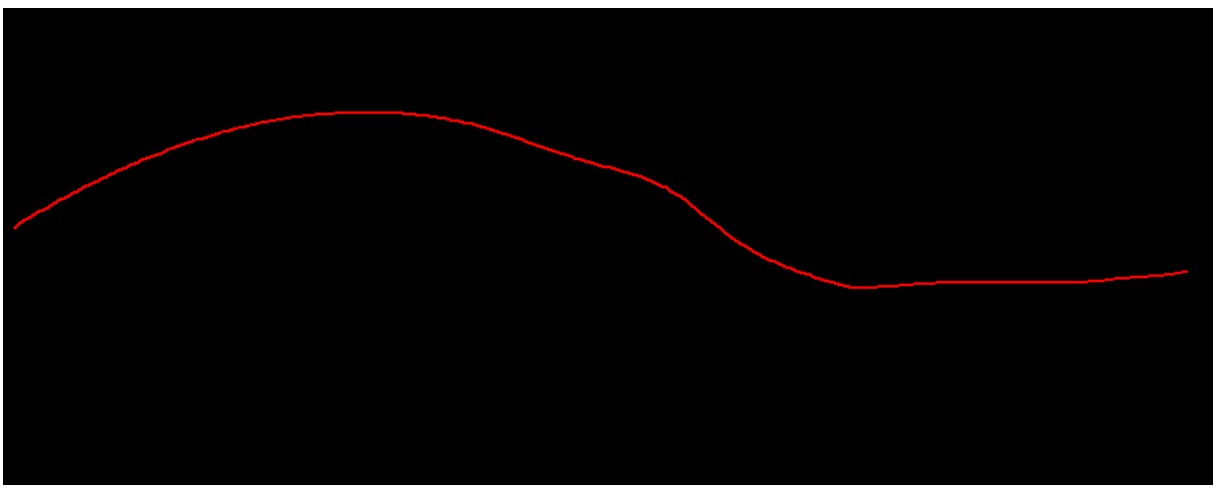
Additional Intelligent Tracking Templates

Search Additional Intelligent ...

Name	Date modified	Type	Size
Equine - 10 Point Left Side Template	25/07/2018 15:07	QRM File	2 KB
Equine - 10 Point Right Side Template	25/07/2018 15:10	QRM File	2 KB
Equine - 11 Point Left Side Template	25/07/2018 15:21	QRM File	2 KB
Equine - 11 Point Right Side Template	25/07/2018 15:22	QRM File	2 KB
Equine - 12 Point Left Side Template	25/07/2018 15:26	QRM File	2 KB
Equine - 12 Point Right Side Template	25/07/2018 15:27	QRM File	2 KB
Equine - Fore Leg - No Coronet Template	23/04/2018 10:30	QRM File	1 KB
Equine - Fore Leg - No Wither Template	23/04/2018 10:30	QRM File	1 KB
Equine - Hind Leg - No Coronet Template	25/07/2018 15:31	QRM File	1 KB
Gait - 7 Point Lower Limb Template	06/04/2018 16:29	QRM File	1 KB
Gait - Alpha Beta Template	26/01/2017 09:46	QRM File	1 KB
Gait - Front View - Single Leg Template	26/07/2018 12:24	QRM File	1 KB
Golf - 5 Point Shaft Template	25/04/2018 09:06	QRM File	1 KB
Golf - 7 Point Shaft Template	25/04/2018 09:05	QRM File	1 KB
Golf - 9 Point Shaft Template	17/04/2018 14:25	QRM File	2 KB
Intelligent - 1 Point	08/02/2017 12:12	QRM File	1 KB
Intelligent - 2 Point	08/02/2017 12:12	QRM File	1 KB
Intelligent - 3 Point - Hip Knee Ankle	09/11/2018 14:59	QRM File	1 KB
Intelligent - 3 Point	08/02/2017 12:12	QRM File	1 KB

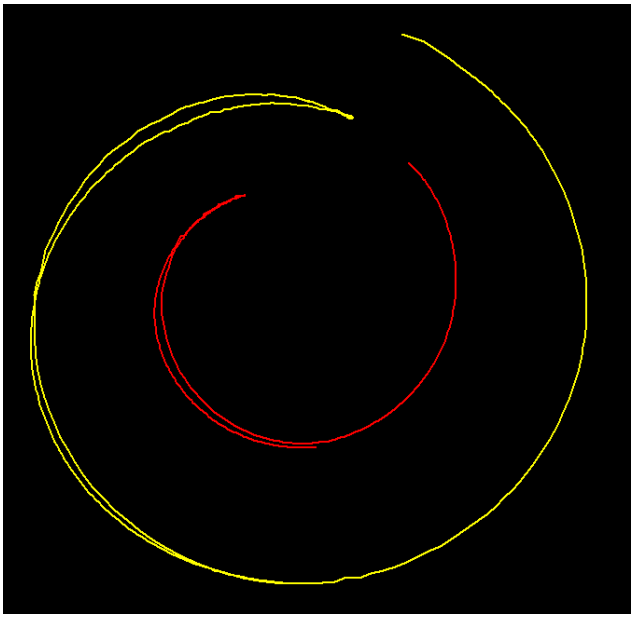
Intelligent – 1 Point

This is a generic template and can be used across different disciplines. This template will Intelligently digitise 1 Point throughout the video. This point will be called Point 1 and this template is available within Quintic Coaching v31 and Quintic Biomechanics v31.



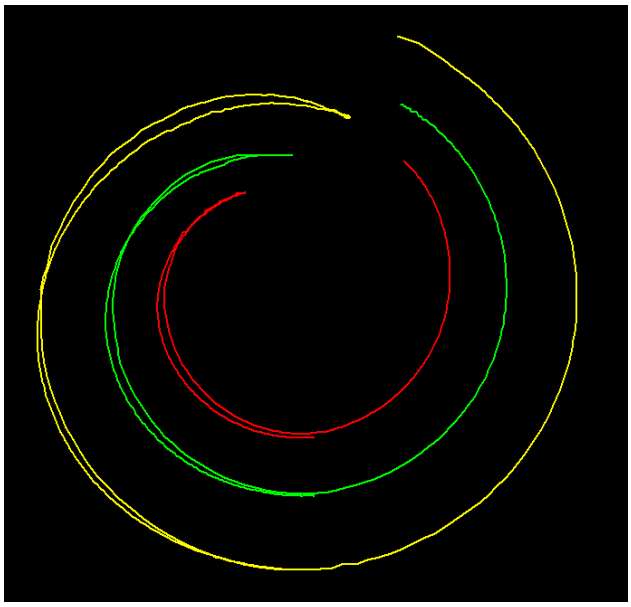
Intelligent – 2 Point

This is a generic template and can be used across different disciplines. This will Intelligently digitise 2 Points throughout the video. These points will be called Point 1 and Point 2. This template is available within Quintic Coaching v31 and Quintic Biomechanics v31.



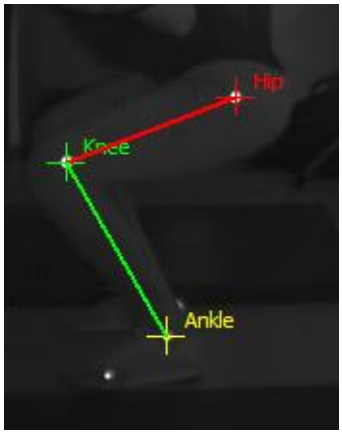
Intelligent – 3 Point

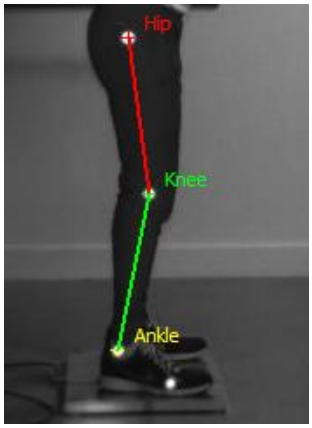
This is a generic template and can be used across different disciplines. This will Intelligently digitise 3 Points throughout the video. These points will be called Point 1, Point 2 and Point 3. This template is only available in Quintic Biomechanics v31 software.



Intelligent – 3 Point – Hip Knee Ankle

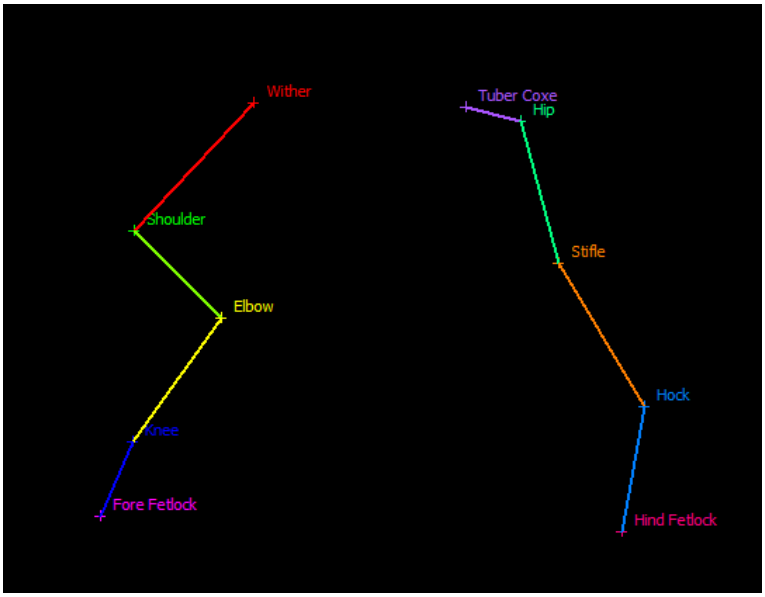
This template should be used to identify the Hip, Knee and Ankle in that order. This template can be used with running, jumping, squatting etc. The points will be called Hip, Knee and Ankle. This template is only available in Quintic Biomechanics v31 software.





