

Computing Custom Digitizing Pointer Configuration

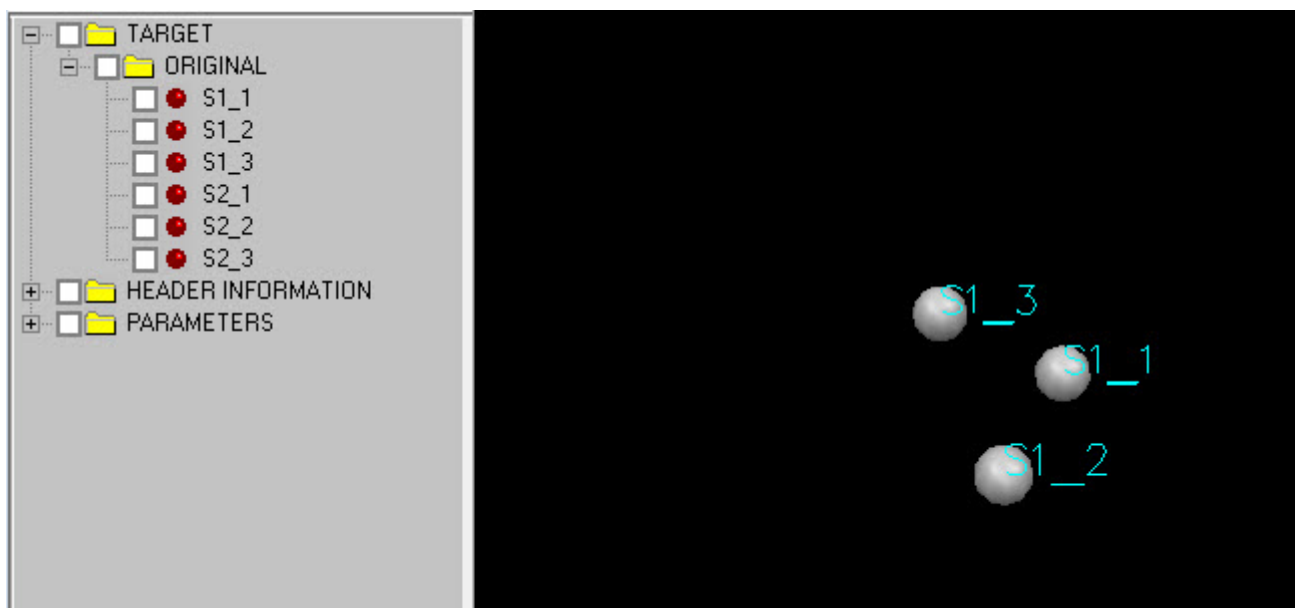
Users can construct their own digitizing pointer. The following steps demonstrate how to compute the location of the pointer tip relative to the markers attached to the rod.

This is especially useful for users that want to construct a pointer using an electromagnetic or inertial sensor, because it isn't obvious how to measure physically the location of the tip from the electromagnetic sensor housing.

The following file was collected by streaming data from a Polhemus Liberty system into Visual3D.

<https://www.has-motion.com/download/examples/LLibertyDigitizingPointer.c3d>

Step1. Open the file in Visual3D



Note that Visual3D displays the 6 degree of freedom information from the Liberty sensor as 3 TARGETS. This file contains two Liberty sensors, which translates to 6 targets (3 for each sensor).

