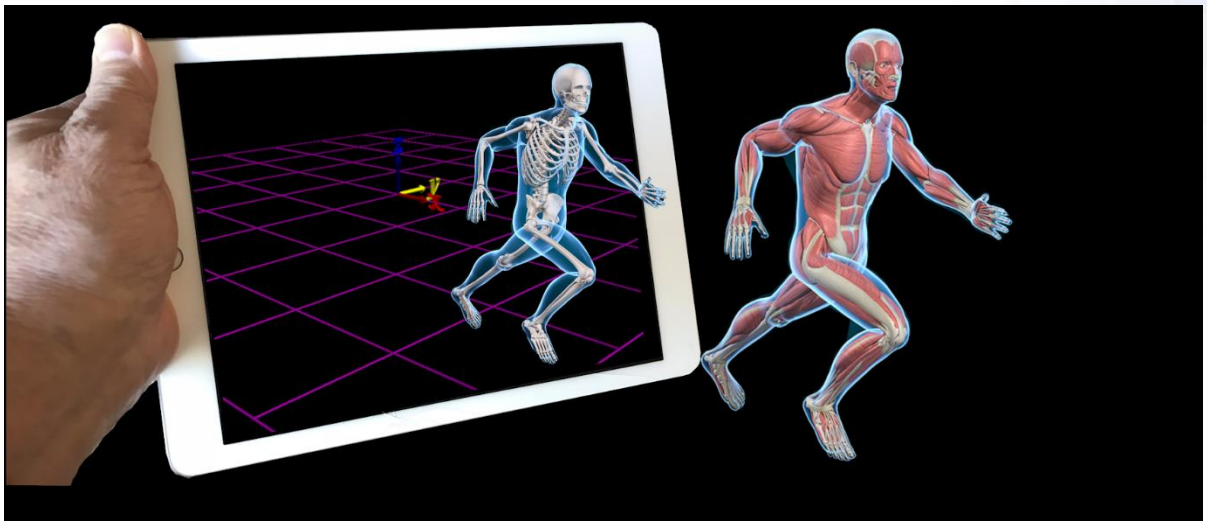
The MotionMonitor xGen Build Log



This build log includes a description of significant changes to The MotionMonitor xGen software. Interim builds involving testing or steps in the creation of a significant update may be available but are not included here. *Windows Operating System updates and display adapter updates should be run in parallel to The MotionMonitor xGen installer. Display adapter updates should be performed directly through the manufacturer's website after completing Windows updates.*

Version 4.06e Installer

Please note that this installer requires internet access to successfully complete the installation. If internet access is not available on the PC at the time of installation, first run this installer up to the NVIDIA CUDA installation process and then download and install the full CUDA installer from our download page. The NVIDIA CUDA installation process may take several minutes.

General Updates:

- Upgraded Basler video Pylon (version 7.4.0.149000)
- Upgraded GStreamer for video processing/handling (version 1.22.9)
- User Interface updates, including a splash screen, modifications to the color scheme, updated button and drop-lists designs, and a watermark logo in the Animation window.
- Moving forward, the Default.iws file should not get overwritten when running an installer.

Performance Updates:

- Added automatic compiling to improve script performance and speed.
- Improved handling of memory buffers for Activities to reduce system resource requirements.

Usability Updates:

- Updated message dialogs and added progress bars to more accurately reflect the software status while processes are being performed.
- Expanded logging details.
- Added a status bar at the bottom of the application to indicate the last message written to the log window and the current workspace and analysis file, if applicable.
- Expanded toolbar capabilities. Text strings can now be entered into a toolbar and edit fields allow for integer and scalar script variables to be updated directly through the toolbar.
- Added capabilities to trim the length of an existing Activity or to extract multiple, smaller 'trials', from a larger Activity.
- Implemented Rigid Body maximum RMS error tolerance checks and added alerts in the log window and status bar when the maximum error is exceeded.