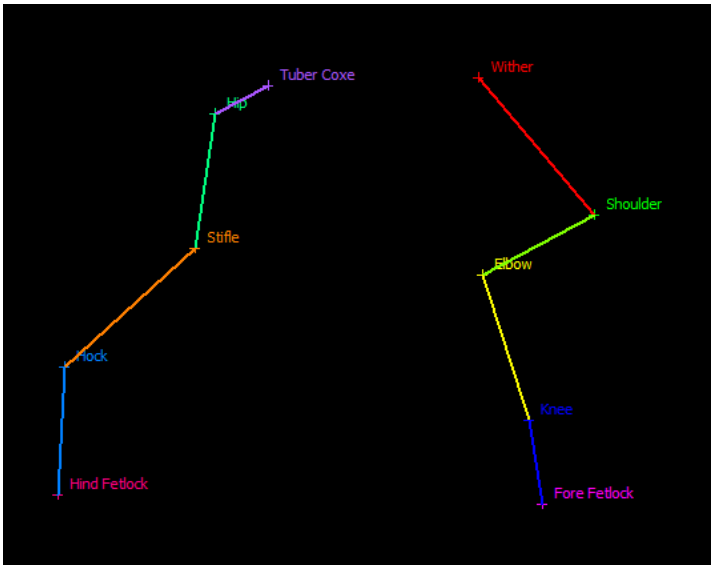
Equine – 10 Point Left Side Template

This template should only be used on the left-hand side of the horse, i.e when the horse is walking/trotting across the video from right to left. The points which should be identified are as follows: Wither, Shoulder, Elbow, Knee, Fore Fetlock, Tuber Coxe, Hip, Stifle, Hock and Hind Fetlock. This template is only available in Quintic Biomechanics v31.



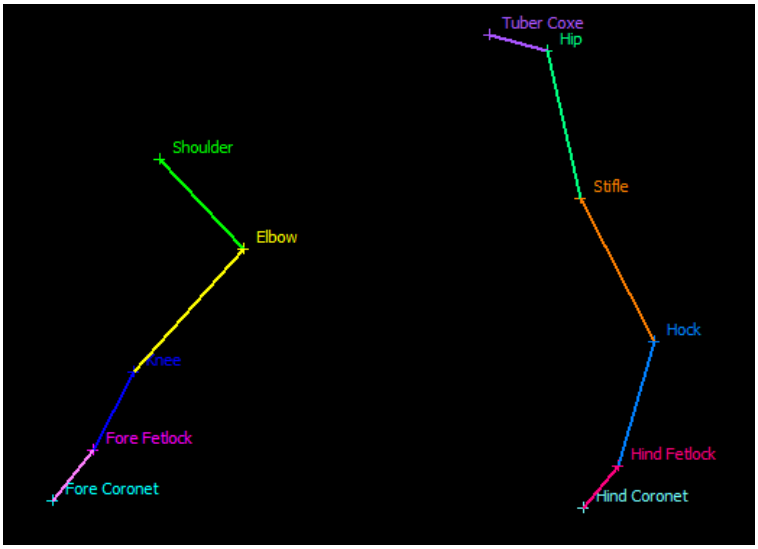
Equine – 10 Point Right Side Template

This template should only be used on the right-hand side of the horse, i.e when the horse is walking/trotting across the video from left to right. The points which should be identified are as follows: Wither, Shoulder, Elbow, Knee, Fore Fetlock, Tuber Coxe, Hip, Stifle, Hock and Hind Fetlock. This template is only available in Quintic Biomechanics v31.



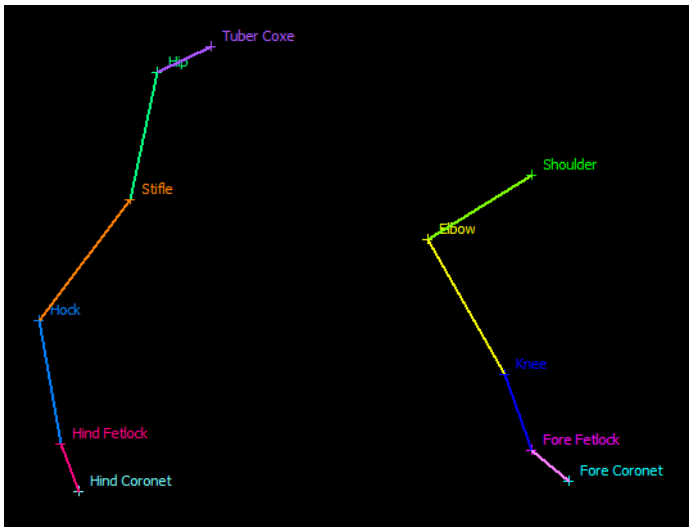
Equine – 11 Point Left Side Template

This template should only be used on the left-hand side of the horse, i.e when the horse is walking/trotting across the video from right to left. The points which should be identified are as follows: Shoulder, Elbow, Knee, Fore Fetlock, Fore Coronet, Tuber Coxe, Hip, Stifle, Hock, Hind Fetlock and Hind Coronet. This template is only available in Quintic Biomechanics v31.



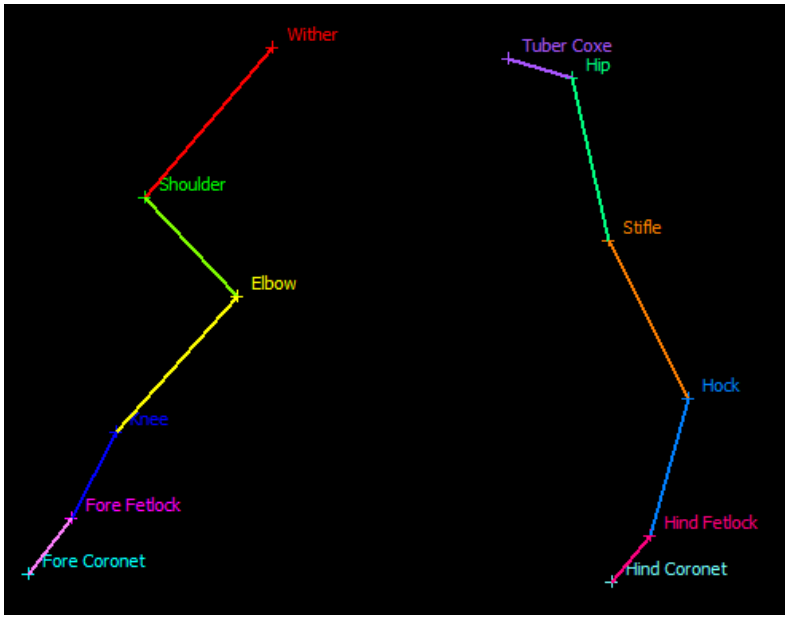
Equine – 11 Point Right Side Template

This template should only be used on the right-hand side of the horse, i.e when the horse is walking/trotting across the video from left to right. The points which should be identified are as follows: Shoulder, Elbow, Knee, Fore Fetlock, Fore Coronet, Tuber Coxe, Hip, Stifle, Hock, Hind Fetlock and Hind Coronet. This template is only available in Quintic Biomechanics v31.



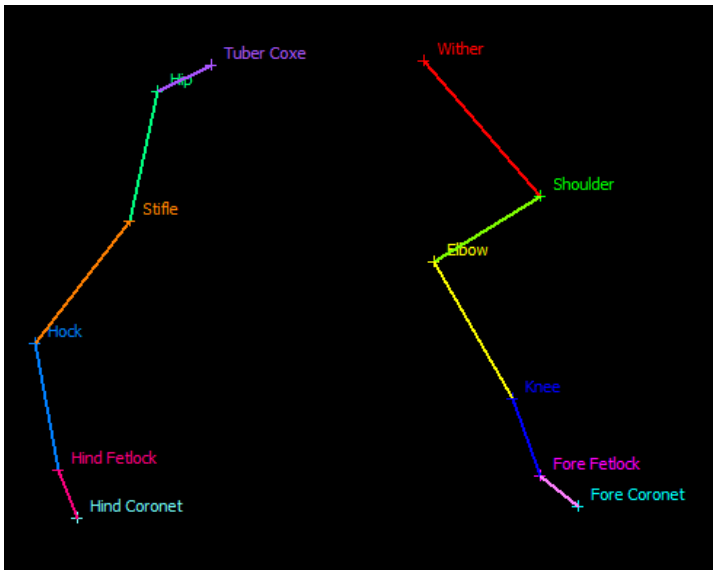
Equine – 12 Point Left Side Template

This template should only be used on the left-hand side of the horse, i.e when the horse is walking/trotting across the video from right to left. The points which should be identified are as follows: Wither, Shoulder, Elbow, Knee, Fore Fetlock, Fore Coronet, Tuber Coxe, Hip, Stifle, Hock, Hind Fetlock and Hind Coronet. This template is only available in Quintic Biomechanics v31.