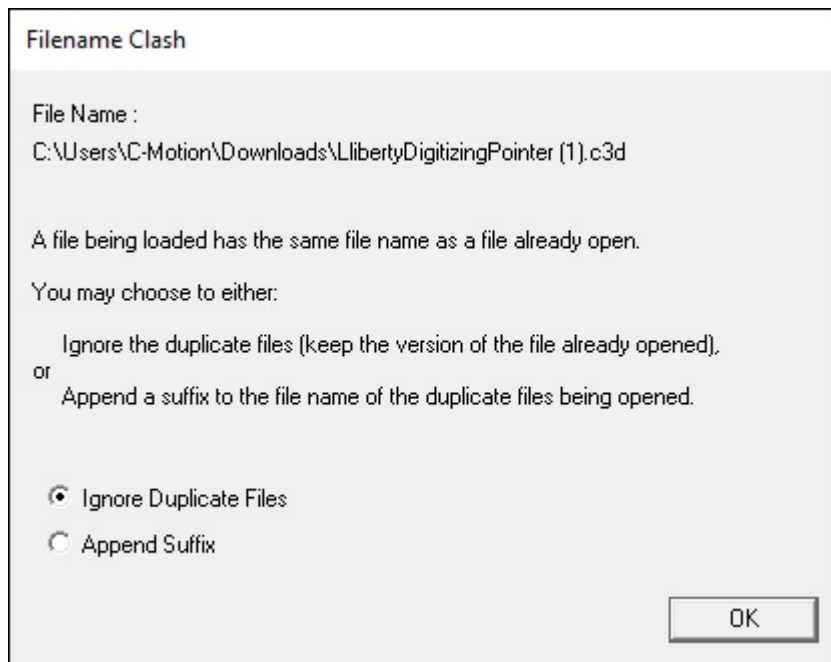
Sensor 1 is attached to a pointer, so the movement of the pointer is defined by markers S1_1, S1_2, S1_3.

In this file the pointer tip has been placed on the ground, and keeping the tip in contact with the ground, the pointer is rotated about that point.

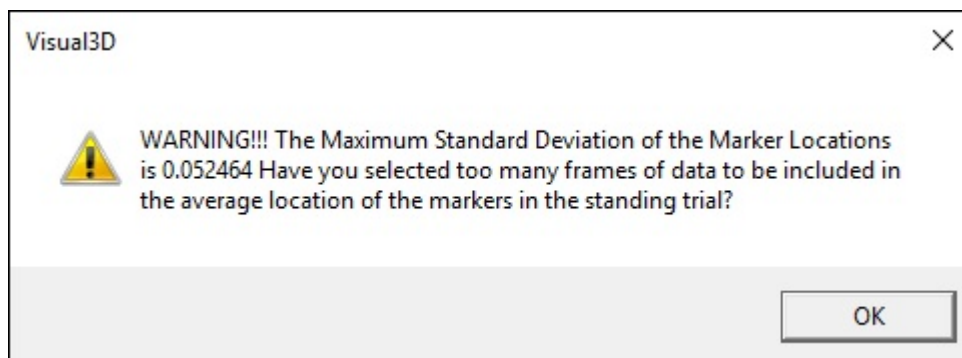
The location of the tip is a stationary point, which means that we can compute its location as a functional joint.

Step 2. Create a hybrid model using the same movement trial

A dialog will appear indicating that the file is already open in the workspace. Select the option to add a suffix to the filename.

