

Quintic Software

Tutorial 9b

Single Video Analysis

V31

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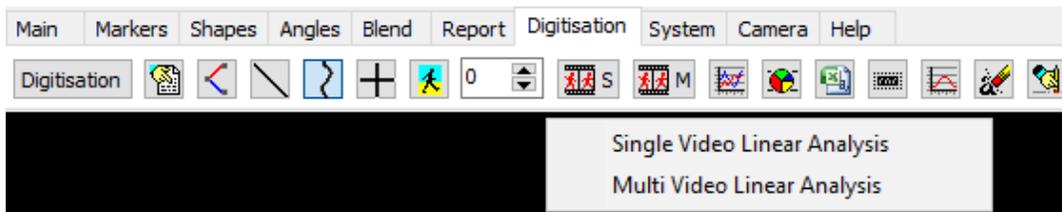
1) Analysis Systems

Quintic allows the user to analyse the digitised movement. These values are automatically calculated for you and can be viewed in graphical form by pressing either the Linear Analysis  or the Angular Analysis  buttons.

From this you can then select Single Video Analysis or Multi Video Analysis.

Linear Analysis

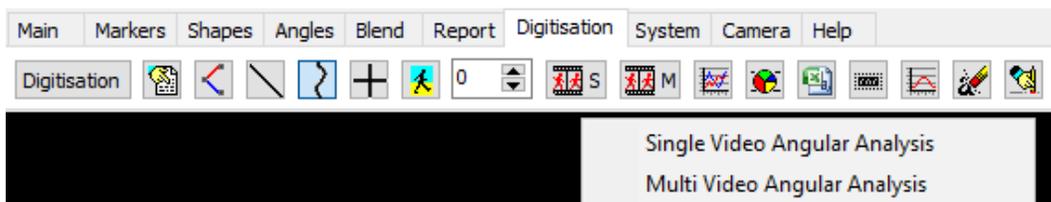
Click on the Linear Analysis button, then either select '**Single Video Linear Analysis**' or '**Multi Video Linear Analysis**' (this is covered in Tutorial 9C).



Linear analysis will provide data on the Distance, Velocity and Acceleration of the points that have digitised.

Angular Analysis

Click on the Angular Analysis button, then either select 'Single Video Angular Analysis' or 'Multi Video Angular Analysis' (this is covered in Tutorial 9C).

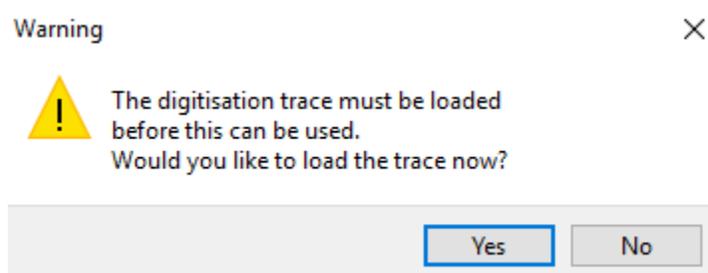


Angular Analysis will provide data on Angular Displacement, Angular Velocity and Angular Acceleration of the points that have been digitised.

2) Single Video Linear Analysis

Once the video has been digitised and the trace has been loaded, simply click on the **'Single Video Linear Analysis'** option after the Linear Analysis button has been pressed.

If the digitisation trace has not been loaded on the video, the following pop up will appear, asking you to load the digitisation trace. Please click **'Yes'**.



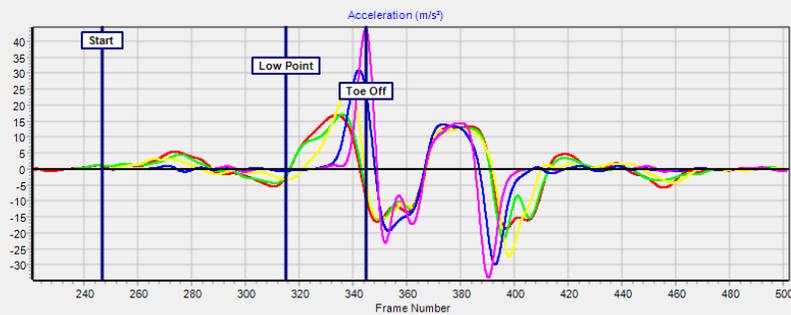
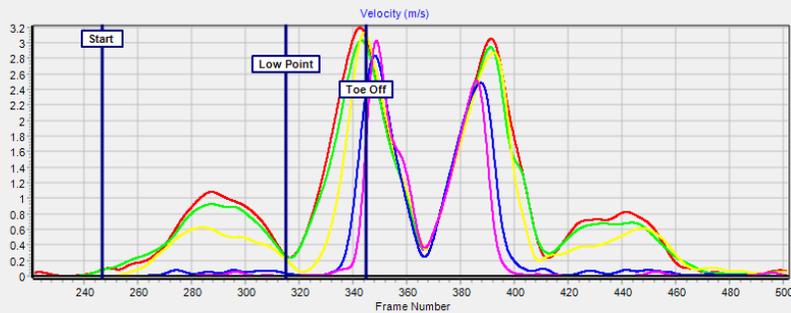
Once the digitisation trace is loaded and the **'Single Video Linear Analysis'** button has been pressed, the Single Video Linear analysis window will load.

This will display the Distance, Velocity and Acceleration in 3 different graphs, for the points that have been digitised throughout the video.

If there are any Time Event Markers (please see Tutorial 2 for further information) that have been saved with the current video, they will also be displayed onto all 3 graphs. This will allow the user to quickly identify on the graph the key events of interest to them (e.g. Impact, Low Point, Toe Off etc). The Time Event Markers will be displayed on the graphs by a blue line, with the default name of Marker 1, Marker 2, if the Time Event Markers have not been named, or the relevant name of that marker if they have been named.

Any Interpolation Markers that have been added to the digitisation trace and saved, will also be shown on the graphs. These are shown with a burgundy line on the graphs.

Please see below an example of the Single Video Analysis Window within Quintic Biomechanics v31 software.



Live Data

- Pelvis
- Hip
- Knee
- Ankle
- 5 Met

Linear
 Horizontal Opp
 Vertical

Smoothed Data Series

Moving Average: 5pts

Frame Number 1

Frame Range 222-501

Time (secs) 0.0000

Record Speed (fps)

Select which digitised markers you want to display on the graph by ticking/unticking the relevant boxes.

Select linear, horizontal or vertical values by ticking the relevant box. These values will then also be displayed on the corresponding graphs. Users are also able to 'opposite' the horizontal direction of the trace.

Digitisation Trace Information. Please see below for further information

Data Series Type – Either smoothed or raw data. In this example smoothing parameters have been applied to the trace.

Frame Number – This displays the current frame number of the associated video.

Time – This displays the current time of the associated video.

Smoothed Data Series
Moving Average: 5pts

Frame Number 1

Frame Range 222-501

Time (secs) 0.0000

Record Speed (fps) 100

Moving Average – This displays the moving average that is applied to the data. Please see the heading 'Moving Average' below for more information.

Frame Range – This displays the digitisation range for the associated video. The digitisation trace starts on the first number and ends on the second number.