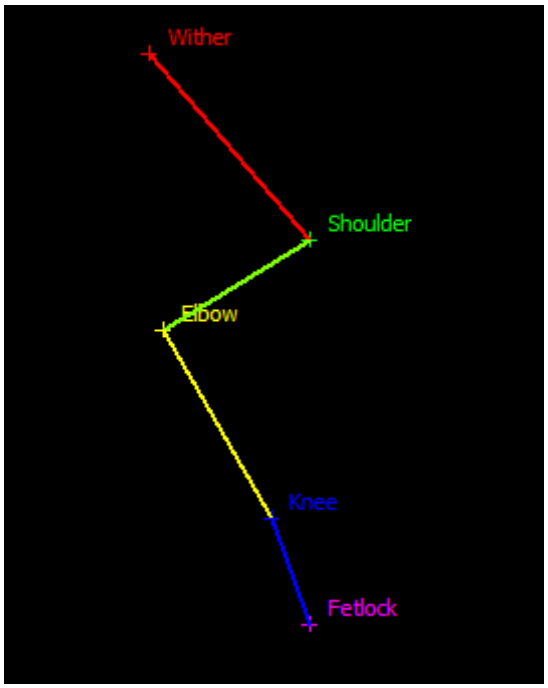
Equine – 12 Point Right Side Template

This template should only be used on the right-hand side of the horse, i.e when the horse is walking/trotting across the video from left to right. The points which should be identified are as follows: Wither, Shoulder, Elbow, Knee, Fore Fetlock, Fore Coronet, Tuber Coxe, Hip, Stifle, Hock, Hind Fetlock and Hind Coronet. This template is only available in Quintic Biomechanics v31.



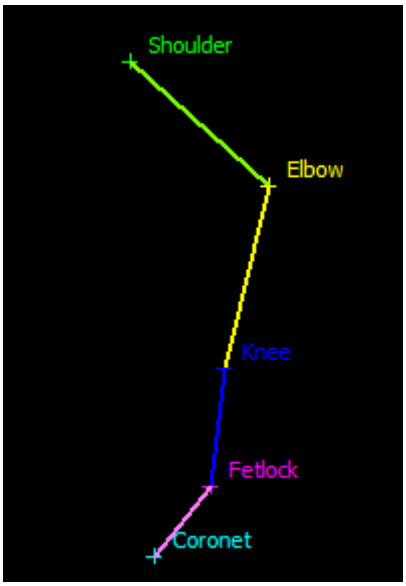
Equine – Fore Leg – No Coronet Template (5 Points)

This template is able to be used on both the left and right side of the horse. The points which should be identified are as follows: Wither, Shoulder, Elbow, Knee and Fetlock. This template is only available in Quintic Biomechanics v31.



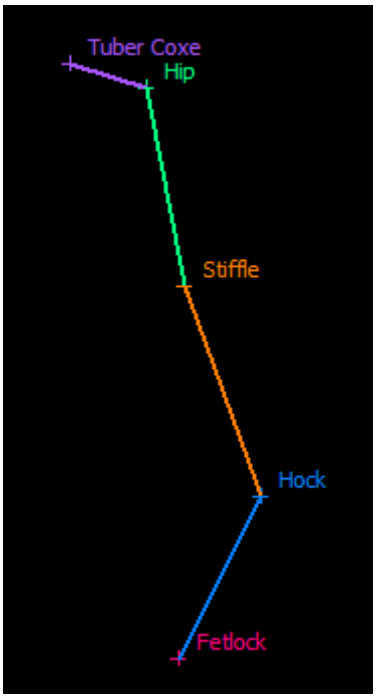
Equine – Fore Leg – No Wither Template (5 Points)

This template is able to be used on both the left and right side of the horse. The points which should be identified are as follows: Shoulder, Elbow, Knee, Fetlock and Coronet. This template is only available in Quintic Biomechanics v31.



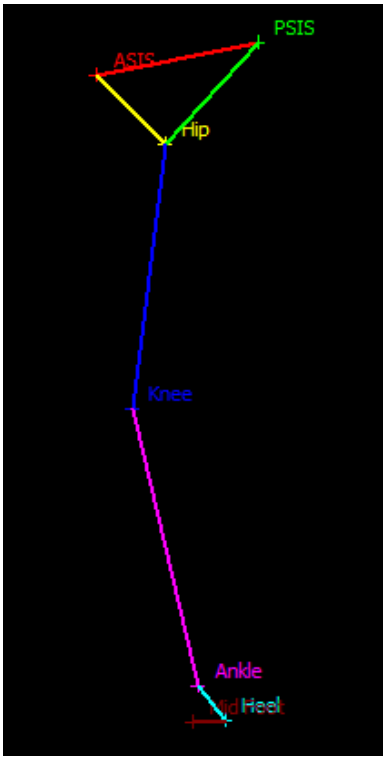
Equine – Hind Leg – No Coronet Template (5 Points)

This template is able to be used on both the left and right side of the horse. The points which should be identified are as follows: Tuber Coxe, Hip, Stifle, Hock and Fetlock. This template is only available in Quintic Biomechanics v31.



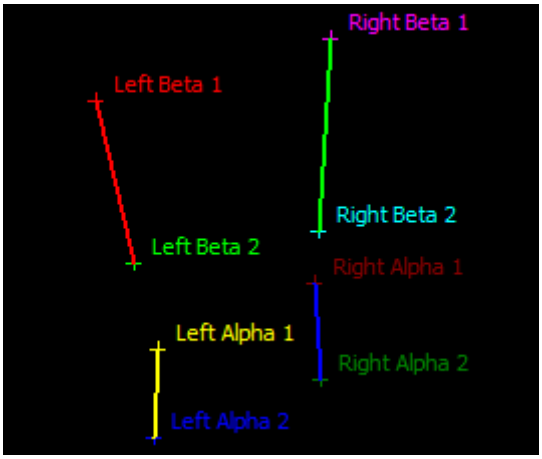
Gait – 7 Point Lower Limb Template

This template is to be used for human gait analysis and is able to be used on both the left and right leg from a side view camera position. The points which should be identified are as follows: Anterior Superior Iliac Spine (ASIS), Posterior Superior Iliac Spine (PSIS), Hip, Knee, Ankle, Heel and Mid Foot. This template is only available in Quintic Biomechanics v31.



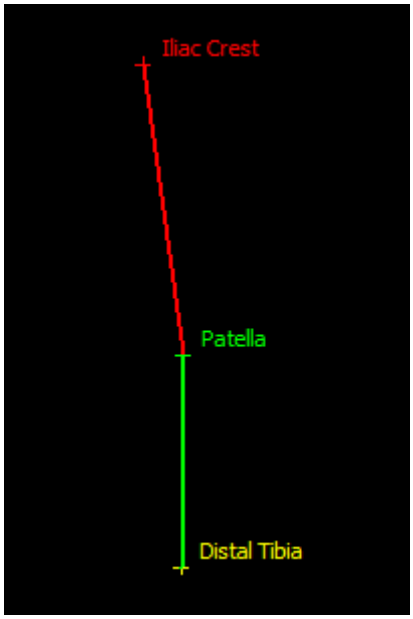
Gait – Alpha Beta Template (8 Points)

This template is to be used for human gait analysis and is able to analyse both the left and right leg at the same time, from a rear-view camera position. The points which should be identified are as follows: Left Beta 1 (Below Calf Belly), Left Beta 2 (Above Shoe), Left Alpha 1 (Top of Shoe), Left Alpha 2 (Above Sole of Shoe), Right Beta 1 (Below Calf Belly), Right Beta 2 (Above Shoe), Right Alpha 1 (Top of Shoe), Right Alpha 2 (Above Sole of Shoe). This template is only available in Quintic Biomechanics v31.



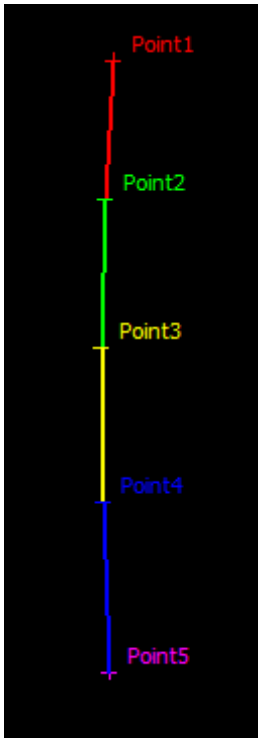
Gait – Front View – Single Leg Template (3 Points)

This template is to be used for human gait analysis and is able to be used on both the left or right leg from a front view camera position. The points which should be identified are as follows: Iliac Crest, Patella and Distal Tibia. This template is only available in Quintic Biomechanics v31.