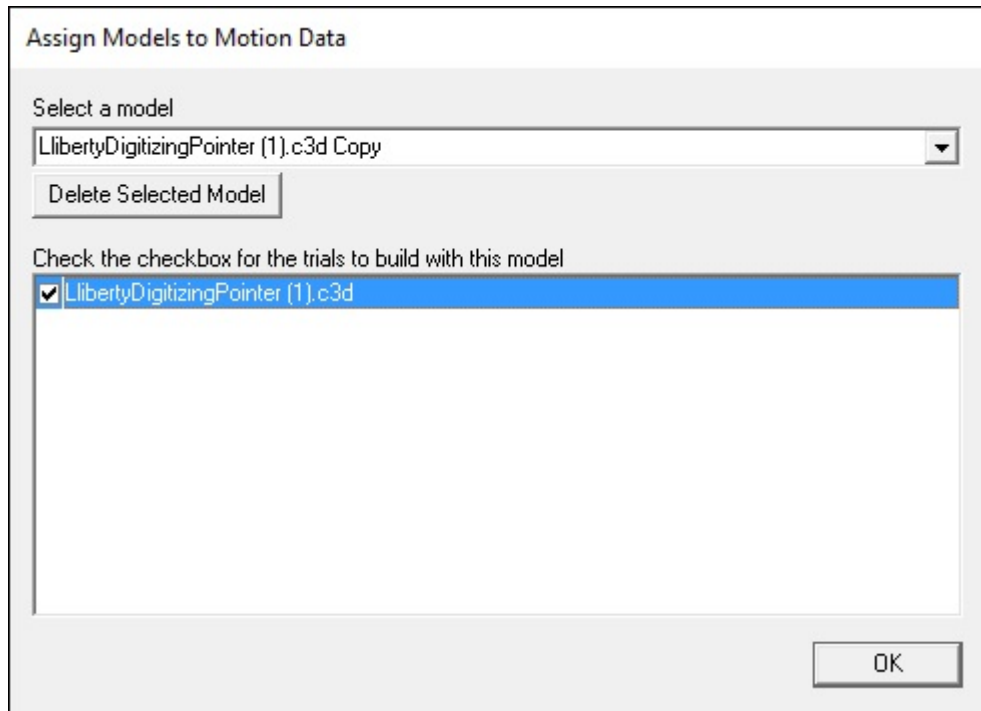


Another dialog will appear stating that the markers are not stationary.



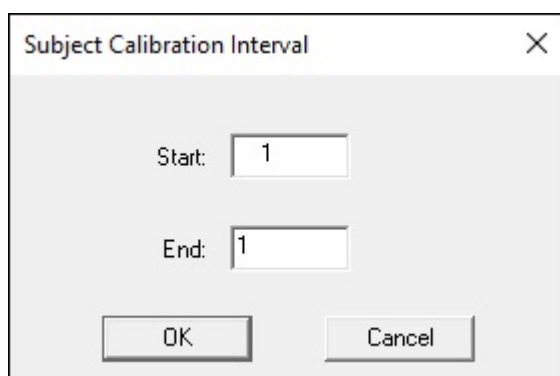
Remember that we have loaded a movement trial, so in order for the average location of the markers to have any meaning, we must select only 1 frame of this trial.

Step 3. Assign the movement trial to the model file



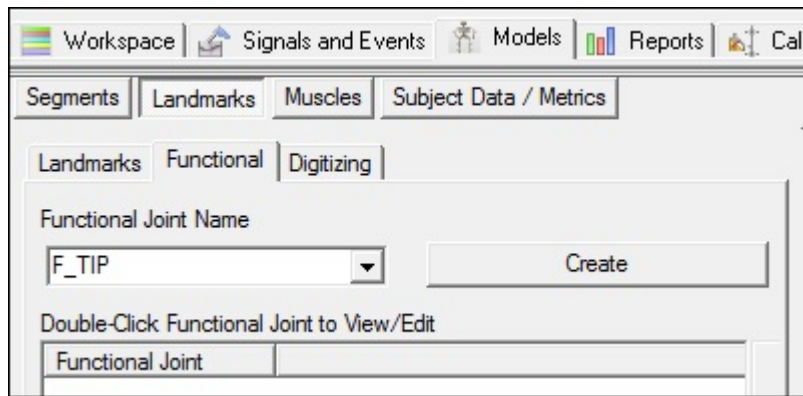
Step 4. Assign the frames for the static trial

under the model menu select the option to “modify frame range for static calibration” and specify only one frame of data.



A warning will appear saying that the model has no Mass and default value of 1 will be used. This default value is fine because we are not computing kinetics from this data.

Step 5. Create a functional joint definition for the tip (F_TIP)