Record Speed – Calibrated frames per second of the associated video.

Live Data Table – This button will pop open the Live Data table, which allows the user to easily identify data values at specific points of interest, throughout the video. Please see the heading 'Live Data Table' below for more information.



Deselect All – When pressed, this will hide all of the digitised points on the associated graphs.

Select All – When pressed, this will show all of the digitised points on the associated graphs.

Pelvis
 Hip
 Knee
 Ankle
 5 Met

 Linear
 Horizontal Opp
 Vertical

Smoothed Data Series
Moving Average: 5pts
 Frame Number 1
 Frame Range 222-501
 Time (secs) 0.0000
 Record Speed (fps) 100

Point Names and relevant digitisation trace information are coloured red when the associated video is outside of the digitisation range in the associated Quintic playback window.

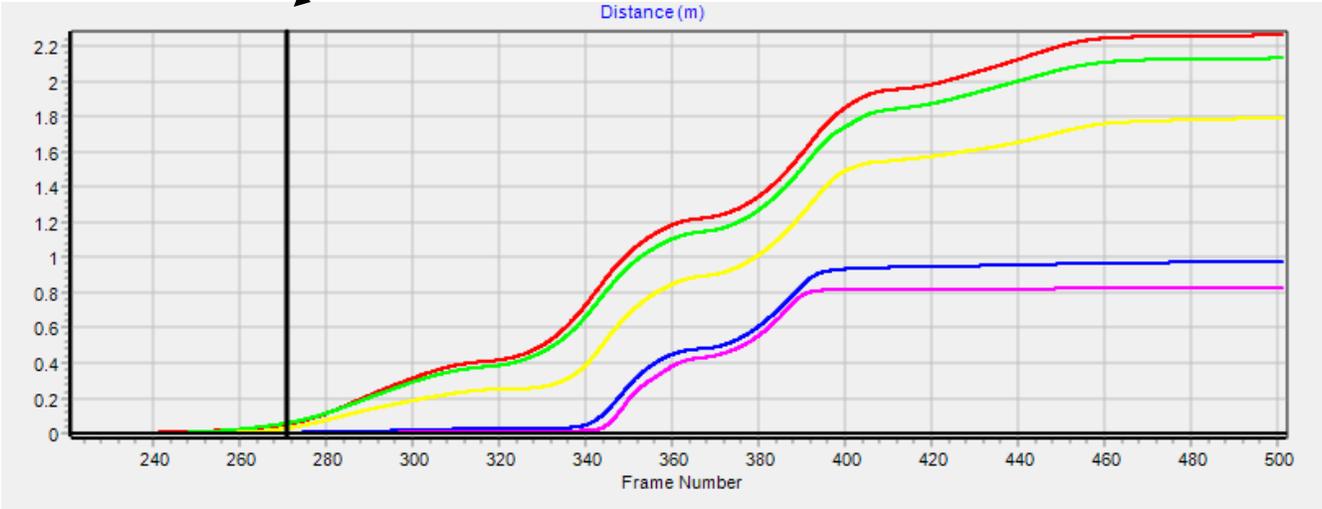
Pelvis
 Hip
 Knee
 Ankle
 5 Met

 Linear
 Horizontal Opp
 Vertical

Smoothed Data Series
Moving Average: 5pts
 Frame Number 241
 Frame Range 222-501
 Time (secs) 2.4000
 Record Speed (fps) 100

Point Names and relevant digitisation trace information are coloured black when the associated video is within the digitisation range in the associated Quintic playback window.

Both the video and analysis windows are synchronised, therefore if the video is played / scrolled while the separate analysis window is open, a black line indicates the current video frame.



a. Functions

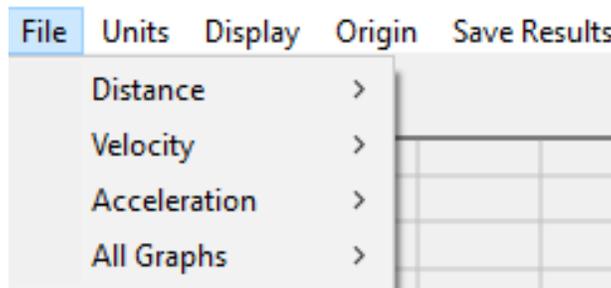
Within the Single Video Linear Analysis window there are a range of options which the user is able to select, which directly effects the distance, velocity and acceleration graphs.

The functions are available at the top of the Single Video Linear Analysis Window and are as follows:

File Units Display Origin Save Results

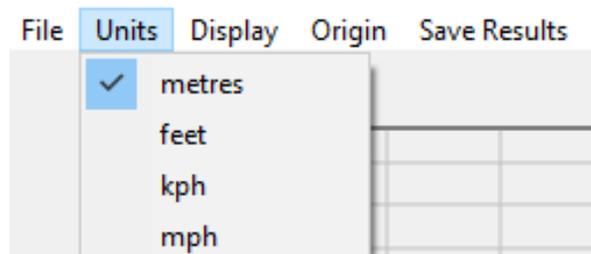
b. File

Within the File menu, the user is able to Print, Print Preview, Save as JPEG or Copy to Clipboard for the individual Distance, Velocity and Acceleration graphs. The user is also able to Print, Save as JPEG or Copy to Clipboard the Distance, Velocity and Acceleration Graphs as one image.



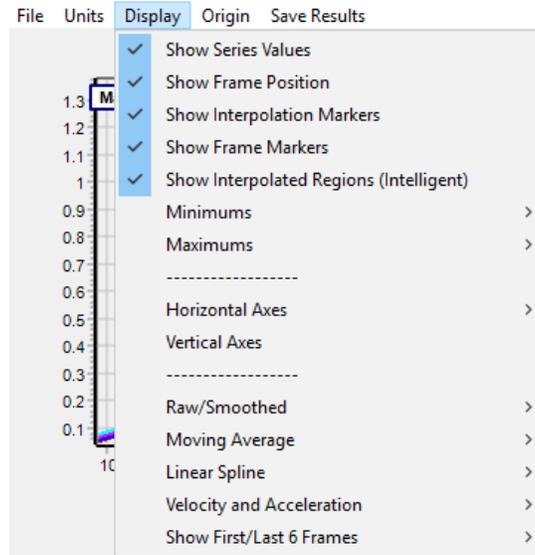
c. Units

Within the Units menu, the user is able to change the units for the data within the Distance, Velocity and Acceleration Graphs. The options are as follows: Metres (Default option), Feet, Kilometres per hour, Miles per hour.