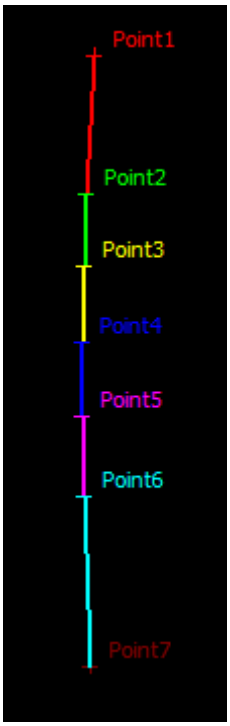
Golf – 5 Point Shaft Template

This template is to be used for golf swing analysis. The points to be identified are as follows: Point 1, Point 2, Point 3, Point 4 and Point 5 from top to bottom. These should be distributed evenly across the club shaft. This template is only available in Quintic Biomechanics v31.



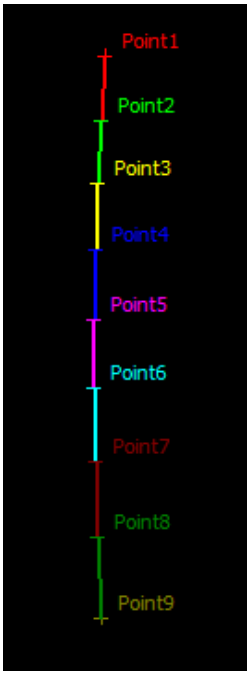
Golf – 7 Point Shaft Template

This template is to be used for golf swing analysis. The points to be identified are as follows: Point 1, Point 2, Point 3, Point 4, Point 5, Point 6 and Point 7 from top to bottom. These should be distributed evenly across the club shaft. This template is only available in Quintic Biomechanics v31.



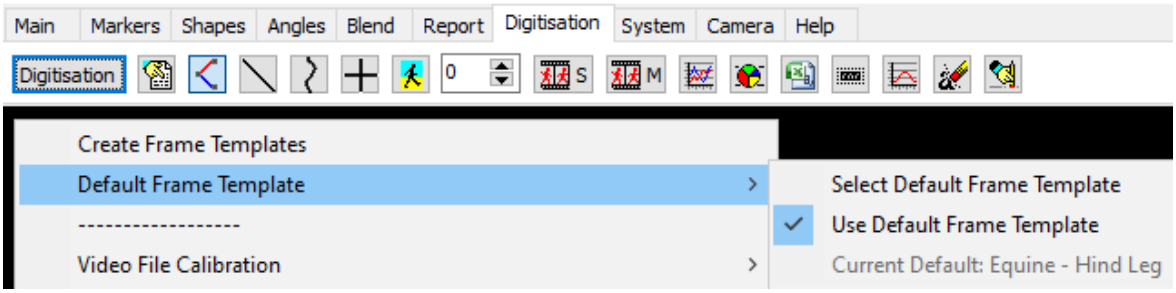
Golf – 9 Point Shaft Template

This template is to be used for golf swing analysis. The points to be identified are as follows: Point 1, Point 2, Point 3, Point 4, Point 5, Point 6, Point 7, Point 8 and Point 9 from top to bottom. These should be distributed evenly across the club shaft. This template is only available in Quintic Biomechanics v31.



c. Default Digitisation Template

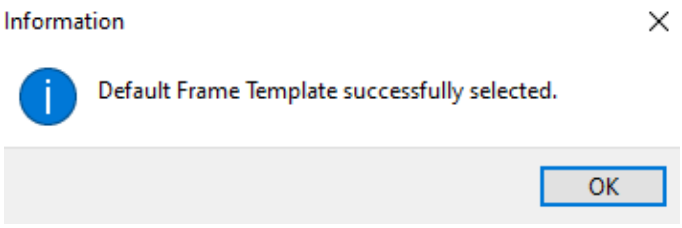
Users also have the option to choose a default digitisation template, removing the need to select it each time. Ideal for users who use the same digitisation template on a regular basis.



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

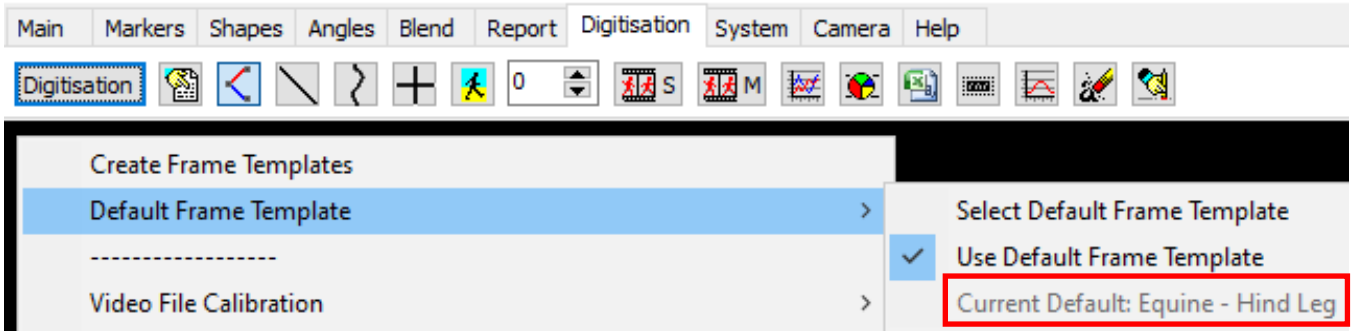
Then click ‘Select Default Frame Template’ and choose your preferred template. Please bear in mind that only our Intelligent Tracking templates are able to be used with Intelligent Digitisation.

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:



4. Intelligent Digitisation Procedure

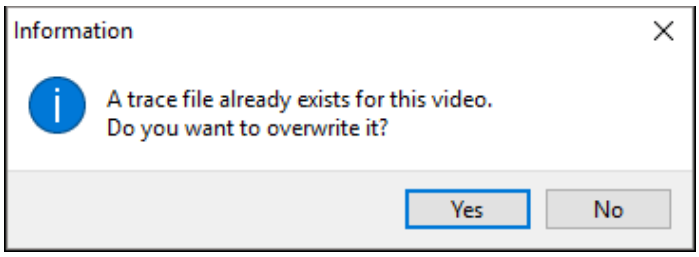
Open the video file that you wish to digitise.

Before starting intelligent digitisation, ensure that the file has been correctly calibrated and a suitable intelligent tracking frame template has been located.

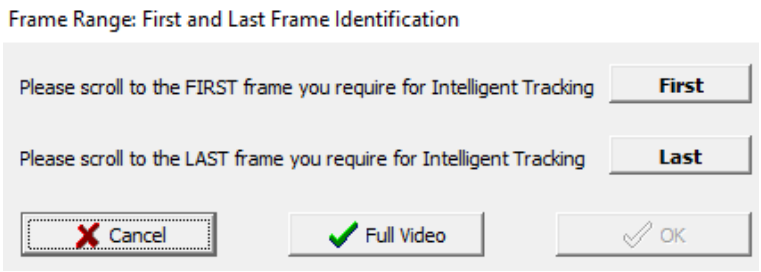
Intelligent Digitisation does require a contrast in order for the markers to be identified. This must be a “white on black” marker only.

Within Quintic open the **‘Digitisation’** tab, then **‘Digitisation’** menu and then select **‘Intelligent Digitisation of a New Trace’**.

If the video has already been digitised, a pop-up asking if you want to ‘overwrite the existing trace’ will appear. Click ‘No’ if you do not want to, or click ‘Yes’ if you do want to overwrite the trace, which will enable you to continue with the Intelligent Digitisation process.

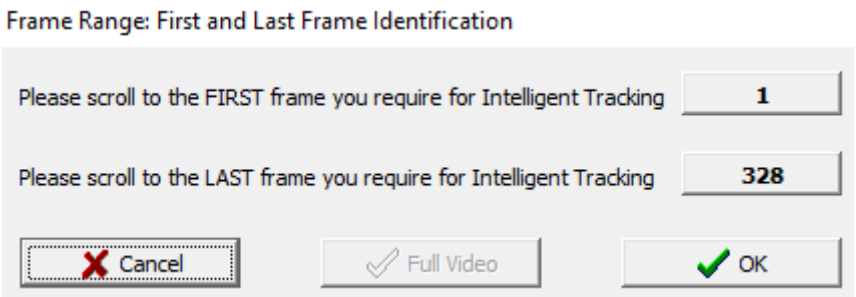


If the video does not have a previous digitisation trace, or you pressed “Yes” to the above pop-up, a new window will open asking you to locate the digitisation template you wish to use for digitisation. Once selected, a new window will appear containing the same video that is in the main window along with the Frame Range window.