- Improved robustness for handling variables that are constructed out of sequence.
- Added a recursive loop check for variable definitions.
- Improved robustness for handling variables that are constructed out of sequence.
- Updated the SaveActivityAs() script command to work from the Live window.
- Simplified the Biofeedback component to either use Axes data or to independently enable each axis for 1D, 2D, and 3D experimental paradigm designs.
- Added the ability to rerun video files for Markerless systems to reprocess subject tracking.
- Improved robustness and quality of the Markerless camera calibration. New features include the removal of outliers from the intrinsic, dynamic, calibration images via a geometric median calculation, an anchoring method to expand the calibration to cameras without static images, an option to perform extrinsic only calibrations, and settings for low-light conditions. The calibration results also include expanded diagnostics, and the calibration can be performed using a script.
- Improved video window robustness and increased video quality. Expanded the video encoding capabilities, including adding a CRF (Constant Rate Factor) edit field. The advanced camera parameters settings can be applied to all cameras and the camera settings are also now disabled after performing a recording and following the processing of video files.
- Expanded controls for the auto-save/auto-name behavior and added an option to withhold the analysis settings from being applied to recorded activities.
- Updated the Recording period and Stop trigger delay settings in the Edit Recording Parameters dialog to accept formulas.
- Expanded the use of the stylus Is-button-pressed expression with the subject setup dialogs.
- Extended support for the use of the functional method computation to include wrist, ankle and MCP knuckle joints.
- Added a check to ensure existing digital force plate configurations for AMTI and Bertec aren't cleared out without end user approval when activating hardware with these force plates disconnected or powered off.
- Expanded the diagnostic results for electromagnetic system distortion corrections/metal mappings to include the RMS position and orientation errors.

New Hardware Updates:

- Added the Microphone component, including capabilities to play back the audio sound and graph the audio waveform, including Voltage, rawVoltage and RMS signals. Filter settings can be applied to the audio playback and the filtered or unfiltered audio waveform can be exported as a .WAV file.

Existing Hardware Updates:

- Updated video processing, including improved efficiency, canceling of recordings, and removing post processing video alignment steps. Additional pixel formats are also now supported for Basler video cameras.
- Added ability to deactivate Biosemi and APDM devices while copying data to prevent driver stalls and reduce CPU load during high-impact periods.
- Updated support for AntNeuro Eego SDK (version1.3.30.57172) and added the ability to disabled channels.
- Added support for 13-bit inputs and outputs for Measurement Computing devices and expanded output functionalities, including setting delays and implementing Lowest latency and Synchronized Output protocols.
- Expanded support for Qualisys marker and rigid body data. Implemented RT protocol version 1.24.
- Added support for multi-subject captures when using Theia3D.
- Added support for SwRI ENABLE version 1.0.6 and improved workflow robustness. Added support for ball tracking and event tags.
- Expanded C3D support to include exporting digital Bertec and AMTI force plates and improved the robustness in interpreting force plate size, position and orientation. Segment lengths are also properly calibrated when importing a C3D file without a static file.

- Improved robustness with digital Bertec force plate activation and updated the Bertec device set measurement rate to be non-editable.
- Improved robustness of Noraxon devices during activation and deactivation and when disabling channels or with receiving channel names.
- Expanded manual synchronization methods between hardware devices to include configuration in the Live window prior to recording. The File menu, “Export Time Shifts”, can be used to perform alignments on existing data in a batch processing mode.
- Updated the VR interface to ensure that biofeedback objects are automatically generated within Unity environments.

Analysis and Visualization Updates:

- Added screen capture and screen recording capabilities through the File menu and Script functions.
- Added Stick and Precision (diamond shaped segments) figure rendering options for the Subject in the Animation and video windows.
- Implemented the ability to add object traces in the Animation and Video windows.
- Added support for the World Axes overlay in video windows.
- Added an absolute value operator for scalar and integer data types.
- Improved robustness of Helical Axis operators, where the S vector calculation would have been affected by a sign error.
- Expanded background processing capabilities for video data and improved robustness for when the markerless AI application is closed.
- Modified the behavior for the Report file field in Data Reduction to accept names that do not yet exist, being left blank – which will result in skipping the report generation, specifying an extension other than .txt, and using the last valid path, rather than the root folder if the file name is entered without a path.
- Corrected an issue where DataReduction and ExtractTrials script commands would sort files by name rather than date when determining which files were the most recent.
- Added a Default display time, which allows for Activities to open with the cursor at a particular time and added a script command to set the currently displayed time within an Activity, SetCurrentTime().
- Added the script function:
    - GetActivityValue(), which when run from the Live window returns the value from an open Activity at a specified time within the Activity.
    - SetPastValue(), to allow for specifying any time for the onset of the value of a script variable within an Activity.
    - SpawnPythonScript(), to spawn Python scripts (requires that Python be separately installed on The MotionMonitor xGen computer).
- Improved the display of plots when opening Activities with graphs using modified time ranges or when remembering the previous time range when saved.
- Updated XY graphs with the option to select the size and shape of the cursor.
- Added support for generating JSON file outputs, in addition to the existing text formatting, and to allow for the streaming of exported data to a local client over a TCP/IP link.
- Added ability to output neutral marker position data from rigid body collections.
- Modified the GRF-to-foot assignment algorithm to be more robust across a larger variety of movement types.
- Added a new axis system for the sacrum segment, “VerticalAxes”, to be aligned with the vertical axis of the world axes (Subject1.Segments.Sacrum.AxisSystems.Anatomical.VerticalAxes…).

