

# DSX\_Release\_Notes

In the following list, click on the release date to expand/collapse the implemented changes for that release.

We would greatly appreciate your feedback. Please send bug reports and other comments to [support@c-motion.com](mailto:support@c-motion.com).

## July 9, 2021 (1.0.5.6367)

### CalibrateDSX:

- **Bug fix: the CMZ file was not saved after adding surface model files during mocap model creation.**
- Bug fix: removal of outlier X-ray frames in the non-uniformity and grid trials was not working.
- Outlier frames are no longer removed from calibration object trials.
- Bug fix: image size was being rounded down when copied from the Image Preview widget to the Image Correction widget.
- Bug fix: edge detection settings in the Image Preview widget did not update properly when the trial was changed.

### Orient3D:

- **Added a command to clean surface models (fix face and vertex normals, fill holes).**
- Added the ability to change landmark size in the 3D display.
- Renamed some math functions in the SDK.

### Surface3D:

- **Added the ability to change the contrast of the image data display in the 2D and 3D windows.**
- Made the paint, erase, and fill modes persistent so you don't have to keep the key pressed while editing the label.
- Improved the surface smoothing algorithm and added another parameter to control its effects.
- Added the option to calculate the center of a hollow sphere when creating landmarks and POIs.
- Bug fix: crash while working with labels and surfaces when no subject file was loaded.
- Bug fix: crash when a label included more than about 250 million voxels.
- Bug fix: face and vertex normals were not being updated when the surface model was decimated.
- Bug fix: landmark labels were always displayed in the 3D window, regardless of the setting in the Landmarks widget.

### X4D:

- Bug fix: the playback control for animating the trial data was not working properly.
- Changed the job loading command (Queue → Load) to append the jobs to the queue rather than

replace them.

General:

- **Added support for importing STL files for Surface Files and ROI Surface Files.**
- Bug fix: landmark files were being saved in the subject file as type "lanamark" instead of type "landmark".
- The Render Threshold parameter for Image Files has been deprecated.

Installer:

- The installer now detects Windows 7 and prevents installation (the latest version of DSX that runs properly on Windows 7 is 1.0.4.5273).

**Jan 14, 2021 (1.0.5.6324)**

CalibrateDSX:

- **Reorganized the Calibration and Calibration Parameters widgets into the Calibration Object, 3D Configuration, and Image Correction widgets.**
- Added contrast stretching and histogram equalization to image correction.
- **Added the Image Preview widget.**
- Improved the error messages when the mocap model does not build successfully.
- The display of the POI cursor now changes depending on whether Ctrl and Alt are pressed.
- Added an option to the X-ray windows to display information about the image files.
- Added options to skip non-uniformity and distortion correction.
- Added the ability to save the 3D configuration residuals to a CSV file.
- Added an option to turn off auto-advance during POI digitization.
- Added an option to show all or only 10 POIs in the POI table.
- Bug fix: the GUI was not properly updated after re-correcting a trial.
- Bug fix: if a calibration object trial had more than one object, they were all selected when the trial was selected.
- Bug fix: if pixel size was specified in the subject file, it was ignored during correction if distortion correction was skipped.
- Bug fix: reordering POIs in the widget table did not work correctly.
- Bug fix: when the centroid or edge thresholds were changed, the POI digitization tool did not update immediately with the new values.
- Bug fix: POI files are no longer loaded every time a trial is selected (only the first time the trial is selected).

Locate3D:

- Added an option to turn off auto-advance during POI digitization.
- The display of the POI cursor now changes depending on whether Ctrl and Alt are pressed.
- POI digitization is now cancelled when the trial frame is changed.
- Added an option to the X-ray windows to display information about the image files.
- Bug fix: when the centroid or edge thresholds were changed, the POI digitization tool did not update immediately with the new values.
- Bug fix: pressing the Escape key unselected the current POI when it should have just cancelled digitization.

- Bug fix: reordering POIs in the widget table did not work correctly.
- Bug fix: POI files are no longer loaded every time a trial is selected (only the first time the trial is selected).

#### Orient3D:

- Landmarks can no longer be placed on top of other landmarks.
- Enhanced the Miranda LCS algorithms to use hip and ankle center landmarks, if defined.
- Bug fix: polygons of an ROI could not be erased if the ROI pose had been adjusted before projecting.
- Bug fix: the surface created by the Image/Surface Match widget no longer has holes at the volume boundaries.
- Bug fix: the program would crash when the only ROI was removed.
- Bug fix: zooming would break landmark picking.