Please note that all of the points within the digitisation template have to be in the video on the first frame you require for Intelligent tracking.

Scroll to the frame you wish to start the tracking from and click on **‘First’**, now scroll to the last frame that you wish to digitise and click on **‘Last’**. Alternatively, click **'Full Video’** if all markers are visible at the start of the video and you wish to digitise the whole video.

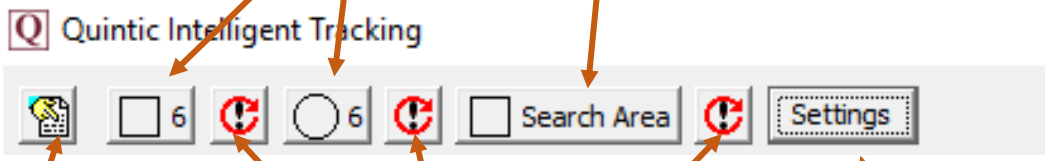


Once you have set the range of frames you wish to intelligently digitise, click on the **'OK'** button to begin identifying the points within the selected digitisation template.

The pop-up screen will disappear and allow you to select the markers of the template.

Blockers – 12 blockers are available to the user (6 Square, 6 Oval).

Search Area – provides an initial area for the software to search when automatically locating markers.



Show/Hide Marker info – turns on and off the marker labels on the video.

Undo – Undo the last blocker or search area placed on the video.

Settings – Allows the user to edit the minimum and maximum marker radius in pixels as well as brightness of the marker the software uses to re-locate missing markers.

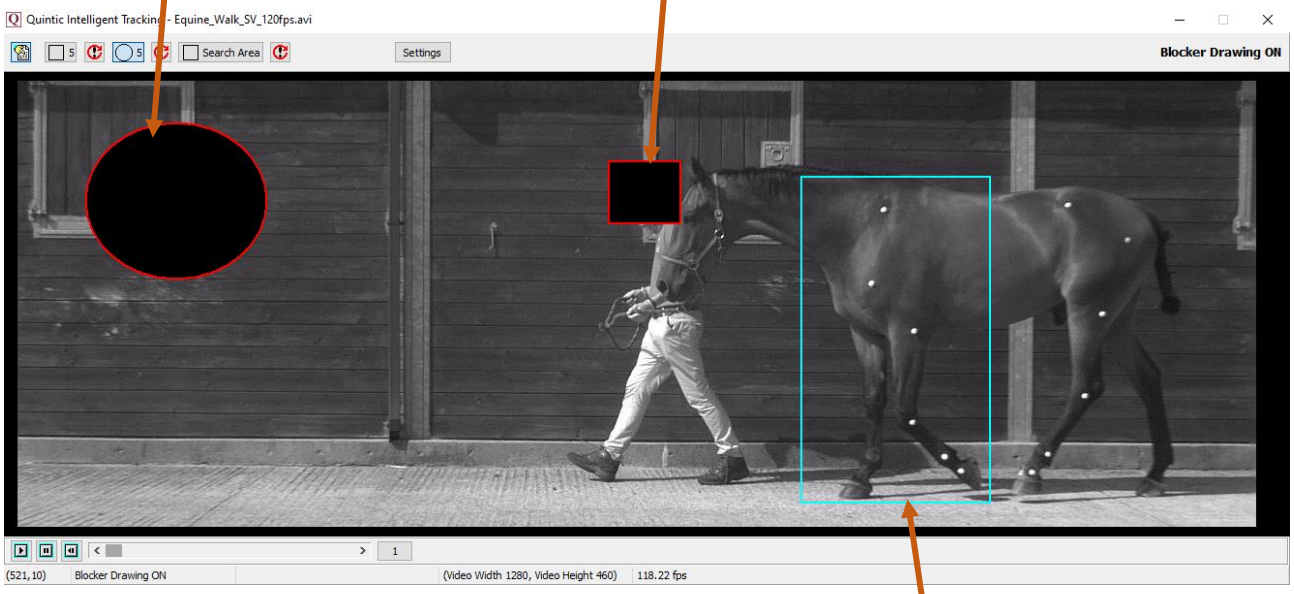
a. Marker Identification

- **Blockers** – The blockers can be used to block out distracting features of the video such as lights or reflective objects that may be confused for markers. If a marker is lost during the blocked region, that marker would be unable to be reidentified in that blocked region. However, they do not obscure markers that are being tracked by the software. Tracked markers can pass through blocked areas without affecting the final digitised trace.
- **Search Area** – The search area directs the software where to look during auto detection of markers. If a search area is not drawn the software will use the whole image.
- **Settings** – Allows the user to edit the minimum and maximum marker radius in pixels as well as brightness of the marker the software uses to re-locate missing markers. Please see 'Unable to Identify Markers' below for more information.

If required apply the blocker and search area tools and click **"AUTO DETECT MARKERS"**. A pop-up window will ask you if the markers found are correct relative to the template selected.

Circle Blocker hiding a reflective object that may be confused for a marker.

Square Blocker hiding a round object that may be confused for a marker.



Initial Search area.

If you are happy that the template is correct, select “Yes” to begin intelligent tracking.

If the markers are located incorrectly, select “No” and you will be asked to manually identify the markers.

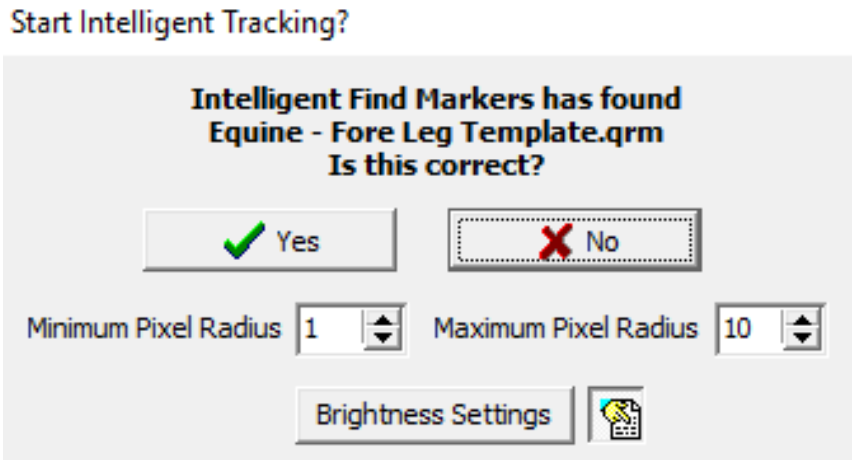
If you make a mistake identifying the markers, you are able to undo the last marker identified by pressing the button.

The marker radius range or brightness settings may need to be adjusted, depending on the marker used. Please see Unable to Identify Markers for more information.

As the cursor moves across the screen, the zoom window displays a larger version of the area under the cursor. Use this to pinpoint the exact locations of the template markers.

This must be done in the correct order and as accurately as possible. As the point is assigned to a landmark, the next point will automatically be selected and ready to be assigned. If the symbol next to the point description is yellow this indicates the marker needs to be identified.

Once the markers have been manually identified, the same “Start Intelligent Tracking?” pop-up window will appear asking whether you are sure the markers have been located correctly. Select “Yes” and tracking will begin automatically.



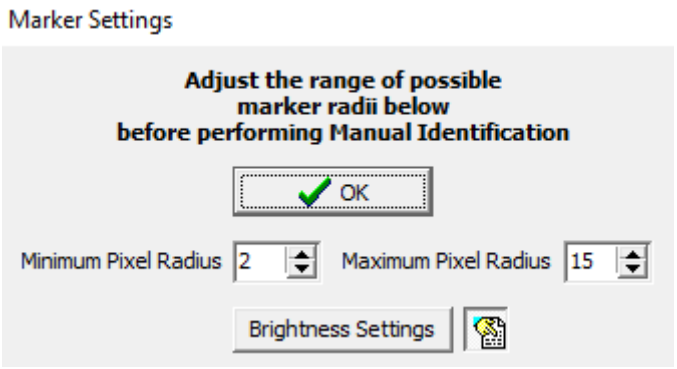
Unlike Automatic or Manual tracking, Intelligent tracking is able to find the optimum digitisation speed throughout the process.

b. Unable to Identify Marker

During the marker identification process if you are unable to identify a marker, you may be able to adjust the settings to change the marker range radius and brightness of the marker. This could potentially help to identify markers that you were unable to previously identify.

Simply click on the Settings button within the Marker Identification window.

This will bring up the following window.