Currently in Progress:

- Video capabilities, including the adjustable playback rate and telestrator functionalities.
- Support for CUDA and Contemplas video recording.
- Video diagnostics, including recording and encoding progress, is not reported in the task manager window.

Additional Version Notes:

- This version no longer automatically sets the Pixel Format to RGB 8 when activating Basler devices. The Pixel Format setting saved to the camera will be used.

Version 3.74 Installer

Please note that this installer requires internet access to successfully complete the installation. If internet access is not available on the PC at the time of installation, first run this installer up to the NVIDIA CUDA installation process and then download and install the full CUDA installer from our download page. The NVIDIA CUDA installation process may take several minutes.

General Updates:

- Added support for NVIDIA CUDA processing (CUDA 11.4)

Performance Updates:

- Increased processing efficiency for data reduction.
- Improved performance and robustness with script variables, out-of-bounds values are now prevented from being accepted.
- Decreased loading time when opening new and saved Activities.
- Optimized processing when generating a report from within an Activity.
- Improved Activity playback with multiple videos and Subject data.
- Improved control of spawned processes, preventing them from still running after the application has been closed.
- Automatic selection of high-performance graphics preference in Windows via the installer.

Usability Updates:

- Simplified the procedure for adding joint center offsets when defining a Subject using the “Assume rigid bodies to be aligned with segment axes” option.
- Added ability to replace sections of raw data as INVALID or with Linear or third-order, Cubic, interpolation in post processing.
- Expanded supported scripting functions, including Close All for Activities, toggling on/off the live video display (viewfinder), and expansion of the Hidden argument for Calibration with all force plate devices.
- Added “Scale to Fit” option to right click menu for graphs through the Components Analysis tab.
- Added “Use Current” viewpoint for creating a fixed viewpoint perspective for the Animation window through the “Use expression” method.
- Expanded logging details.
- Added import component set function to the File menu within Activities.
- Variables “Show All” button in the Components tabs now displays variable groups.
- Added functionality for reprocessing videos in the background.

New Hardware Updates:

- Support added for collection of video data for Theia3D, including calibration procedure, processing, data alignment, and collection routines for single and batch processed recordings.
- Support added for Tobii Pro Glasses 3.
- Support added for collection of video data for SIMBioSys (SwRI), including calibration procedure, processing, data alignment, and collection routines for single and batch processed recordings.
- Support added for collection of video data for KinaTrax, including calibration procedure, processing, data alignment, and collection routines for single and batch processed recordings.

Existing Hardware Updates:

- Improved metal mapping performance for electromagnetic systems and added features for when no mapping readings fall outside the distorted space.
- Enabled NaN values to be sent for time series data being uploaded to Smartabase.

- Improved robustness for digital force plate activation.
- Extended C3D support for Bertec instrumented treadmills and added safeguards for importing files that don't adhere to the C3D file format standards.
- Improved overall video performance for webcam and Basler devices. Expanded camera calibration features and added the ability to change camera device names, set the video bitrate, GOP size and encoding options.
- Added support for Trigno Avanti Duo, Goniometer, Mini and FSR sensor types. Also added the ability to save applied filter settings.
- Expanded support for Noraxon hardware devices, including support for some legacy systems. Updates also extended support for Ultium sensors, including the BioMonitor SmartLead and the sensor raw accelerometer and IMU data (Noraxon SDK version 1.7.91.0).
- Updated Bertec SDK integration (version 2.50 – build 777) for improved multi-force plate synchronization.
- Updated Xsens Drivers (MT SDK, version 4.6.5).