#### Surface3D:

- **Added support for importing and exporting labels as TIFFs.**
- **Added support for handling multiple DICOM stacks by using a patient matrix for each one.**
- Improved the surface smoothing algorithm by removing duplicate vertices and updating vertex normal after smoothing.
- Added support for exporting surface models using the Inventor file format.
- Added voxel information to the status bar (XYZ coordinates and intensity value).
- Added support for outputting surface models in different units.
- Default file names are now generated when saving surface files and label files.
- Added labels to the display of landmarks and POIs in the 3D window.
- Bug fix: saving the segmented image in the TIFF format would Y-flip the images.
- Bug fix: masking the image data would set its render threshold to 0.
- Bug fix: the configuration widget was not cleared when an image file was loaded while subject was loaded.

#### X4D:

- **Added the Optimization Job Queue widget.**
- Added an option to the X-ray windows to display information about the image files.
- Added labels to the display of landmarks in the X-ray and 3D windows.
- Bug fix: pose map files are no longer loaded every time a trial is selected (only the first time the trial is selected).
- Bug fix: DRRs were generated/processed improperly after selecting or deselecting GPU devices.
- Bug fix: the metric parameters widget was not always populated and updated properly when selecting objects.
- Bug fix: when image optimization finished, the GUI didn't always update properly with the new parameter values.
- Bug fix: the DRRs would disappear when 'p' is pressed while a DRR is selected.
- Bug fix: the 3D view widget would disappear when undocked from the main window.

#### xManager:

- **Added the Populate From Data Folder command to fill out a subject file by scanning a folder for data files.**
- Added the patient matrix parameter to trackable objects.

- Bug fix: frame times were not being sorted after being manually edited.
- Bug fix: view names were not being prevented from containing spaces.

#### Installer:

- Multiple versions can now be installed side-by-side on one computer.
- Correct version of vc\_redist is now automatically installed if required.

#### Jul 10, 2020 (1.0.4.5959)

##### CalibratedDSX:

- **Added the “Re-correct Current Trial” command.**
- Bug fix: X-ray images were improperly clipped when panning and zooming in the 2D windows.
- Bug fix: Grid Centroid Size Range values were being reset too often.

##### Locate3D:

- Bug fix: X-ray images were improperly clipped when panning and zooming in the 2D windows.
- Bug fix: in graphs, snapping of the cursor to data points did not work.

##### PlanDSX:

- Added “Save Configuration As” to the File menu and changed the behavior of “Save Configuration” accordingly.
- **Bug fix: crash when loading any motion from a CMZ.**
- Bug fix: crash when loading a configuration that contained objects with empty file paths.
- Bug fix: 2D DRR windows did not show DRRs if they were opened before DRRs were generated.
- Bug fix: cancelling a file-open command should not clear the existing file path.

##### xManager:

- Added the “Reset to Defaults” button to the Program Links dialog.

##### X4D:

- Bug fix: 4D solving did not work with the conditional entropy metric.

##### General:

- The mouse wheel has been disabled in the configuration widget in all applications so it can no longer change the session, configuration, or trial.

#### Jun 24, 2020 (1.0.4.5892)

##### Surface3D:

- Bug fix: Save Subject command in File menu did not get enabled after parameters were

changed.

#### X4D:

- Bug fix: crash if an object was deselected in the Configuration widget while selected for moving in an X-ray window.
- Bug fix: DRR was still displayed after an object was deselected.

#### xManager:

- Bug fix: launching an application while no subject file was loaded in xManager caused the application to start with the subject file that was last loaded into the program.

### Jun 19, 2020 (1.0.4.5883)

#### CalibrateDSX:

- **White and grid images now update in real time as relevant calibration parameters are changed.**
- **Added an option to display the grid-check images in the X-ray windows (G key).**
- **Separated the white\_threshold parameter into white\_threshold\_view1 and white\_threshold\_view2.**
- Added help text to the 2D windows.
- Added the grid\_centroid\_max\_size parameter.
- Improved some error and output messages related to creating the mocap model.
- Bug fix: default positioning of X-rays in 2D windows was not ideal.
- Bug fix: landmarks and POIs disappeared from the display when the segmentation label was masked or cropped.
- Bug fix: fixed several small bugs related to adding, deleting, and renaming POIs.

#### Locate3D:

- **Added the ability to specify the order of rotations for body poses, to help avoid gimbal lock.**
- Added help text to the 2D windows.
- Bug fix: fixed several small bugs related to adding, deleting, and renaming POIs.
- Bug fix: default positioning of X-rays in 2D windows was not ideal.

#### Orient3D:

- Bug fix: the Miranda tibia algorithm would sometimes point the bone's long axis in the wrong direction.
- Bug fix: ROI projection did not work if the ROI had been manually adjusted.