Marker Radius

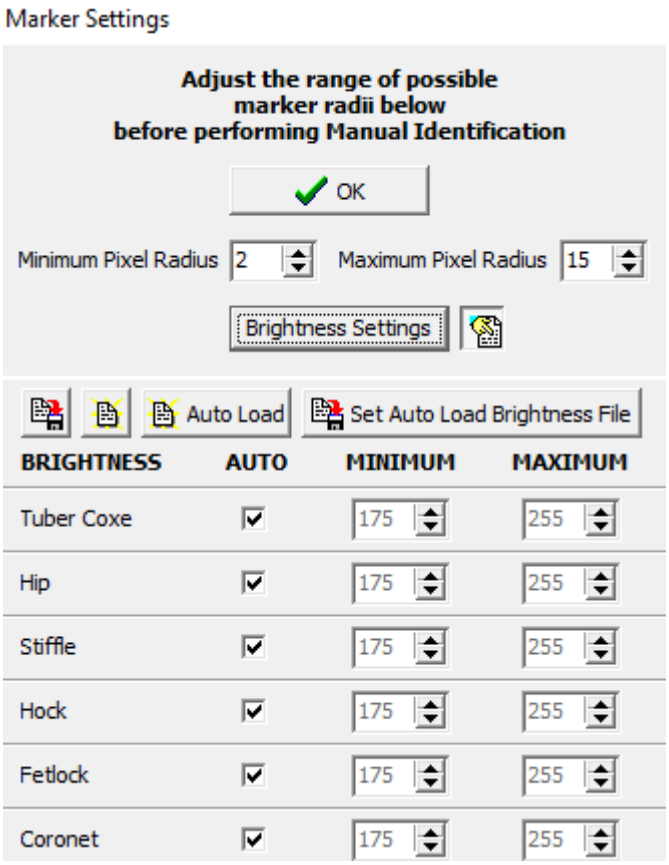
You are able to adjust the minimum and maximum pixel radius by adjusting the counters accordingly. Press OK to accept the changes to the radius size once you are happy with them. The default range is between 2 and 15, however this can be changed to 1 to 25 to help identify smaller/larger markers accordingly.

Brightness Settings

The brightness settings control the brightness range the marker would have to be in for it to be re-identified.

If you click the Brightness Settings button, this will bring up the brightness ranges for the markers. Each marker within the digitisation template defaults to Auto. This is automatically calculated once the marker is identified. Should you like to over write the brightness ranges, simply untick the Auto tick box for each specific point you would like to overwrite and use the Minimum and Maximum counters to increase/decrease the brightness range of that specific point.

The brightness range is between 0 and 255, with 0 being minimum and 255 being max (pure white).



Save - Save the current Brightness settings into a file, in a destination of the users choosing.

Auto Load – This allows the user to control whether a brightness settings file is automatically loaded or not for new intelligent digitisations. When the button is pressed down, the brightness file is automatically loaded. When the button is up, no file will be automatically loaded.

Load – The user is able to load a previously saved brightness settings file.

Set Auto Load Brightness File – This allows the user to select which brightness file will be loaded automatically if the Auto Load button is pressed down.

c. Lost Markers

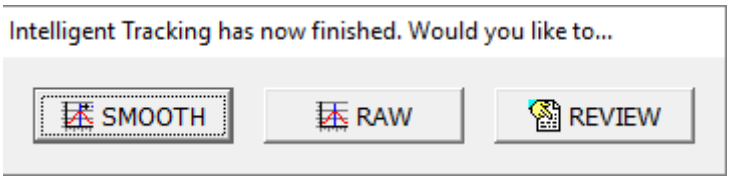
During digitisation a marker can be “lost”; obstructed by equipment or limbs, or leave the Area of Interest (AOI). With intelligent tracking Quintic is able to recognise the marker when it reappears from behind the obstruction.

Once the tracking has started, you do not have to do anything until the video has played through.

5. Ending the Intelligent Digitisation Process

To end Intelligent Digitisation, either let the video digitise until the last digitisation frame you selected has been reached, it’s the end of the video or the ‘Stop Tracking’ button has been pressed.

When the last video frame has been digitised or if the user clicks stop tracking, a pop-up window will appear to inform the user that Intelligent Tracking has now finished. The user then has to choose out of the three options before the digitisation trace is saved.



Smooth – Saves the data of the trace with the optimal Butterworth filters, without review of the trace. The window will then close.

To change or add filters at a later time, click “Digitisation” on the Main window and select “Load an Existing Trace” and then “Data Smoothing of Current Trace”. This will bring up filtering options (refer to section 5d for further information).

Raw – Directly saves the raw data of the trace without editing or filtering.

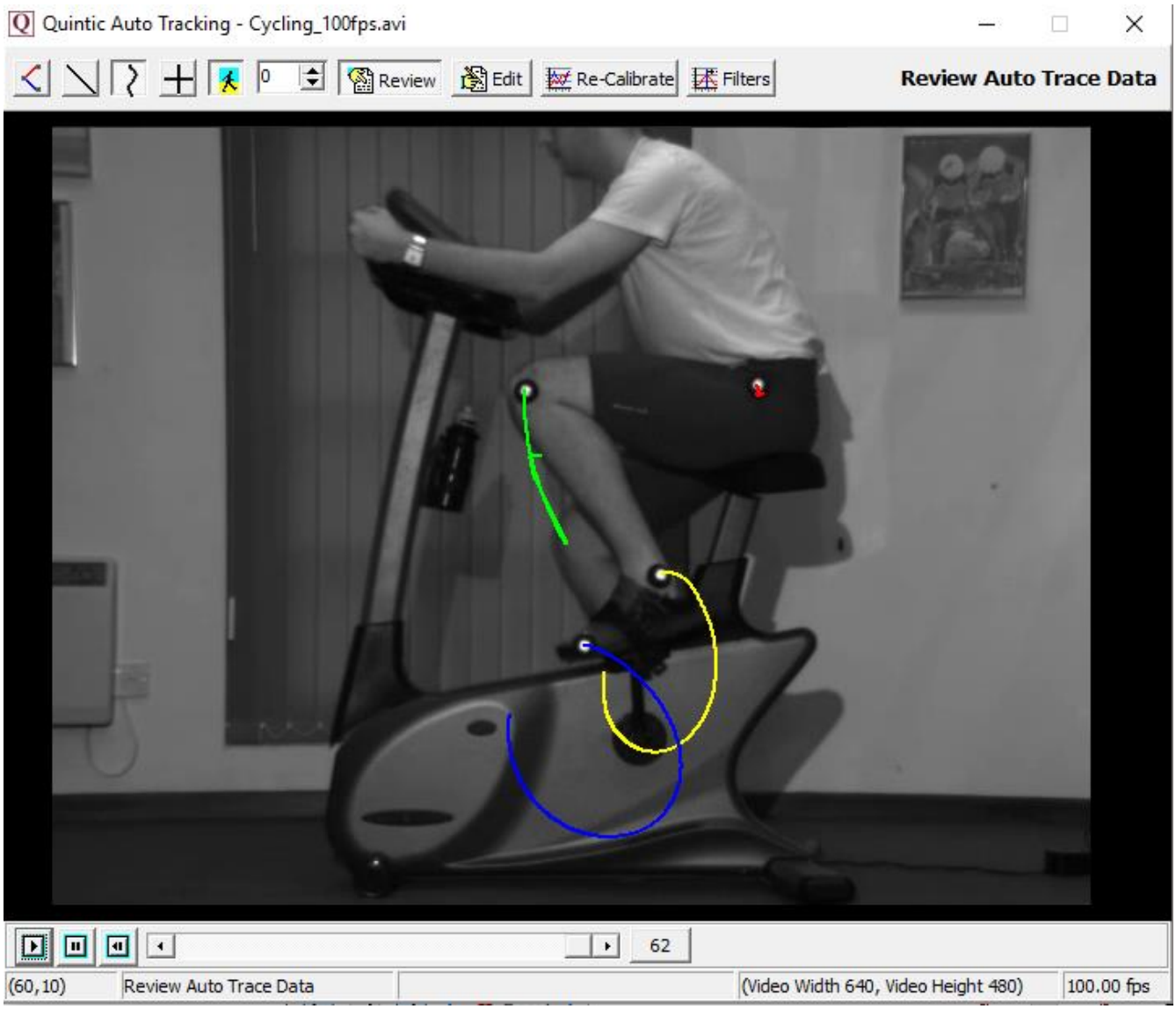
To change or add filters at a later date, click “Digitisation” on the Main window and select “Load an Existing Trace” and then “Data Smoothing of Current Trace”. This will bring up filtering options (refer to section 5d for further information).