Analysis and Visualization Updates:

- Expanded supported data reduction and open activity scripting functions.
- Adjusted timing when generating a report from the Live Workspace to prevent erroneous invalid data outputs.
- Extended "Show Value" setting to all graph types.
- Added ability to edit the background color for the Animation window.
- Improved Musculoskeletal Animation visualizations and mouse control.
- Added adjustable playback rate for Activities.
- Added left and right boundaries for zooming in the time domain for time series graphs.

Currently in Progress:

- Video capabilities, including sound, adjustable playback rate and telestrator functionalities.

Version 3.55.7 Installer

General Updates:

- Upgraded QT framework (QT 5.13.2)

Performance Updates:

- Improved Start of recording process – removed delays (besides video) and eliminated possible unavailable hardware at start of recording.
- Improved thread handling, and in turn performance and responsiveness, for Measurement Computing, AMTIGen5DeviceSet, BertecDeviceSet, BertecPLC and BioSemi hardware devices.
- Optimized data processing during data reduction.
- Improved responsiveness when resuming the display of live data, such as after a recording or when saving and closing Activities.

Usability Updates:

- Updated mouse scroll wheel behavior so that changes to the drop lists selections will only occur if focus is on the drop list and the mouse cursor is within the boundaries of the drop-list.
- Improved robustness in copy + paste function with Variable Group variables throughout the application.
- Expanded capabilities for the use of Lassoing markers in the Animation for rigid body collections.
- Added a tone accompanied with all pop-up dialogs and another for error dialogs.
- Added enhanced diagnostics for socket errors associated with VR and BertecFIT hardware devices.
- Improved robustness when adding and deleting Objects and removed Intersection node for Objects when not applicable for the Object type ('Model').
- Applied updates for Subject Setup procedures. Including functionalities for assigning segment landmarks to joint digitization points, to eliminate the need to digitize the same landmark more than once; retention of digitized locations for Davis and Bell hip joint center and Meskers shoulder joint center landmarks; and the ability to skip the neutral stance pose by using rigid body axes to align the segment axes.
- Expanded script functionalities for sorting and accessing files, workflow control, file name and file path parsing, date control (calendar interface), and a Delay.
- Added ability to shift data in post processing for all hardware devices.
- Added ability to adjust the size of toolbar buttons.

New Hardware Updates:

- Support added for Polhemus VIPER electromagnetic system.
- Support added for Eyelink II eye tracking system.
- Added C3D File generator for C3D file creation.
- Support added for AMTI AccuGait type analog force plates.
- Support added for APDM V2 hardware.

Existing Hardware Updates:

- C3D import: Improved robustness in handling force plate data; added support for Rotation data types (e.g.Theia and Kinatrax data); added support for Event data; and added support for AMTI AccuGait force plates as Type-2 C3D force plates.
- Added capabilities for reverting to the native coordinate system for all hardware devices.
- Changed the video file type from .mkv to .mp4.
- Improved Video recording and playback robustness.
- Improved Delsys Quattro sensor data display in Live mode when data decimation is enabled; resolved issues with filters not applying to Trigno Quattro data; and resumed support for Delsys Trigno Legacy sensors.

- Modified Smartabase interface to allow special characters in the name fields and for uploading time series data.
- Integrated Optotrak x64-bit drivers and current OAPI version (3.16.0.10).
- Added support for new BertecPLCTreadmill DLL and corrected an issue where values were being interpreted as unsigned, rather than signed, integers when the BeFit treadmill runs in the negative direction.
- Added support for updated PhaseSpace version (5.2.474.0).
- Expanded metal mapping capabilities, including adding a roll off boundary at the edge of the mapped region and an Animation visualization of the metal mapping correction field.
- Updated BioSemi thread processing to reduce memory usage.
- Added an XSens hardware delay upon the completion of recording to ensure transmission of all data.
- Added support for Noraxon digital channels on Noraxon digital devices.

Analysis and Visualization Updates:

- Added ability to specify the duration of the data tail (trace) in Live X-Y graphs.
- Corrected an issue where inverse calculations were being performed for helical axis arguments.
- Corrected a rounding error in the calculation of angular change over time for angular velocity that was resulting in data reporting as 0 under rare circumstances.
- Improved robustness for the display of Bertec treadmill data in graphs when filters are enabled and disabled.
- Updated the definition for colors in all graphs so they can now be specified with a color picker, variable, or formula.
- Added functionality for Grood-Suntay angle sets to be created for default anatomical axes and to be created in postprocessing.
- Expanded script functionalities for opening files, performing data processing, and running data reduction.
- Added ability to display a skeletal overlay in the Animation window for Data Reduction, in instances where less than 3 files are being reduced.
- Applied scaling to all body segments in the Animation based on segment lengths.