#### Surface3D:

- Added an option to calculate the weighted center when defining POIs and landmarks.
- Bug fix: loading a segmentation label from a file sometimes would not work properly.
- Bug fix: segmentation label and image histogram thresholds were not updated after the image data was cropped.
- Bug fix: manual label edits were lost if the image data was cropped before being masked.
- Bug fix: the image data histogram did not fully clear when the data was unloaded.

- Bug fix: mouse wheel scaling of paint/erase cursor did not work properly.

#### X4D:

- **Added the ability to specify the order of rotations for body poses, to help avoid gimbal lock.**
- **Reorganized the tracking parameters that are specific to certain metric algorithms.**
- Added more actions to the context menu in the 2D windows.
- Added an option to center the selected object in the 2D windows (C key).
- Added the Fill Pose Maps command (fills the tracking range with poses).
- Added the Clean Pose Maps command (removes poses that are not at a reporting time).
- Bug fix: X-ray/DRR settings were not being applied properly when tracked objects were selected and deselected.
- Bug fix: the GUI is now disabled/enabled properly based on which optimizer is running.
- Bug fix: image optimization could not be stopped easily, and would sometimes crash.
- Bug fix: pose maps didn't import properly if the units were different than the subject units.
- Bug fix: graphs did not show any poses if there was only one reporting time in the trial.

#### xManager:

- **Added bead/hole radius to the grid object definition, to help with calculation of the expected pixel size of grid beads/holes.**
- Improved the display and specification of the LCS transform and the Mocap transform.
- Undefined transforms are now displayed as an empty matrix instead of the identity matrix.
- Added an option to update POI files when the C3D file name is changed for a trial.
- Added an option to update transform files when a subject object is renamed.
- Added an option to update transform files when a mocap segment name is changed.
- Added an option to update landmark and transform files when a trial's C3D file is changed.
- Added options to update landmark and transform files when any file parameter is changed.
- Added an option to update tracked object files when the units are changed.
- Added an option to update all dependent files when the mocap time offset is changed for a trial.
- Bug fix: the tracked object and X-ray view panels did not always update properly when switching between trials.

#### General:

- Added an option to update all landmark files when a landmark is deleted using any application.
- Added an option to update all POI files when a POI is deleted using any application.

**Mar 11, 2020 (1.0.4.5582)**

#### CalibrateDSX:

- Pressing the Esc key now clears the current POI selection.
- Bug fix: crosshairs for perfect POI locations were not updated when POI colors changed.

#### Orient3D:

- Before an ROI is projected, its name is now checked to make sure it is unique.
- Bug fix: the -X orientation did not work properly for rectangle ROIs.
- Bug fix: the Project and Adjust buttons were not immediately enabled after placing an ROI.

### Surface3D:

- Bug fix: pressing the '3' and 'f' keys changed the 2D slice views in undesirable ways.
- Bug fix: the 's' key to toggle label display did not work in the 2D slice windows.
- Added help text to the 2D slice windows.

### X4D:

- **Added the ability in the pose map widget to specify which pose maps are modified by the other commands.**
- Bug fix: x-ray images were sometimes colored red.
- Bug fix: using 'Open with' with subject files did not launch X4D.
- Added 'toggle help' to the context menu.

### xManager:

- **Added “clone” and “clone (template)” commands for sessions, configurations, and trials.**
- Bug fix: x-ray file attributes sometimes did not get written to the subject file.
- Bug fix: using 'Open with' with subject files did not launch xManager.
- Bug fix: trial x-ray paths were colored red if they were empty when first displayed.

## Feb 21, 2020 (1.0.4.5539)

### X4D:

- Added help text for keyboard commands in the X-ray windows.
- The keyboard commands to move objects now move only the objects selected in the Tracking widget.
- The 3D window can now be maximized.
- When an object is selected in the 3D window it is rendered semi-transparent, making it easier to grab the trackball handles.
- Bug fix: the scene in the 3D window became mangled after several mouse interactions.

### General:

- Added support for importing RGB X-ray images (they are converted to grayscale).

## Feb 6, 2020 (1.0.4.5520)

### CalibrateDSX:

- Bug fix: image size in the Calibration Parameters widget was not always initialized properly when selecting a new configuration.
- Bug fix: loading trials that bypassed distortion correction gave unnecessary errors.

### General:

- The TIFF module was enhanced to support import of additional TIFF formats.