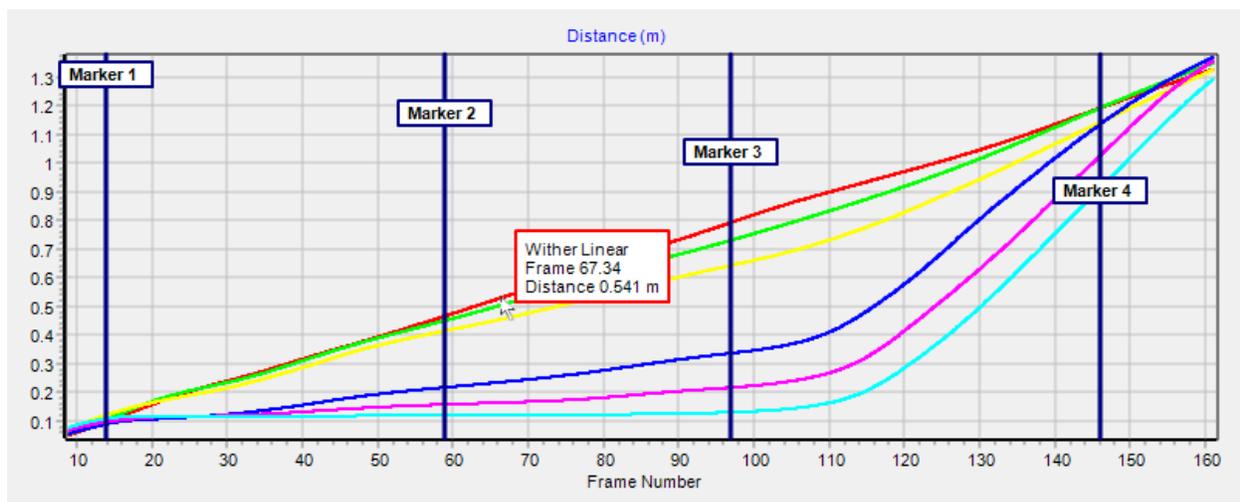
d. Display

Within the Display menu, the user is able to adjust certain display settings which affect the Distance, Velocity and Acceleration graphs.



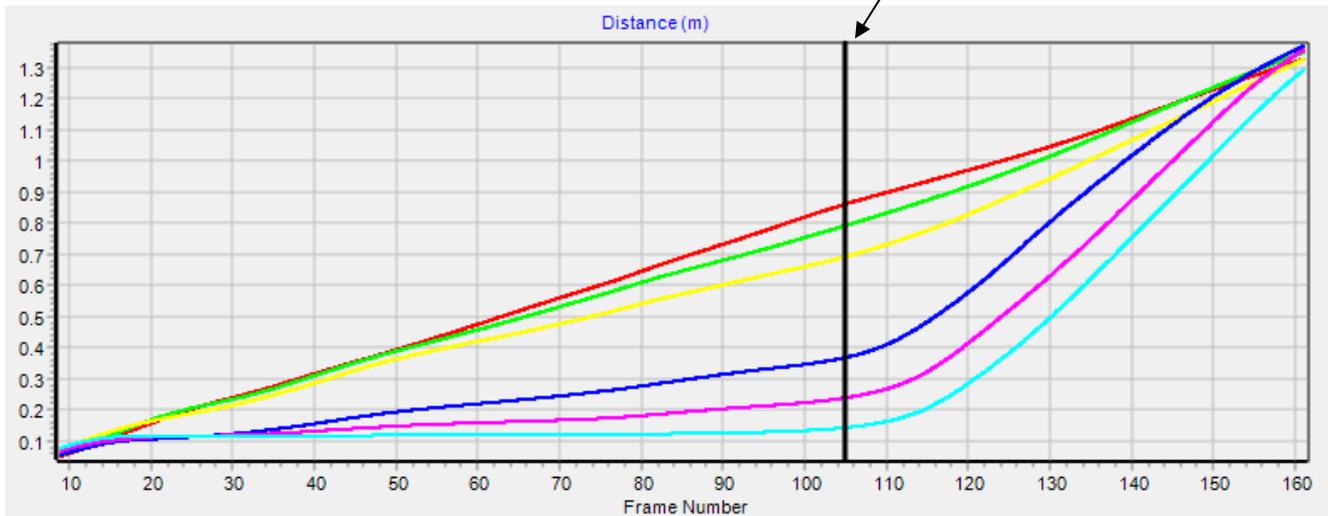
Show Series Values – Ticking and Unticking the Show Series Value option (Default – Ticked/On) will either turn on or off the box which gives you more information on a specific point on the graph. If ticked on, the user is able to use the mouse/cursor and hover over a specific point on the graph, to receive the data for that exact point.

Series Value ON:



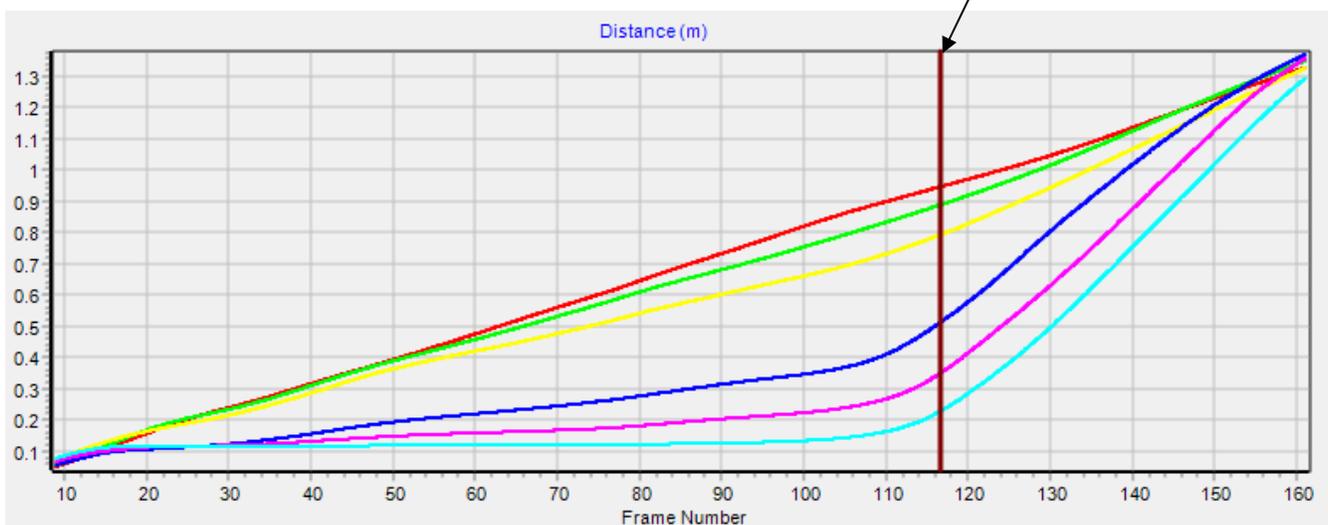
Show Frame Position – Ticking and Unticking the Show Frame Position (Default – Ticked/On) will show or hide the black line which shows the current frame position in relation to the current frame position in the associated Quintic window.