Workspace | Signals and Events | Models | Reports | CalT

Segments | Landmarks | Muscles | Subject Data / Metrics

Landmarks | Functional | Digitizing

Functional Joint Name

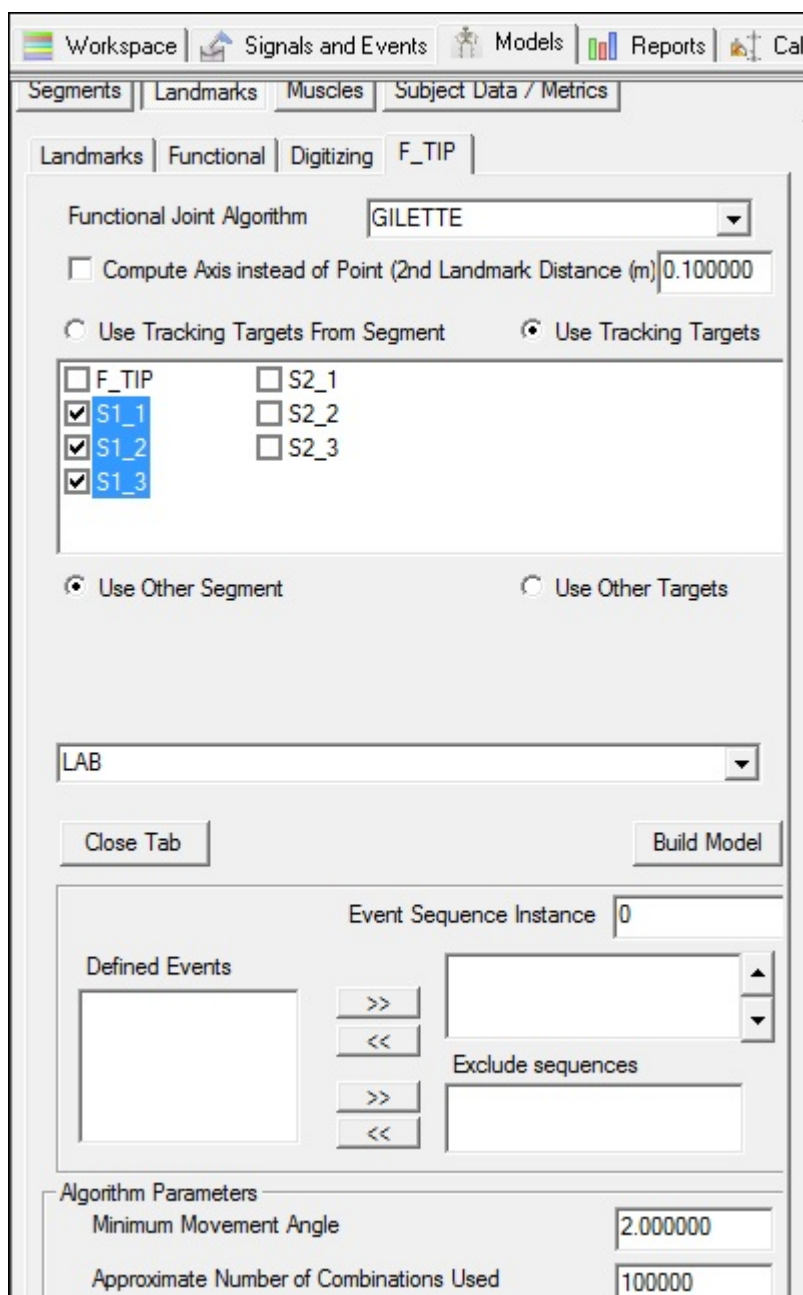
F_TIP [v] Create

Double-Click Functional Joint to View/Edit

Functional Joint

Note that there isn't a default definition for this landmark, so you should type F_TIP into the combo box as shown.

Select the Create button.



Workspace | Signals and Events | Models | Reports | CalT

Segments | Landmarks | Muscles | Subject Data / Metrics

Landmarks | Functional | Digitizing | F_TIP

Functional Joint Algorithm GILETTE [v]

☐ Compute Axis instead of Point (2nd Landmark Distance (m)) 0.100000

☐ Use Tracking Targets From Segment ☒ Use Tracking Targets

☐ F_TIP ☐ S2_1

☒ S1_1 ☐ S2_2

☒ S1_2 ☐ S2_3

☒ S1_3

☒ Use Other Segment ☐ Use Other Targets

LAB [v]