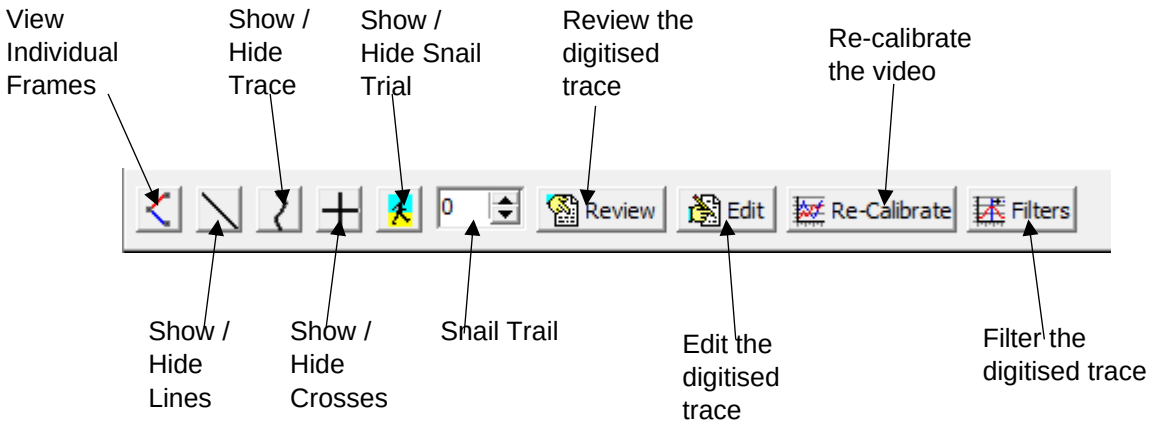
Review – Opens the review screen allowing you to edit the digitised points before the trace is finalised. The user is able to review, edit, re-calibrate or apply filters to the digitisation trace.

a. Reviewing the Digitisation Trace

If you have pressed the ‘Review’ trace button, this will bring 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 Trace – 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.

b. Editing a Digitised Trace

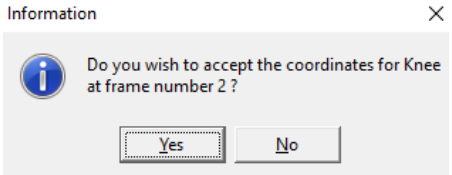
Press ‘Edit’ within the Edit Trace Data Window, which will pop up the ‘Edit Marker Position’ window.

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.

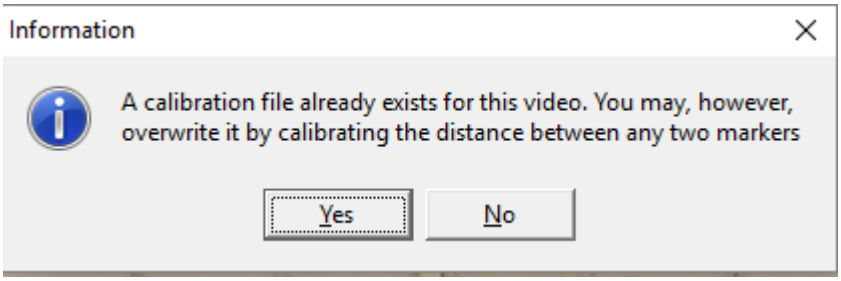
Once clicked, it will bring up a pop up to confirm that you are happy to accept the new point in the digitisation trace. Simply click YES if you are or NO to locate that point again.



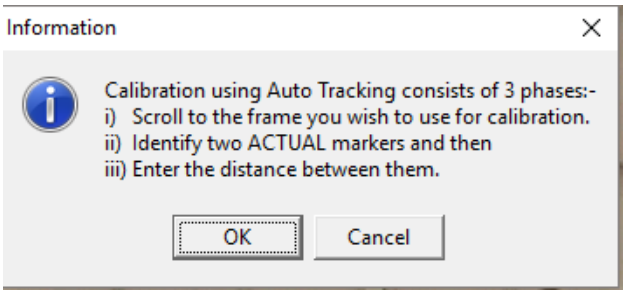
To exit from the editing mode, select one of the other options from the top menu bar or close the window.

c. 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.

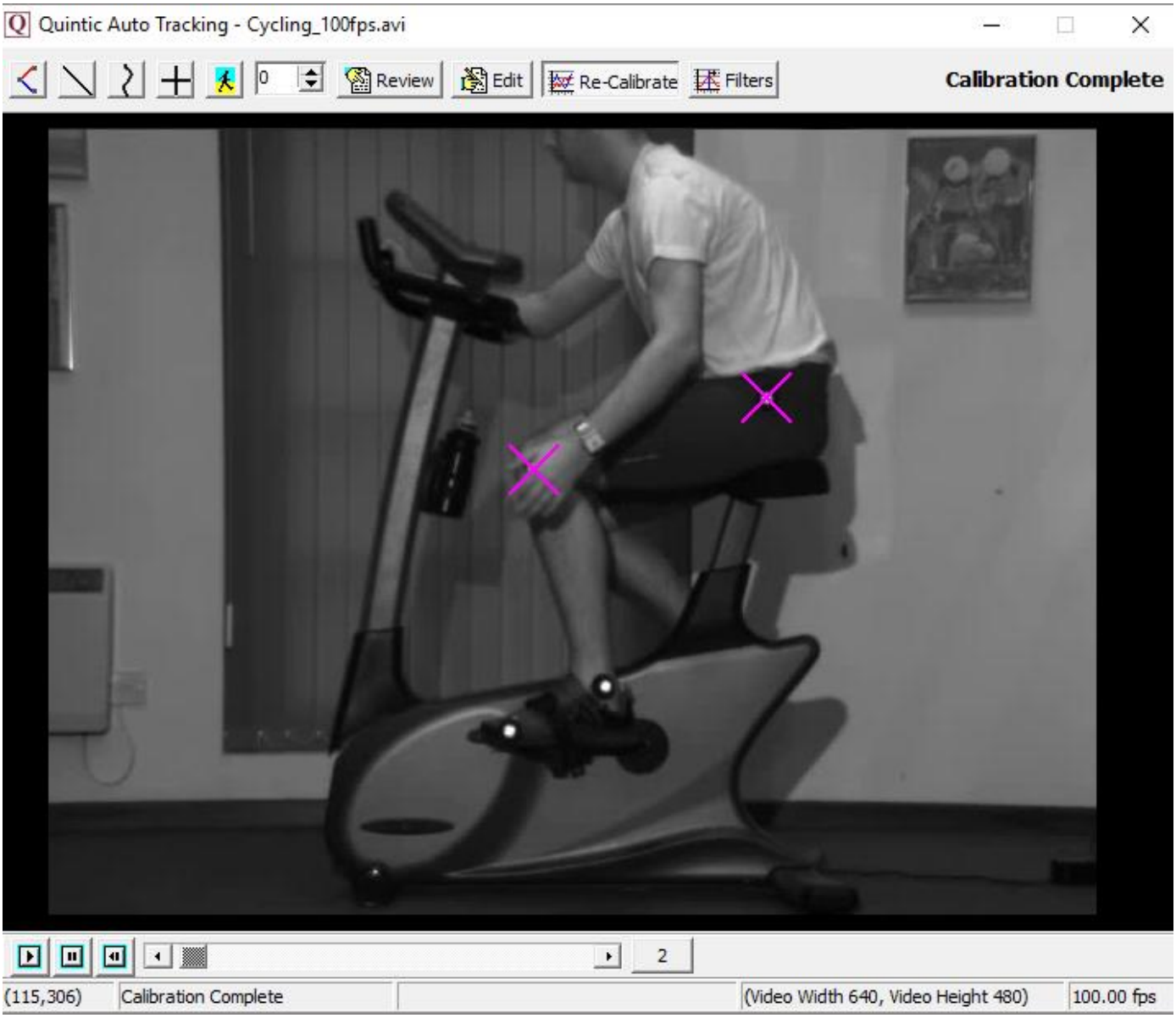


If you clicked yes, you will be brought to the following pop up window, where you will be required to scroll to the frame you wish to use for re-calibration, identify the two markers you wish to use for re-calibration, then enter the distance between them.



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.

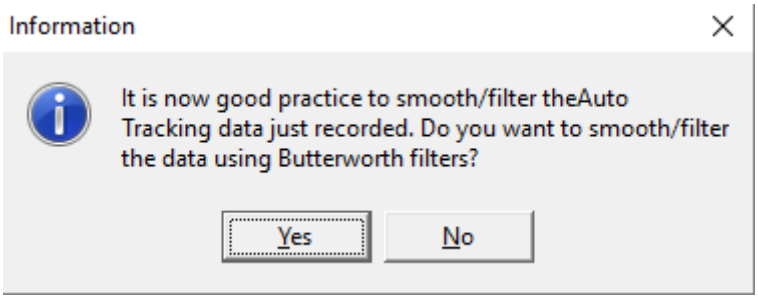

Quintic Auto Tracking - Cycling_100fps.avi
0
Review
Edit
Re-Calibrate
Filters
Calibration Complete
2
(115,306)
Calibration Complete
(Video Width 640, Video Height 480)
100.00 fps

d. 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.

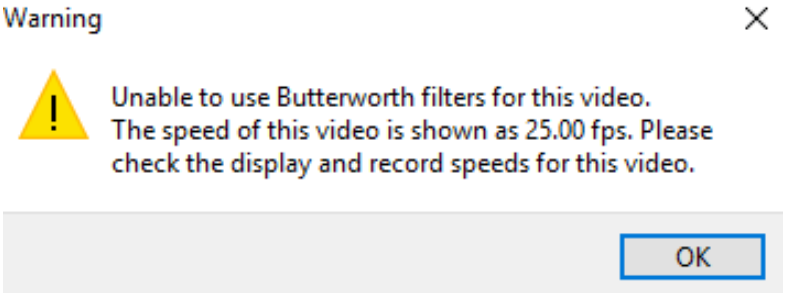
This will bring up the following window.