Show Frame Position ON:



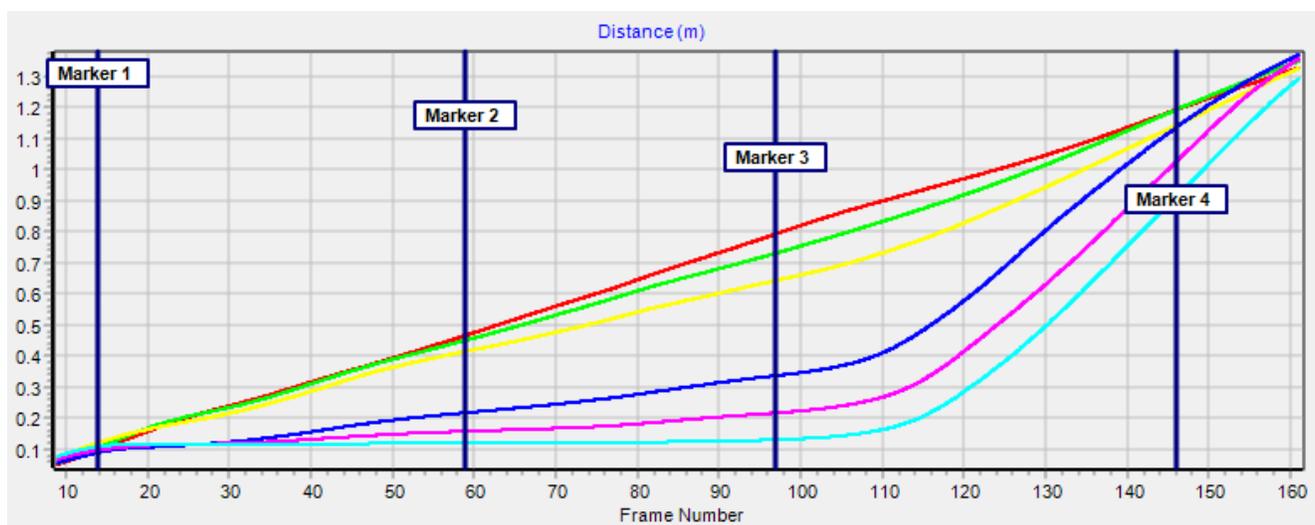
Show Interpolation Markers – Ticking and Unticking the Show Interpolation Markers (Default – Ticked/On) will show or hide any Interpolation markers which are saved with the associated digitisation trace. They will be shown on the graph by a burgundy line(s).

Show Interpolation Markers ON:



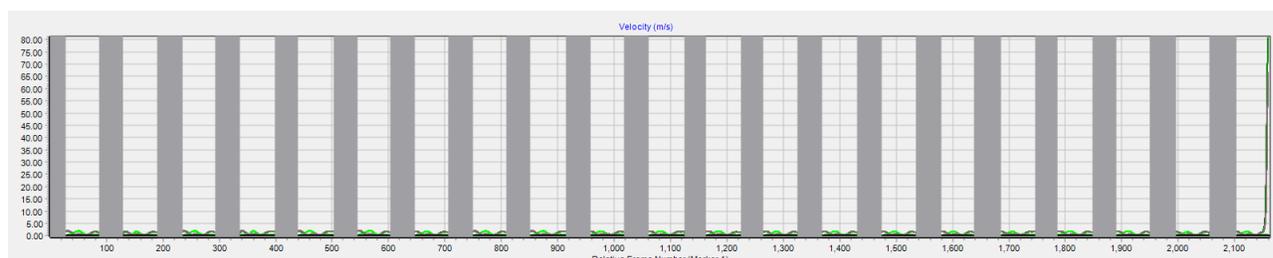
Show Frame Markers – Ticking and Unticking the Show Frame Markers (Default – Ticked/On) will show or hide any frame (Key Event) markers if there are any saved and within the digitisation range. They will be shown on the graph by blue line(s) and will either say Marker 1, Marker 2 etc if they have not been named or the relevant names if they have been named.

Show Frame Markers ON:



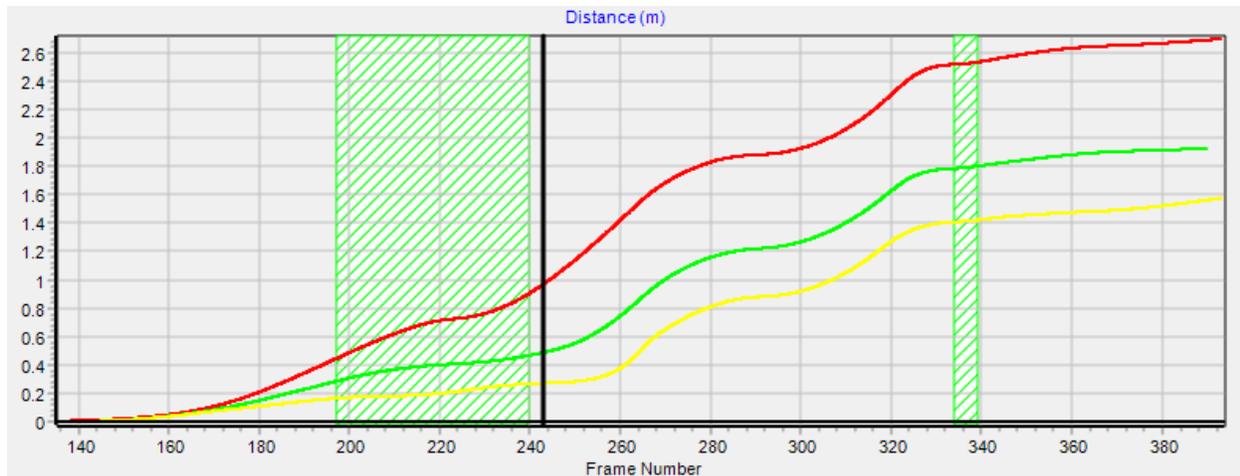
Show Interpolated Regions (Intelligent) – Ticking and Unticking the Show Interpolated Regions (Intelligent) will show or hide any regions where the reflective markers were lost or occluded and the marker(s) were interpolated. When analysing trial data in Quintic, the regions where interpolation has occurred are shown using different colours of box and hatching:

Solid Grey Box – This occurs when the whole reference template has been lost from the Area of Interest (AOI). The solid grey box appears on the graph between the frame where the template was completely lost and the frame where the whole template was re-found. The data series in this region is obscured from view.



Coloured Hatching – Covers the region of the graph where a single marker has been lost. The colour of the box is dependent on the colour of the marker selected when creating the reference model.

Interpolated Regions ON:



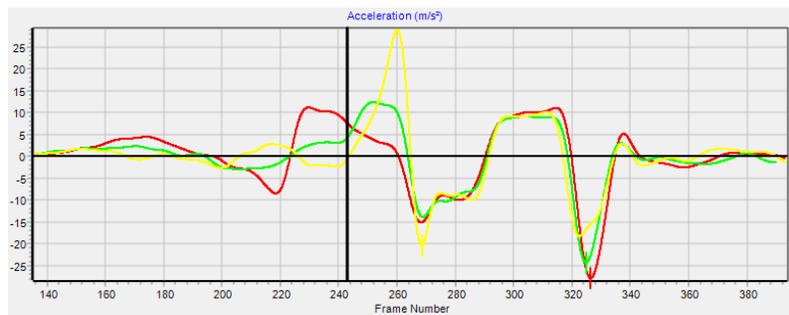
When using Single Angular Analysis hatching will only be displayed when the selected angle includes the marker that has been interpolated. E.g. When analysing the knee angular velocity during a gait analysis, regions where the hip marker has been interpolated, the hatching will be displayed.