**Feb 3, 2020 (1.0.4.5516)**

CalibrateDSX:

- **Replaced the generic parameters widget with the Calibration Parameters widget.**
- Implemented masks for POI digitization. When digitizing a POI, it cannot be placed over an existing POI.
- Added code to make sure all images files have the same bit depth.
- POIs in the POI Widget can now be sorted alphabetically by click on the header of the name column.

Locate3D:

- **Replaced the generic parameters widget with the POI Parameters Widget.**
- POIs are now output to the CMZ file when object poses are output.
- POIs in the POI Widget can now be sorted alphabetically by click on the header of the name column.
- Implemented masks for POI digitization. When digitizing a POI, it cannot be placed over an existing POI.

Orient3D:

- Removed the generic parameters widget and moved the parameters to the ROI widget.
- A placed ROI is now updated automatically when any of its parameters are changed.
- Bug fix: scaling of global axes was sometimes incorrect when loading multiple surfaces.
- Bug fix: the Miranda femur algorithm would sometimes give incorrect results on bones with holes in the surface.

PlanDSX:

- Replaced the generic parameters widget with a dialog accessible from the Options menu.

Surface3D:

- **Removed the generic parameters widget and moved the parameters to various other widgets.**
- Added the ability to save label images to a file and re-load them later.
- Added slice crosshairs to the 2D views.
- Separating masking and cropping of image data, so each can be performed independent of the other.
- The Home/End keys can now be used to go to the first/last slice in the 2D views.
- The mouse wheel can now be used to increase/decrease the paintbrush radius when in paint or erase mode.
- Improved how slice numbers are displayed.
- Bug fix: loading an image file a second time did not work.
- Bug fix: voxel size was not being set when outputting images files in the TIFF format.

X4D:

- **Removed the generic parameters widget and moved the parameters to various other widgets.**
- Added a warning if the pose map times do not match the reporting times for a trial.

- Added a cutoff frequency slider to the graph widget.
- Added an option to turn off CPU threading.
- The Home/End keys can now be used to go to the first/last slice in the 2D views.
- Added output messages for each action in the pose map widget.
- Added a right-click context menu to the X-ray windows.
- Bug fix: DRR generation was incorrectly handling empty voxels.
- Bug fix: Alt-R shortcut to toggle display of local reference frames was not working.

#### xManager:

- Added a warning message if the time precision is set to a low value.
- Bug fix: Empty scan data items could not be deleted.
- Added “load folder” to scan data items.

#### General:

- **Separated calibration objects from [trackable] subject objects.**
- **Added grid objects that can be defined in xManager, replacing the five grid parameters in CalibrateDSX.**
- **Added a dark color theme to the GUI for all apps (accessible via Options → Settings).**
- Many small fixes to reading and writing pose map, POI, landmark, and transform files (mostly header format changes).
- Pose map cutoff frequency is now stored in the subject file for each pose map.
- Bug fix: the backup subject file was not being deleted during Save Subject As.
- Bug fix: copying network-drive files to a local drive before reading is now done for all files, not just X-ray files.

#### Oct 16, 2019 (1.0.4.5234)

#### CalibrateDSX:

- Added a user parameter called Positive Frame Times for making all trial times positive.
- Bug fix: The “too few centroids” warning was actually an error, resulting in distortion correction being skipped.

#### Orient3D:

- Improved the naming of some vertebra landmarks.
- Bug fix: the Image/Surface Match widget was sometimes not using the Render Threshold properly when creating the image surface.

#### Surface3D:

- Improved the display of slice numbers in the 2D windows.

#### X4D:

- **Bug fix: tracking optimization frequently failed when only one GPU was used.**
- Bug fix: the trackball in the 3D window did not work properly if the object did not have an LCS defined.

#### xManager:

- **Added a command to make the current trial synchronous by adjusting the frame and reporting times.**

General:

- Improved error messages when encountering errors reading image files.

**Sep 18, 2019 (1.0.4.5211)**

CalibrateDSX:

- Bug fix: POI trails were not displayed properly.
- **Added an option to compute and display “perfect” calibration bead locations.**
- Bug fix: no error message was displayed if segment creation failed when building a mocap model.
- Bug fix: distortion correction algorithm should ignore grid images with only a few grid points.
- Added error dialog when 2D POI files are not imported properly.

Locate3D:

- Added the Save Pose Maps As command.
- Improved the look of POI crosshairs.
- Added error dialog when POI file is not imported properly.

Orient3D:

- Bug fix: disk ROI did not work for +X and -X orientations.
- Bug fix: deleting ROI landmarks did not work properly.