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

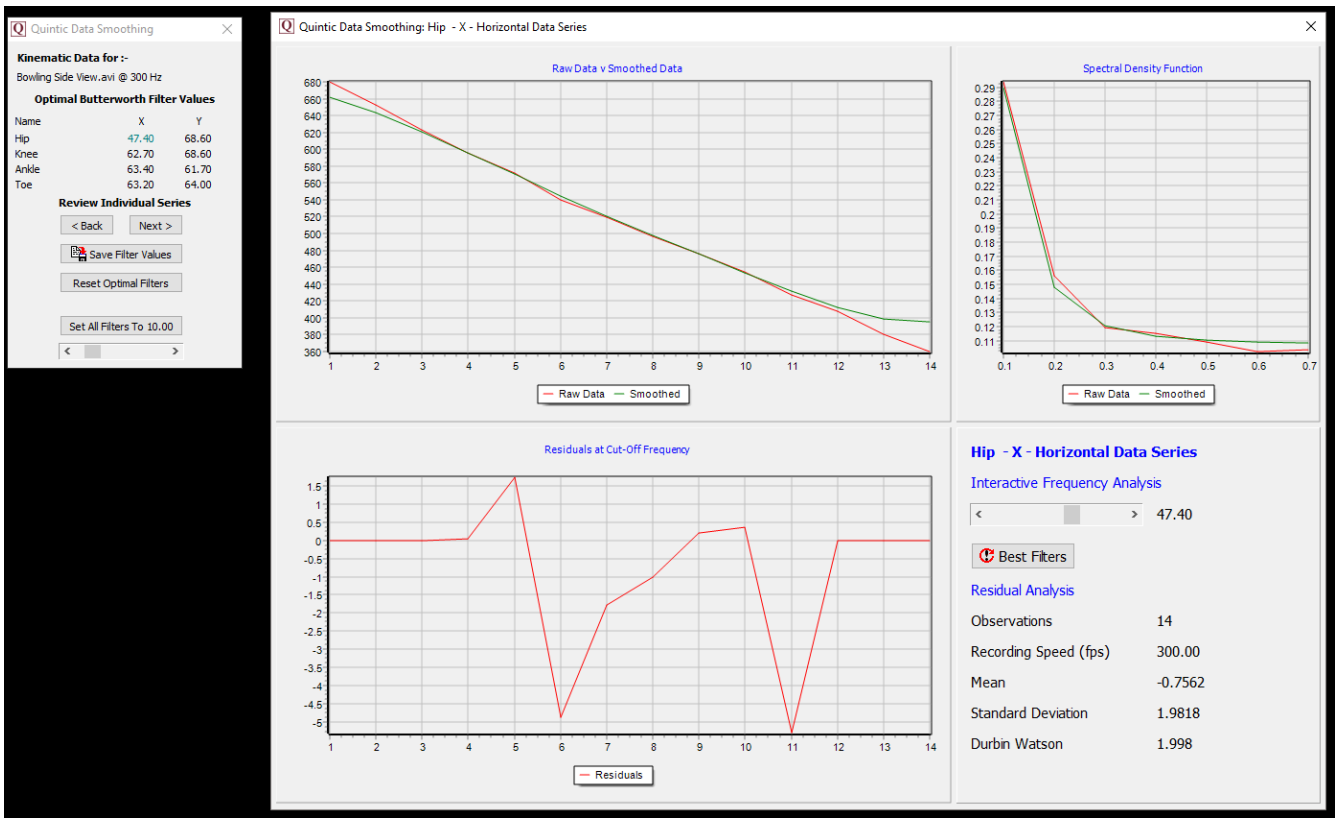
If you click No, no Butterworth filters will be applied.

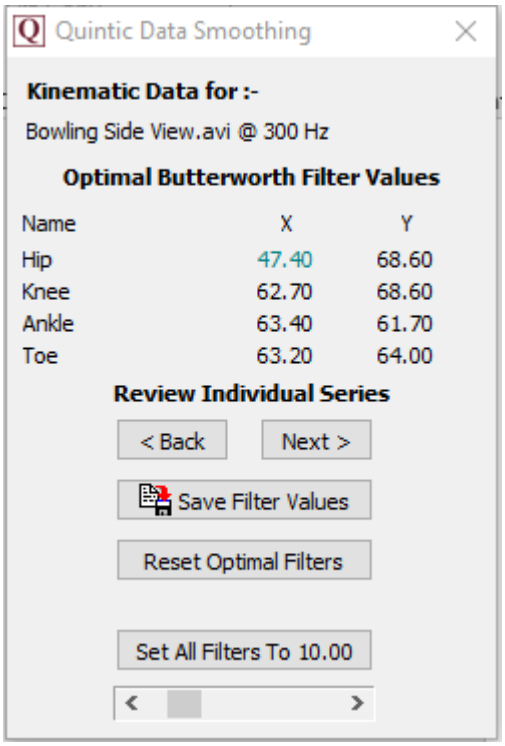
If you click Yes but your video is less than or equal to 25 fps, the following message will appear.



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.





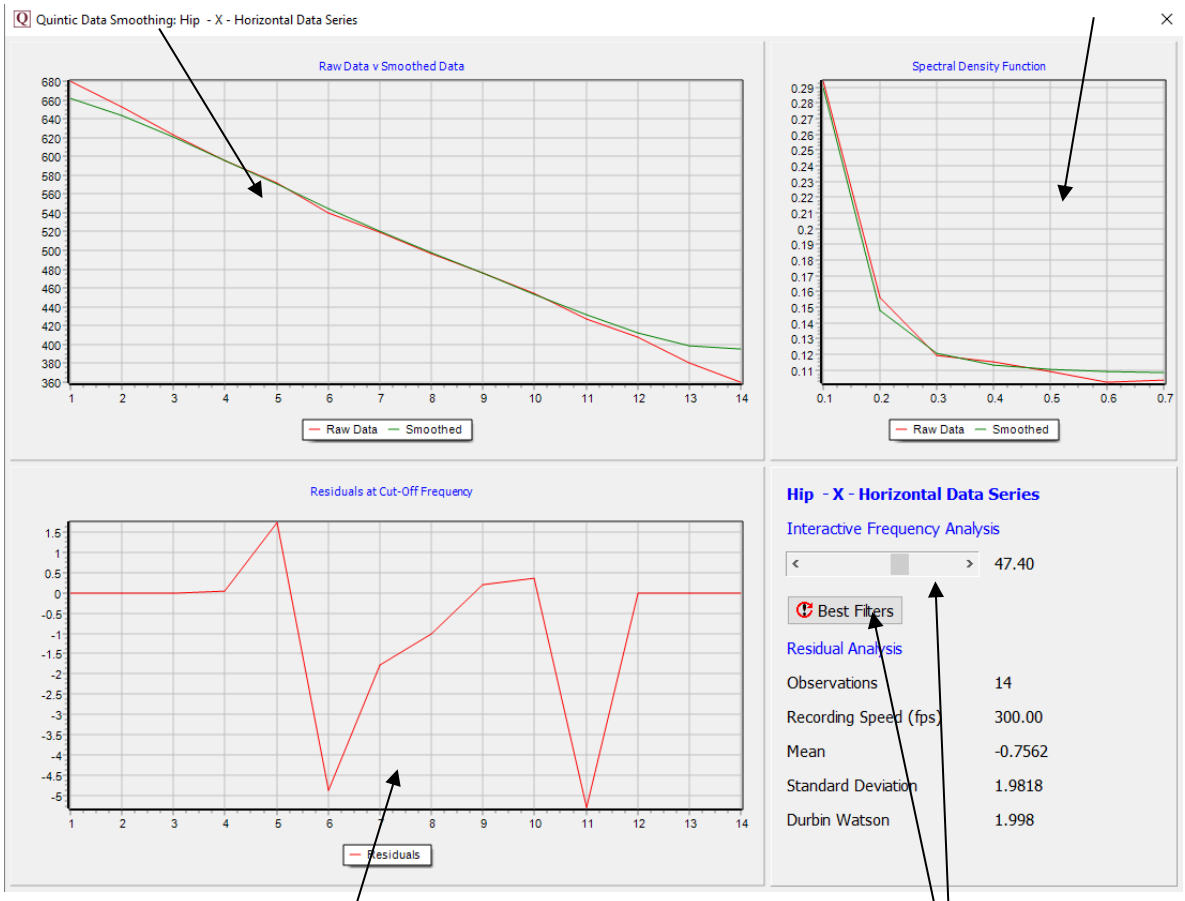
Each point that has been digitised has its X and Y co-ordinates smoothed independently. These smoothing values are show in the Quintic Data Smoothing window above, e.g. 47.40.

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

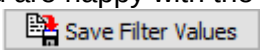
Interactive Frequency Analysis

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).

6. Continue Manual Digitisation of an Existing Trace

You are able to save a digitisation trace and then carry on Manually digitising it at a later time. 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 traces within this window.

7. Editing an Existing 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, as detailed earlier in this tutorial.