However, in order to show interpolated regions, all videos must be digitised using the Intelligent Digitisation function in Quintic Coaching or Biomechanics v29/v31.

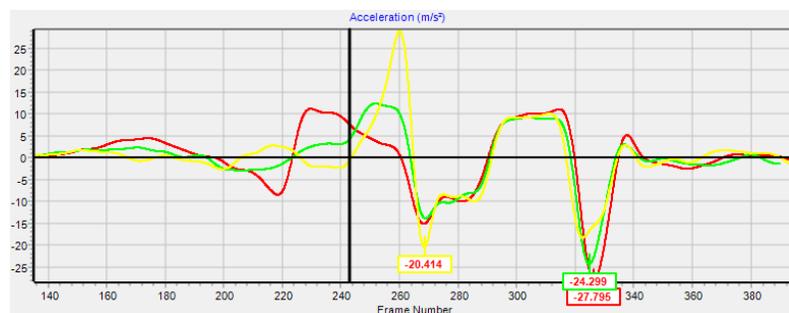
Minimums – The user is able to identify the minimum point on the Distance, Velocity and Acceleration graphs. Options are:

- Min
- Min and Value
- Min, X Pos and Value.

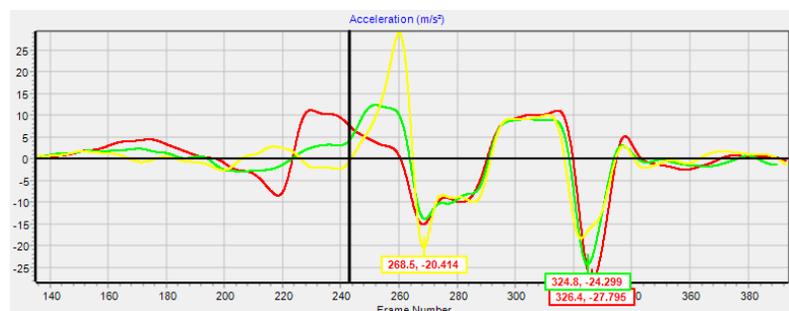
Min – This will draw a small notch for each individual trace at the minimum position of the graph for distance, velocity and acceleration.



Min and Value – This will draw a small notch and give the minimum value at the minimum position of the graph for distance, velocity and acceleration.



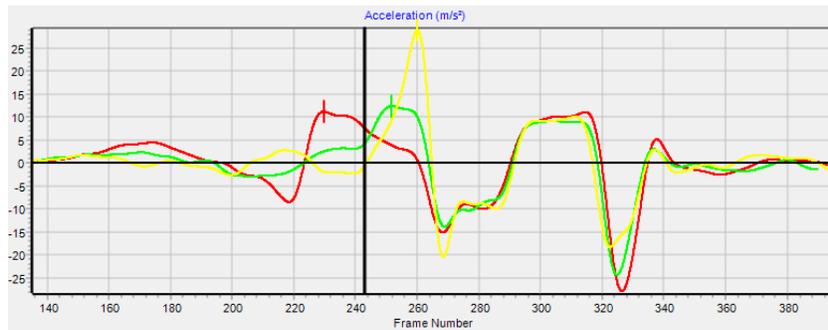
Min, X Pos and Value – This will draw a small notch, the X position (whether this be time or frame number) and the minimum value at the minimum position of the graph for distance, velocity and acceleration.



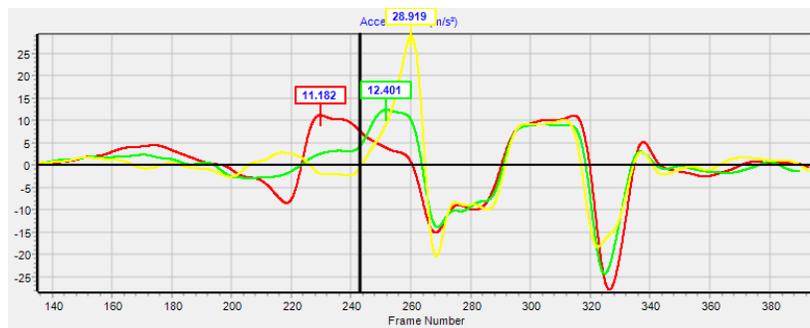
Maximums – The user is able to identify the maximum point on the Distance, Velocity and Acceleration graphs. Options are:

- Max
- Max and Value
- Max, X Pos and Value.

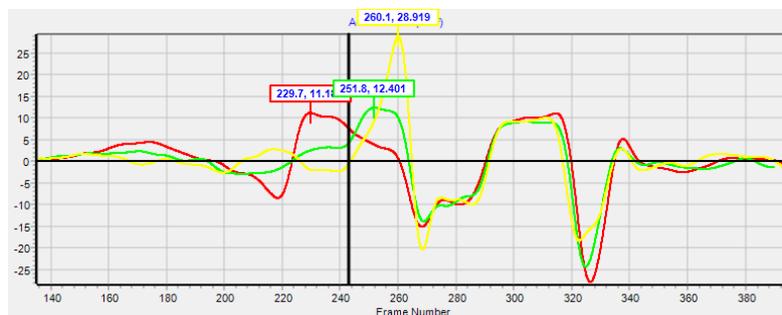
Max – This will draw a small notch for each individual trace at the maximum position of the graph for distance, velocity and acceleration.



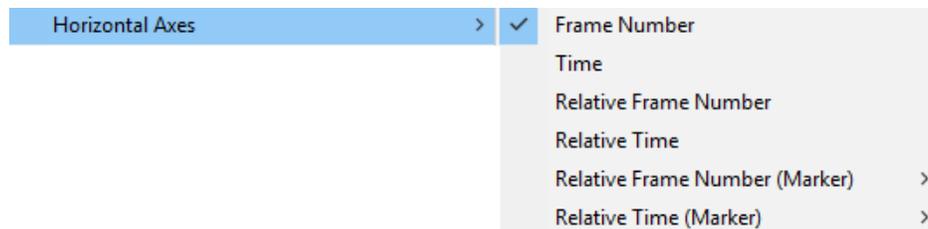
Max and Value – This will draw a small notch and give the maximum value at the maximum position of the graph for distance, velocity and acceleration.



Max, X Pos and Value – This will draw a small notch, the X position (whether this be time or frame number) and the maximum value at the maximum position of the graph for distance, velocity and acceleration.



Horizontal Axes – This allows the user to edit the horizontal axes on the Distance, Velocity and Acceleration graphs. The options available to the user are: Frame Number, Time, Relative Frame Number, Relative Time, Relative Frame Number (Marker) and Relative Time (Marker).



Frame Number – The horizontal axis will be the relevant frame numbers from the associated video. As both the associated video and the Single Linear Analysis Window are synchronised, the frame numbers of the video will match the frame numbers on the graphs e.g frame number 796 in the video will also be frame number 796 on the graphs.

Time – The horizontal axis will be the relevant time from the associated video. This is time from the start of the video, not the digitisation trace. For example, if your digitisation trace starts at 1.2 seconds into the video, 1.2 seconds will be where the horizontal axis will start from.