Close Tab Build Model

Event Sequence Instance 0

Defined Events

>> <<

Exclude sequences

>> <<

Algorithm Parameters

Minimum Movement Angle 2.000000

Approximate Number of Combinations Used 100000

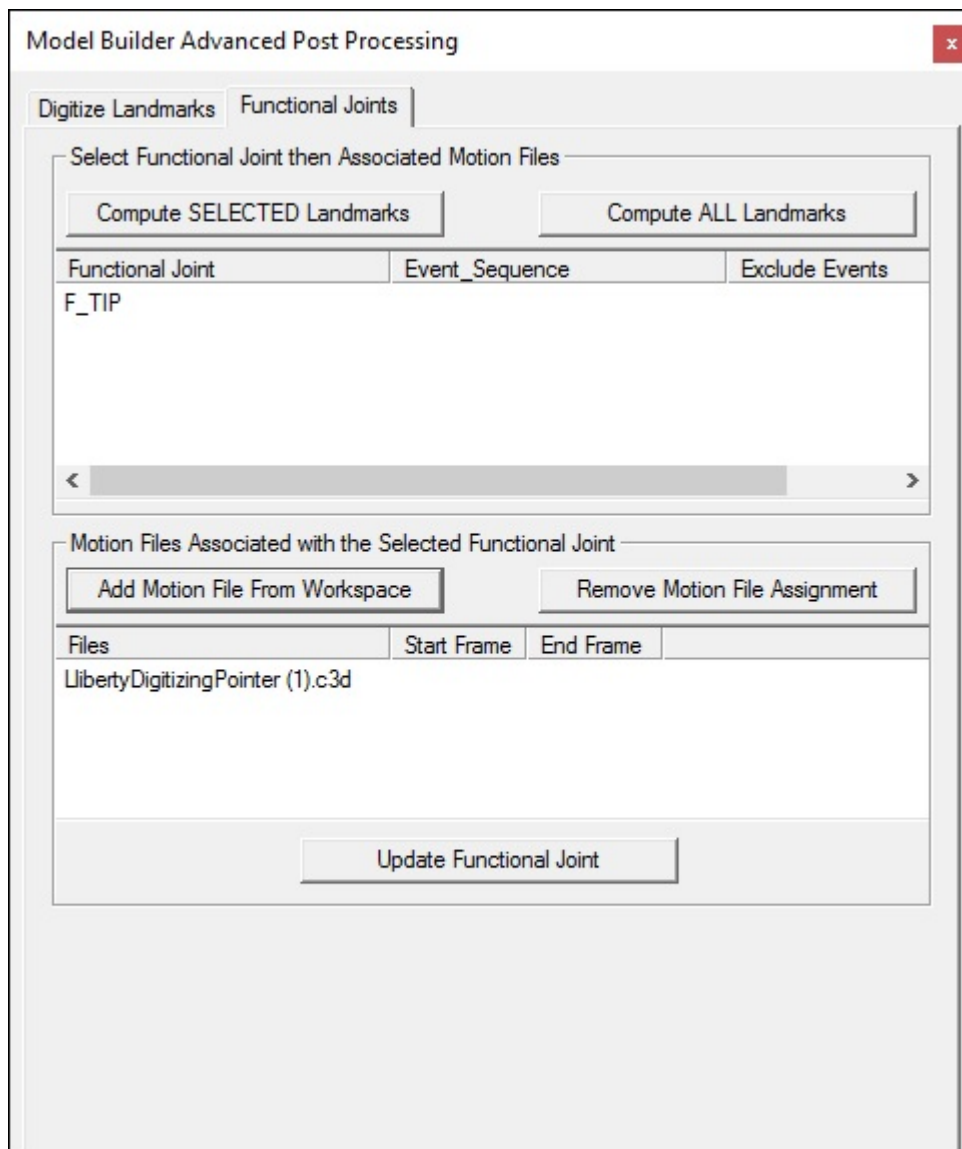
Enter the information above. The landmark will be created relative to the 3 targets (eg. liberty sensor

1) and the movement will be computed relative to the LAB.

Step 6. Compute the functional joint



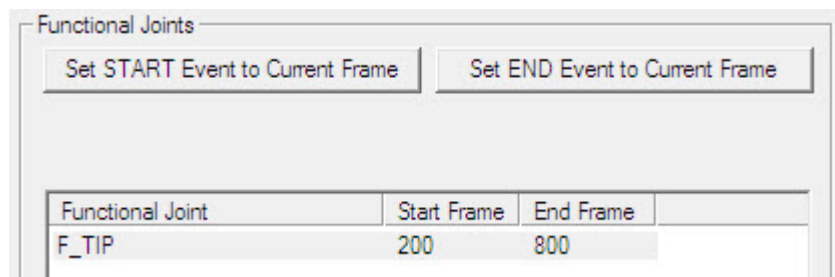
Select the Model Builder PostProcessing item on the Toolbar.