Currently in Progress:

- Video capabilities, including calibration with Animation overlay and telestrator functionalities.
- Video sound

Version 3.42.5 Installer

General Updates:

- Upgraded QT framework (QT 5.12.7)

Performance Updates:

- Added accelerated video processing support for improved video capture and playback.
- Minimized recording initiation delays involving biomechanical (Subject) data and video data.

Usability Updates:

- Added a back button to “re-do” Subject digitization for the last main segment and final hand detail digitization.
- Expanded support for dynamic electromagnetic distortion correction and hardware alignment using hybrid configurations.
- Improved robustness for stylus assignments with Subjects and hardware devices.
- Significantly improved time for closing Activity files, especially larger Activity files.
- Permanent script variables (String variable type) are now retained from the first file selected when performing data reduction.

New Hardware Updates:

- Support added for Smartabase athlete data management system.

Existing Hardware Updates:

- Added support for event marker data with Polhemus Fastrak devices.
- Updated Polhemus G4 measurement rate selection.
- Expanded support for Bertec PLC Treadmill controls and data analysis.
- Improved tracking of force plates and 6DoF force/torque transducers with rigid bodies.
- Expanded metal mapping functionalities and improved usability, including ability to load and save mapping files, an indication for the currently loaded mapping file and ability to reset mapping to none.
- Live window support for Subject calibration using Meskers’ method for the shoulder joint center.
- Functional and Meskers’ methods added to C3D import Subject shoulder joint center calibration.
- Video performance improvements including activation, playback robustness, video window sizing and video saving.

Analysis and Visualization Updates:

- Improved robustness and simplified variable definitions using the “Relative to” operator.
- Modified the definition for vector variables to include an assignment of position/non-position to ensure the proper, and automatic, handling in calculations.
- Added derivative drop-list selector for quick definition of linear and angular velocities and accelerations.
- Added a SetNormal script function for creating a normal (Gaussian) distribution of numbers.
- Updated SetRandom functionality to ensure a truly random generation of numbers across all conditions.
- Enabled availability of data from interpolated segments for analysis.
- Improved segment rendering in the Musculoskeletal Animation window.

Currently in Progress:

- Video capabilities, including calibration with Animation overlay and telestrator functionalities.

Version 3.33.0 Installer

General Updates:

- Upgraded Qt framework (5.12.6)
- Upgraded GStreamer version for video processing/handling (1.16.2)

Performance Updates:

- Improved software robustness by modifying the timing for destruction of script variables and dependent variables
- Improved software robustness by modifying hardware alignment procedures
- Improved VR connection robustness
- Improved camera activation/deactivation robustness

Usability Updates:

- Expanded script function capabilities
- Updated Components parameter panel view settings within Activities

Existing Hardware Updates:

- Basler video performance and usability improvements
- Polhemus Fastrak, measurement rate drop-list based on the selected number of sensors

Currently in Progress:

- Improving Video performance, including during repeated activation/deactivations
- Availability of data from interpolated segments

Version 3.31.0 Installer

General Updates:

- Upgraded Basler video Pylon (6.0)
- Modified GStreamer version for video processing/handling (1.14.5)

Usability Updates:

- New Activities open on top of other application windows
- Drop-lists have been de-cluttered. Disabled segments are no longer displayed in drop-lists and right-click menus
- "Relative to" fields for variable expression drop-lists are now hidden when a reference frame isn't applicable for the preceding selections
- Modified the Stop and Cancel button icons to be red and black, respectively, based on Client feedback
- Proper window rendering when the application is maximized
- Expanded script function capabilities
- "Closing activity" message is displayed in front of the application when an activity is invisible but is still closing
- Updated Organization of Component parameter panels. Added Show/Hide buttons for Subjects and collapsible Default, Setup and Advanced sections for hardware devices.