Relative Frame Number – The horizontal axis will start from 0, with 0 being the start of the digitisation trace as it is relative to the first digitised frame. For example, if your digitisation trace starts at frame number 614 on the video, this will appear as 0 on the graphs.

Relative Time – The horizontal axis will start from 0, with 0 being the start of the digitisation trace as it is relative to the first digitised frame. For example, if your digitisation trace starts at 0.8 seconds into the video, this will appear as 0 on the graphs.

Relative Frame Number (Marker) – This allows the user to change the 0 point of the x axis to a Marker (Key Event) of their choice, if there are any saved for the associated video and digitisation trace. The x axis will then be frame numbers relative to that frame.

Relative Time (Marker) - This allows the user to change the 0 point of the x axis to a Marker (Key Event) of their choice, if there are any saved for the associated video and digitisation trace. The x axis will then be time relative to that frame.

Vertical Axes – This will allow the user to adjust the Vertical Axes of the Displacement, Velocity and Acceleration graphs independently. As default, Quintic will automatically scale the Vertical Axes to the best possible fit, so that both the minimum and maximum values are displayed in each graph.

Graph Type	Automatically Scale Vertical Axis	Minimum	Maximum
Linear Displacement	<input checked="" type="checkbox"/>	0.08	2.78
Linear Velocity	<input checked="" type="checkbox"/>	0.02	3.09
Linear Acceleration	<input checked="" type="checkbox"/>	-27.80	28.92

Users are able to manually adjust the Vertical Axes, by unticking the 'Automatically Scale Vertical Axis' for the graph they would like to manually scale, whether this be Distance, Velocity or Acceleration. Then simply enter in the Minimum and Maximum values you would like the vertical axis to display. You should notice the graph being updated live. Once you have set the vertical axis, simply close the Vertical Axes Settings Window. These axes settings will be remembered when opening and closing the analysis window.

Raw/Smoothed – This allows the user to display either the Raw data for the distance, velocity and acceleration graphs or the Smoothed data with the parameters selected from within the smoothing window.

Moving Average – As default, a moving average is applied to the digitised data. This will be a moving average of 5 i.e the average of 2 frames previous to your current frame, your current frame and 2 frames after your current frame. This applies to all of the distance, velocity and acceleration graphs. The user is able to control how many frames should be taken into account for the moving average (3, 5, 7, 9, 11) or turn the moving average off completely (1).

Linear Spline – As default, a Linear spline is applied to the digitised data, in order for it to appear smoother. The user has the ability to turn this linear spline on or off by either selecting or deselecting this option within the analysis window.

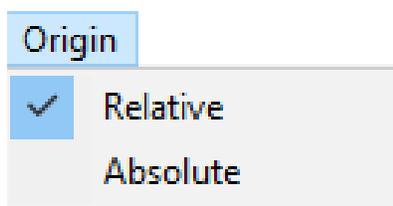
Velocity and Acceleration – This allows the user to edit the way velocity and acceleration is calculated and displayed. This can either be:

- one frame before
- one frame before and one after

Show First/Last 6 Frames – This controls whether the first 6 and last 6 digitised frames are displayed within the analysis windows. As default, Quintic will not display these frames due to any potential smoothing filters applied to the data. The user is able to control whether this should be on or off.

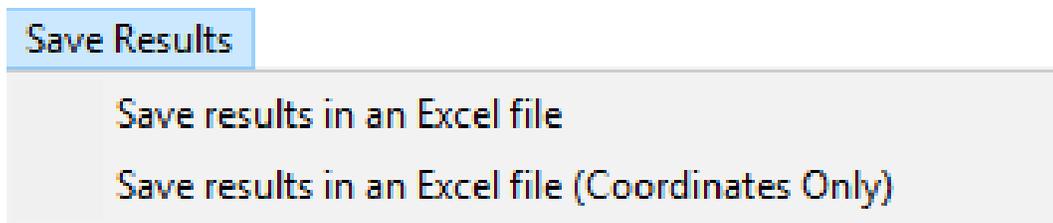
e. Origin

Within the Origin Menu, the user is able to change the origin of the data. The origin options are either: Relative (from the start point of the marker) or Absolute (the 0,0 coordinate). As default the Quintic analysis windows will be set to relative.



f. Save Results

Within the Save Results menu, the user is able to save the results which are displayed on the Distance, Velocity and Acceleration graphs into an Excel spreadsheet for further analysis.



Users have the option to:

Save Results in Excel File – Saves whatever points are displayed on the distance, velocity and acceleration graphs.

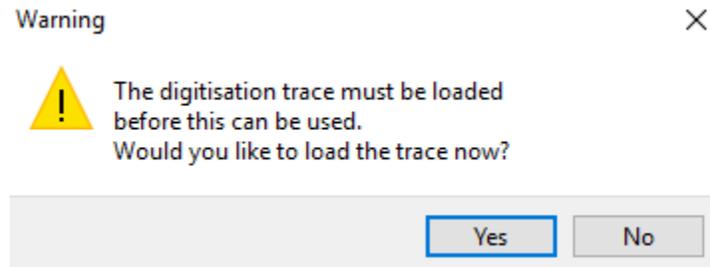
Save Results in Excel File (Co-Ordinates Only) – Saves the co-ordinates of each point only. The user is then able to calculate the distance, velocity and acceleration manually.

The results will be automatically saved within the same folder as the video and with the same name as the video.

3. Single Video Angular Analysis

Once the video has been digitised and the trace has been loaded, simply click on the **'Single Video Angular Analysis'** option after the Angular Analysis button has been pressed.

If the digitisation trace has not been loaded on the video, the following pop up will appear, asking you to load the digitisation trace. Please click **'Yes'**.



Once the digitisation trace is loaded and the **'Single Video Angular Analysis'** button has been pressed, the Single Video Angular analysis window will load.