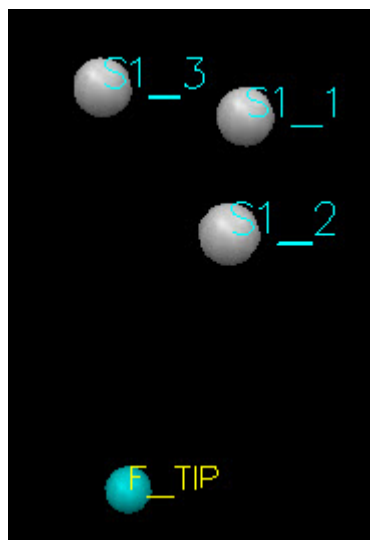
Switch to the Functional Joints tab and select the button “add motion files from Workspace”.

Select the motion file. At this point you should be able to animate the motion file.

Specify the range of frames to be used for the functional joint calculation by selecting the buttons “Set START Event to Current Frame” and “Set END Event to Current Frame”. Current Frame refers to the frame of data shown in the animation viewer.



Select "Compute SELECTED Landmarks"



A landmark should appear in the animation viewer, and an instance of the functional joint should appear as a Landmark

Segments Landmarks Muscles Subject Data / Metrics				
Landmarks Functional Digitizing F_TIP				
Landmark Name	Segment	ML	AP	AXIAL
F_TIP		-0.017319	0.287495	0.024086

edit the landmark. Note that the location of the tip is relative to the 3 markers.

The screenshot shows the Visual3D software interface with the 'Landmarks' tab selected. The 'F_TIP' landmark is being configured. The 'Landmark Name' is 'F_TIP'. The 'Define Orientation Using' section is active, showing 'Starting Point' as 'S1_2' (Reference), 'Ending Point' as 'S1_3' (On a line), '*Lateral object' as 'S1_1' (On a plane), and '*Project From' as an empty dropdown (Projection onto a line or plane). The '* = Optional' note is present. The 'Existing Segment' option is not selected. The 'Landmark Offset from Start Point (Reference) or Segment Origin' section shows 'Offset to Existing Calibration Target or Landmark' as an empty dropdown, and 'Offset Using the Following ML/AP/AXIAL Offsets' is selected. The offsets are: ML: -0.017319, AP: 0.287495, and AXIAL: 0.024086. The 'Offset by Percent (1.0 = 100%) (Meters when not checked)' checkbox is unchecked. The 'Calibration Only Landmark (Not generated for assigned motion file(s))' checkbox is also unchecked. At the bottom, there are buttons for 'Undo Changes', 'Apply', 'Build Model', and 'Close Tab'.

Visual3D has selected the order of the 3 markers automatically based on a set of internal rules. There is no need to modify the default selection.

Step 7. Specify the pointer configuration

Switch to the Digitizing Landmarks Tab

Select the button "Create/Modify Digitizing Wand"