New Hardware Updates:

- Muscle Modeling (Force and Activation Optimizations)

Existing Hardware Updates:

- Video truncation and alignment. Alignment options are immediately, when saving, or upon request, including batch processing when upon request is used.
- Implementation of video transformations (for all video types)
- Tobii HMD calibration through Unity (including Unity script and mmserver updates)
- Basler video speed presets drop-lists. Presets weigh the tradeoff between frame rate and resolution during recording
- Digital video (webcams), performance and user interface updates, including drop-list for supported resolutions and frame rates
- Playback of The MotionMonitor Classic *.wmv and *.avi files
- Delsys Trigno, support for legacy streaming mode and Quattro sensors, selectable accelerometer ranges and improvements to the hardware activation process
- Expanded error reporting for VR when sockets are disconnected and for Noraxon digital devices during activation
- Improved robustness for Biofeedback target rendering in real time

Analysis and Visualization Updates:

- Average and Moving Average operators now accept an argument for the time at which to evaluate the function
- IMU devices no longer display as "Axes" data. Redefined as "Ori" only and replaced with "axes(vec(0, 0, 0), <IMU name>.Ori)" where currently defined in the software as an "Axes".
- Expanded features and improved performance of the Musculoskeletal Animation window
- Display of foot segments (Talus, Calcaneus and Phalanges) in the animation window

Currently in Progress:

- Improving Video performance, including during repeated activation/deactivations
- Support for Basler devices
- Availability of data from interpolated segments
- Accessibility to view Component settings within recorded Activities

Version 3.25.2 Installer

General Updates:

- Upgraded Qt framework (5.12.3)
- Upgraded Visual Studio (2017)
- Upgraded Basler video Pylon (5.1)
- Implemented video processing/handling with GStreamer (1.16.0)

Performance Updates:

- Reduced usage of computer resources and improved performance for high-speed "analog" data type hardware devices (i.e. Measurement Computing, Delsys, Noraxon, BioSemi, etc.) by revising the handling of their data streams
- Significantly reduced usage of computer resources by implementing data decimation factors for Live window data for high-speed "analog" data type hardware devices (i.e. Measurement Computing, Delsys, Noraxon, BioSemi, etc.)
- Improved software responsiveness via the addition of a spline fit calculation that can be specified for Subject joint force and moment calculations

Usability Updates:

- Search feature added (Ctrl+F and F3 (find next)) for searching within Setup and Analysis expression edit fields or within a script
- Vertical and horizontal scroll bars added within all component windows
- Improved responsiveness through optimization of the variable-evaluation code and reduction of RMS operator processing impact
- Orthopaedic angles grouped together at the top level of the subject-segment hierarchy for quicker access
- Expanded script function capabilities

New Hardware Updates:

- ANT Neuro Eego devices (*Windows 10 Operating Systems only*)
- Streaming data out to TCP/IP clients
- Tobii HMD (Vive)
- Uploading (exporting) data to Kinduct athlete management software systems

Existing Hardware Updates:

- Biosemi EEG supports up to 273 channels
- Delsys Trigno Avanti sensors support, including orientation/acceleration and EMG data
- Metal Mapping – Grid based metal mapping option implemented for Ascension and Polhemus hardware types
- PhaseSpace support for SDK version 5.2.420.0
- Polhemus G4 event marker data accessible as a data type
- Qualisys SDK update. SDK version can now be specified, allowing for support of current and previous SDK versions.
- VR – Immersive display collocation routines and head tracking/compensation added, including Unity and WorldViz (Vizard) mmserver updates
- VR – Activation/Deactivation timing updates applied for more robust VR connectivity

Analysis and Visualization Updates:

- Subject 'segment' and 'entire body' data types including momentum, energetics and anthropometrics added
- 'Magnitude' option added for all vector data types
- Operator for calculating displacement from a specified Time
- Report (export) optimization and expanded controls for applying analyses to exported data
- Bar graphs added, including overlay and transparency settings

- Frequency domain (PSD) analyses added, including Frequency domain graphs, frequency domain exporting and mean/median frequency operators
- Single-segment interpolation for most major body segments. When a segment is disabled/not instrumented and both proximal and distal segments have valid data, the segment is rendered in the Animation window and data from the segment are available for analysis. Interpolation is not applied to the head, thorax, and sacrum segments.
- Hand and feet segments are rendered in the Animation window when these segments are disabled/not instrumented. Interpolated data from these segments are also available for analysis.
- Hand detail added to the Musculoskeletal Animation window
- Object and plane intersection detection
- Object axes position and orientation data are available for analysis
- Anthropometric and Segment Axes data are now saved with Analysis files

Currently in Progress:

- Playback for MotionMonitor Classic *.wmv and *.avi files
- Video truncation and alignment
- Video rendering while Activities are maximized
- Support for Basler devices
- Video transformations

Version 3.03.9 (Initial Release)