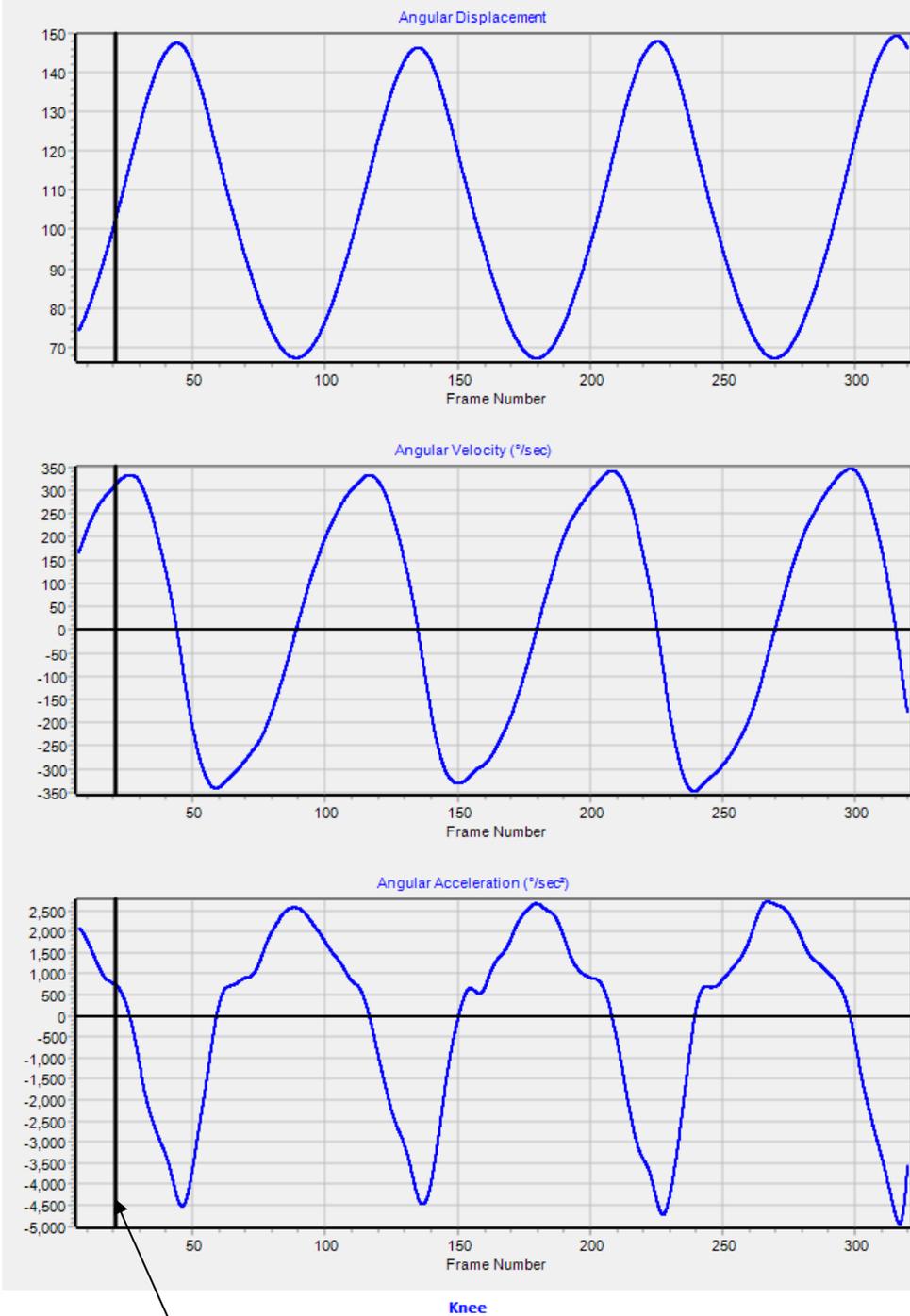
This will display the Angular Displacement, Angular Velocity and Angular Acceleration in 3 different graphs, for the selected angle throughout the digitisation trace. As default, the angle that is calculated is the first three points, e.g Vertical, Point 1 and Point 2.

If there are any Time Event Markers (please see Tutorial 2 for further information) that have been saved with the current video, they will also be displayed onto all 3 graphs. This will allow the user to quickly identify on the graph the key events of interest to them (e.g. Impact, Low Point, Toe Off etc). The Time Event Markers will be displayed on the graphs by a blue line, with the default name of Marker 1, Marker 2, if the Time Event Markers have not been named, or the relevant name of that marker if they have been named.

Any Interpolation Markers that have been added to the digitisation trace and saved, will also be shown on the graphs. These are shown with a burgundy line on the graphs.

Please see below an example of the Single Video Angular Analysis Window within Quintic Biomechanics v31 software.

File Units Display Save Results



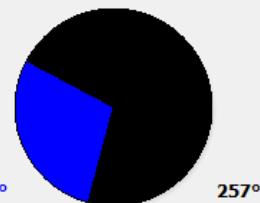
Select Angle Live Data **A B C**

Vertical	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Head	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Shoulder	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Hip	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Knee	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Ankle	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Pedal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Horizontal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Smoothed Data Opposite Flip
Moving Average: 5pts

Frame Number: 21
Frame Range: 7-320
Time (secs): 0.160
Record Speed (fps): 125

Live Angle Display: Knee 1
A: Hip
B: Knee
C: Ankle



Live Angle: 103°

Both the video and analysis windows are synchronised, therefore if the video is played while the separate analysis window is open, a black line indicates the current video frame.

Select Angle	Live Data	A	B	C
Vertical		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Head		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Shoulder		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Hip		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Knee		<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Ankle		<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Pedal		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Horizontal		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Live Data Table – This button will open the Live Data table, which allows the user to easily identify data values at specific points of interest, throughout the video. Please see the heading Live Data Table below for more information.

This is where the user is able to create the angle they wish to analyse. The digitisation template will be displayed along with the vertical and horizontal. To create an angle, the user simply chooses the three points in which the angle is created, with Point B being the centre of the angle you are interested in and Point A and C the points from which the angle is created. For example, to create the knee angle, Hip would be point A, Knee point B and Ankle point C.

Smoothed Data Opposite Flip

This allows the user to either 'opposite' or 'flip' the angle being displayed. Opposite will display the opposite angle from the one currently being displayed (i.e 360 minus). Flip will change the angle from positive to negative or vice versa.

Moving Average: 5pts

Frame Number	21
Frame Range	7-320
Time (secs)	0.160
Record Speed (fps)	125

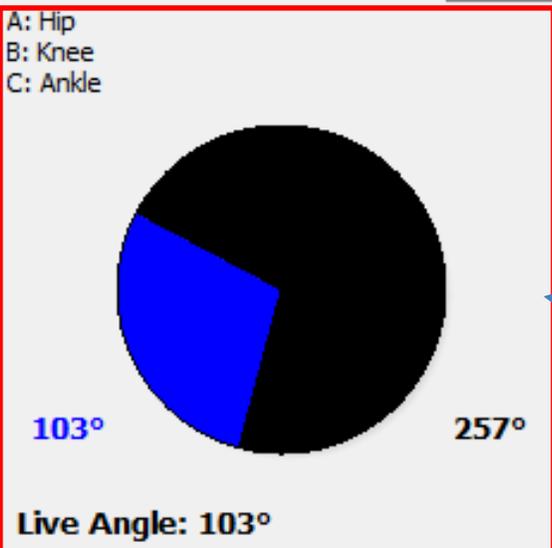
This displays information on the data series. Please see above under Single Linear Analysis for further information on each heading.

Angle 1 All Angles

These buttons will either reset the current angle you are displaying or all of the angles you have created on the graphs.

Live Angle Display: Knee 1

This counter allows the user to display more than one angle on the graph. When increased the user then is able to create another angle to display. The user is able to display up to 10 angles on the same graph.



This provides an overview of the current angle being displayed on the graph. It informs the user on the points from which the angle is created. As well as this, the live angle is shown in a text and pie chart format, which gets updated frame by frame as the video is scrolled/played. The opposite is also displayed in black with the live angle being displayed in blue.

a. Functions

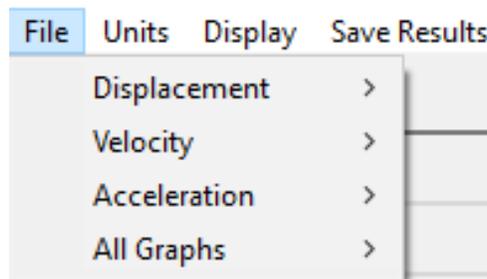
Within the Single Video Angular Analysis window there are a range of functions which the user is able to change, which directly affects the Angular displacement, velocity and acceleration graphs.