WorkspaceSignals and EventsModelsReportsCalT

SegmentsLandmarksMusclesSubject Data / Metrics

LandmarksFunctionalDigitizing

Digitizing Point NameCreate

Double-Click Digitizing Point to View/Edit

Digitizing_Point

Delete Selected Digitizing Point

Edit Digitizing_Points

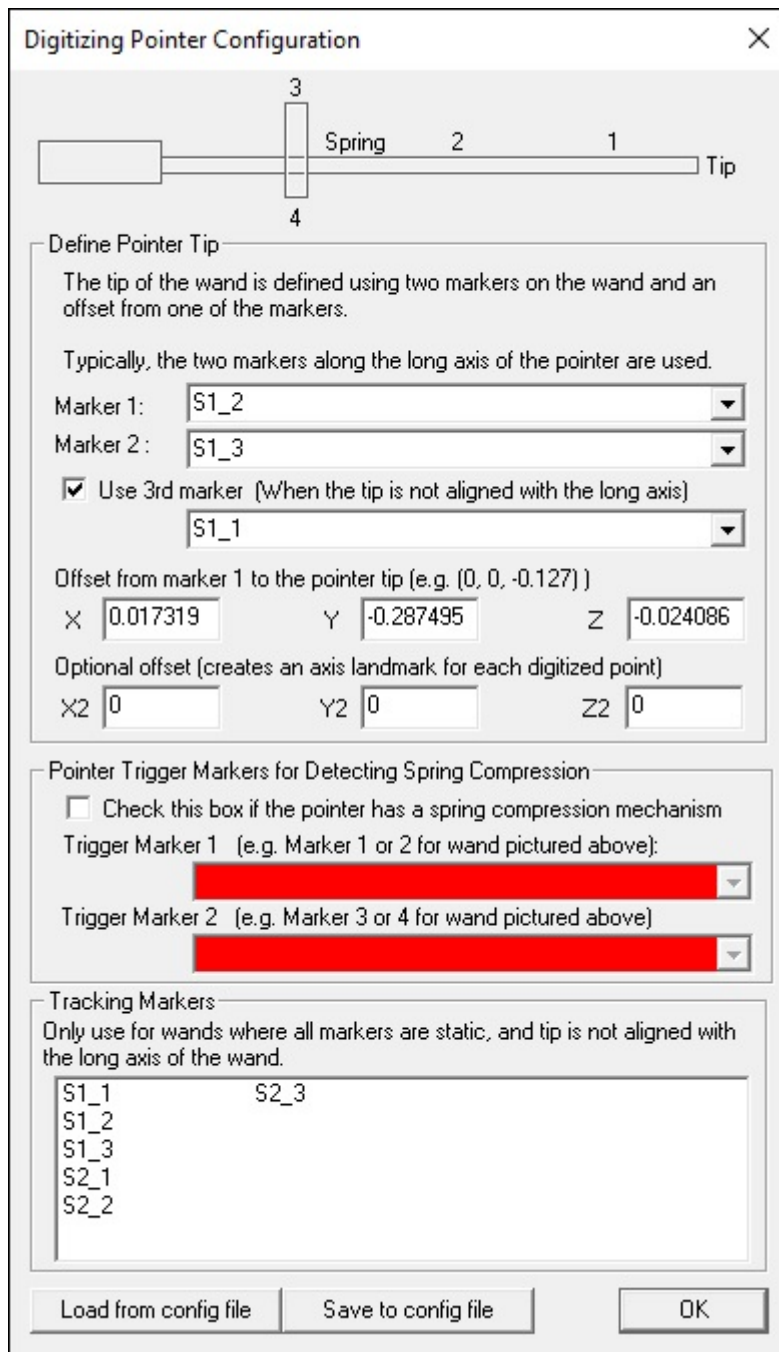
Load Points From File

Create/Modify Digitizing Wand

Save Points To File

Build Model

Populate the dialog as shown.



Digitizing Pointer Configuration

Diagram of a digitizing pointer with markers 1, 2, 3, 4 and a Spring. The Tip is at the end of the long axis.

Define Pointer Tip

The tip of the wand is defined using two markers on the wand and an offset from one of the markers.

Typically, the two markers along the long axis of the pointer are used.

Marker 1:

Marker 2:

☒ Use 3rd marker (When the tip is not aligned with the long axis)

Offset from marker 1 to the pointer tip (e.g. (0, 0, -0.127))

X Y Z

Optional offset (creates an axis landmark for each digitized point)

X2 Y2 Z2

Pointer Trigger Markers for Detecting Spring Compression

☐ Check this box if the pointer has a spring compression mechanism

Trigger Marker 1 (e.g. Marker 1 or 2 for wand pictured above):

Trigger Marker 2 (e.g. Marker 3 or 4 for wand pictured above):

Tracking Markers

Only use for wands where all markers are static, and tip is not aligned with the long axis of the wand.

The order of the markers and the offsets are extracted from F_TIP landmark definition above.

Note especially that the offset locations are the negative of the F_TIP landmark locations. This is because Visual3D has a subtly different mechanism for specifying landmarks relative to markers, and landmarks relative to segments. The digitizing pointer is treated as a segment.

Select the option "Save to config file".

This config file can then be loaded for subsequent trials.

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