The functions are available at the top of the Single Video Angular Analysis Window and are as follows:

File Units Display Save Results

b. File

Within the File menu, the user is able to Print, Print Preview, Save as JPEG or Copy to Clipboard the individual Angular Displacement, Velocity and Acceleration graphs. The user is also able to Print, Save as JPEG or Copy to Clipboard the Angular Displacement, Velocity and Acceleration Graphs as one image.



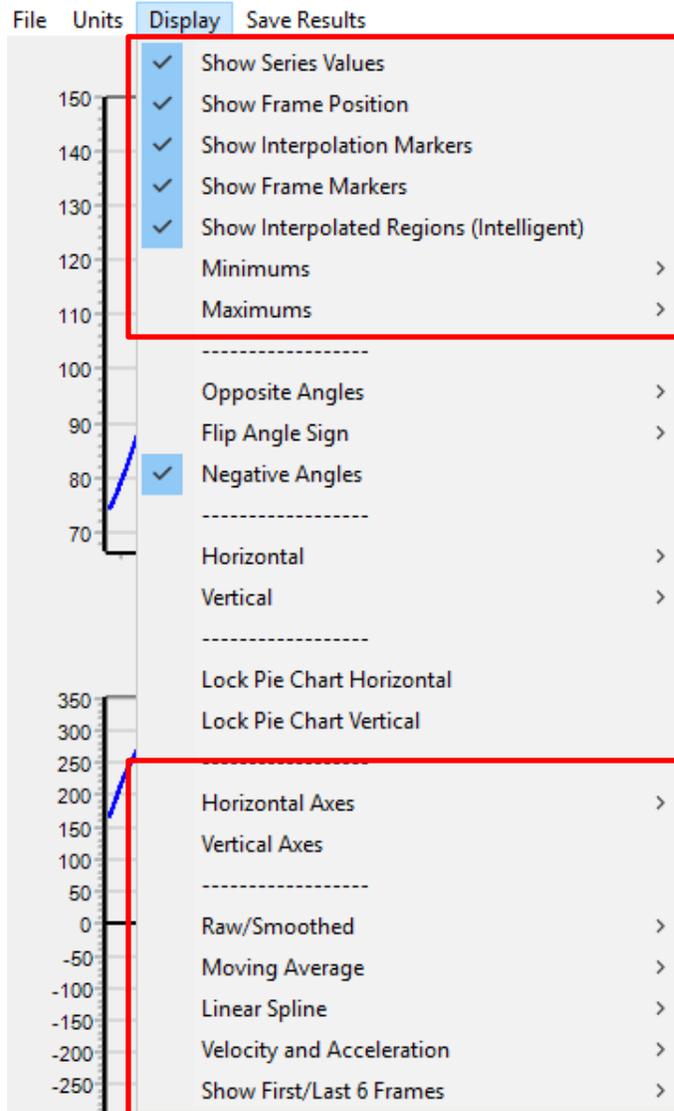
c. Units

Within the Units menu, the user is able to change the units for the data within the Angular Displacement, Velocity and Acceleration Graphs. The options are as follows: Degrees, Radians.



d. Display

Within the Display menu, the user is able to adjust certain display settings which affect the Angular Displacement, Velocity and Acceleration graphs.



These have already been covered. Please see above under 'Single Linear Analysis' for more information on these features.

Opposite Angles – Opposite will display the opposite angle from the one currently being displayed.

Flip Angle Sign – This will change the angle from positive to negative or vice versa.

Negative Angles – This allows negative angles to be displayed. As default, this setting is switched on. This is particularly useful when looking at an angle which fluctuates around 0.

Horizontal – If an angle has been created using the horizontal, the user is able to choose whether the horizontal will be to the left or to the right. As Default this is set to the right.

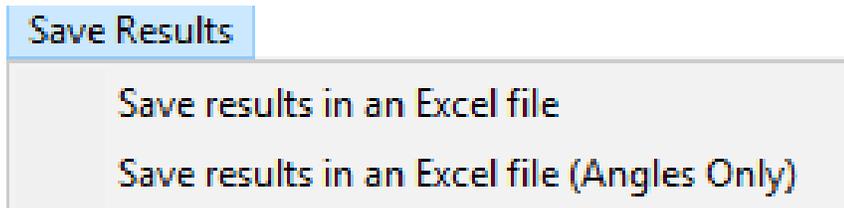
Vertical – If an angle has been created using the vertical, the user is able to choose whether the vertical will be to the top or bottom. As default this is set to the top.

Lock Pie Chart Horizontal – This will allow the user to lock the pie chart to the horizontal.

Lock Pie Chart Vertical – This will allow the user to lock the pie chart to the vertical.

e. Save Results

Within the Save Results menu, the user is able to save the results which are displayed on the Angular Displacement, Velocity and Acceleration graphs into an Excel spreadsheet for further analysis.



Users have the option to:

Save Results in Excel File – Saves whatever angles (up to 10) are displayed on the angular displacement, velocity and acceleration graphs.

Save Results in Excel File (Angles Only) – Saves the angles only. The user is then able to calculate the angular velocity and acceleration manually.

The users must choose the location and file name for the angular data to be exported to.

4) Live Data Table

Within the Linear and Angular analysis windows, there is an option to display the live data table.

Live Data

To display the Live Data Table, simply click the Live Data button within the Linear or Angular analysis window.

Q Live Data Table



Frame 309	Distance			Velocity			Acceleration		
	Linear	Horizontal	Vertical	Linear	Horizontal	Vertical	Linear	Horizontal	Vertical
Head	0.045			0.063			0.056		
Shoulder	0.064			0.044			-0.035		
Hip	0.240			0.206			0.797		
Knee	2.093			1.372			-3.443		
Ankle	2.767			1.293			-4.675		
Pedal	2.924			1.475			-1.178		

This will then display the data which is displayed on the Distance, Velocity and Acceleration graphs.

As the video plays through, the Live Data table will be updated with the current frame data.

Within the Analysis windows, if any points of the digitisation trace are unticked, this data will not be displayed within the Live Data table. If the Horizontal and Vertical (Linear Analysis only) options are ticked on the graph, this will also be displayed on the Live Data Table.

Q Live Data Table



Frame 309	Distance			Velocity			Acceleration		
	Linear	Horizontal	Vertical	Linear	Horizontal	Vertical	Linear	Horizontal	Vertical
Shoulder	0.064	0.000	-0.002	0.044	0.002	0.044	-0.035	-0.036	0.057
Hip	0.240	-0.001	-0.015	0.206	-0.017	0.207	0.797	1.120	1.095
Knee	2.093	0.032	-0.088	1.372	-0.609	1.240	-3.443	5.340	-1.121
Ankle	2.767	0.080	-0.044	1.293	-0.792	1.015	-4.675	-4.881	-10.059
Pedal	2.924	0.104	-0.059	1.475	-0.938	1.127	-1.178	-8.359	-8.381