Surface3D:

- **Bug fix: the Unlabel Disconnected Regions command was broken.**

X4D:

- Added a bell sound when a tracking optimization finishes.
- Added error dialog when a pose map file is not imported properly.

xManager:

- Added support for negative mocap offset times, and added tool-tip text.
- Bug fix: file path validity (red coloring) was not updated in some cases when a shortcut path was changed.
- Bug fix: warning dialogs were displayed with every character change of a session path.
- Bug fix: adding extra white space to frame times or reporting times messed up the time values.
- Bug fix: when restored after an application finishes, xManager was not immediately checking for a modified subject file.

General:

- Bug fix: special characters in the subject ID would cause problems in the generation of default file names in save dialogs in all applications.

- Bug fix: no error was reported when a file could not be written (several places in several applications).

## Jun 28, 2019 (1.0.4.5086)

### CalibratedDSX:

- Implemented a minimum value for the Image Threshold parameter.
- Implemented individual licensing.
- Added information to the residuals dialog when computing the 3D configuration.
- Bug fix: landmark names could conflict with landmarks used to create mocap segments in Visual3D model.

### xManager:

- Bug fix: some session items did not update when paths were added, removed, or changed.

### Locate3D:

- **Added support for outputting object transform files.**
- Bug fix: fixed a possible crash while exporting landmark files.

### Orient3D:

- Added code to prompt the user to update surface files when LCS changes or a surface is transformed.
- Bug fix: Anderst algorithm often doesn't produce valid LCS transforms.

### X4D:

- Object poses can now be saved to CMZ files without first calculating the mocap seed poses.
- **Bug fix: landmarks were not output to text files properly if the image data was auto-cropped.**
- Bug fix: landmarks were not displayed properly in the 2D windows.
- Bug fix: transform files were padded with NaNs even if that option was not selected.
- Bug fix: fixed a bug in 4D optimization when using two graphics cards.
- Bug fix: current pose was added to the pose map before 4D optimization even if it wasn't within the optimization range.
- Bug fix: residuals need to be initialized when calculating mocap poses.

### General:

- Made finding a C3D inside a CMZ more flexible (if full path is not found, just file name is used).
- Standardized the format label for TIF/TIFF files to "tif", fixing a few small bugs.
- Bug fix: enabling of "Visual3D Format" in file save dialogs should not depend on presence of C3D file.
- Bug fix: TIFF image files did not support the "origin" field.
- Bug fix: existing landmark files were not updated when landmark names were changed.

## **Jun 5, 2019 (1.0.4.5003)**

### CalibrateDSX:

- Bug fix: disabled POIs are no longer used for calculation of 3D configuration.
- Bug fix: selection of POIs and landmarks could get mangled when adding, deleting, or selecting them.

### Surface3D:

- Added 'Toggle Voxel Interpolation' menu item to toggle between NN and linear voxel interpolation for image display.

### xManager:

- Bug fix: changing units and time precision did not work properly.
- Bug fix: invalid ScanData paths are now displayed in red.
- Bug fix: ScanData paths were not properly updated when shortcut paths were added, removed, or modified.

### X4D:

- Bug fix: not all 'new best pose' messages were displayed for 'solve range' optimization.
- Bug fix: improved graph display when data is scaled to the control points.

### General:

- Bug fix: Negative frame numbers and reporting times were not handled properly.
- Added option to output NaNs for missing data in pose map, landmark, and transform files.
- Bug fix: mocap segment name was not written to subject file properly.

## **May 9, 2019 (1.0.4.4967)**

### CalibrateDSX:

- Added and improved error messages when correcting xray image files.

### Orient3D:

- Bug fix: an object's LCD transform was corrupted when the object was loaded a second time.
- Bug fix: the main window title did not always show the subject file and image file.

### Surface3D:

- Added the segmentation command "Unlabel Disconnected Regions."
- Improved the display of POIs and landmarks, and added labels to them in the 2D windows.
- Added the option to toggle visibility of the segmentation label by pressing the 's' key.
- Changed the display of voxel data to solid rectangles instead of smoothed/interpolated ones.
- Bug fix: manual hole filling did not work properly in the COR (Z slice) window.
- Bug fix: surface models could have holes if the object label touched the image volume boundaries.

- Various bug fixes to adding/deleting labels, loading new image files.
- Bug fix: display of POIs and landmarks in the 2D windows was wrong after pressing 'r' to reset the camera.
- Made the paint brush radius a decimal number instead of an integer; new minimum is now 0.5.
- Bug fix: the paint brush cursor sometimes had the wrong color or shape when it was first displayed.
- Bug fix: the main window title did not always show the subject file and surface file.

#### xManager:

- Bug fix: when a subject object was deleted, the associated tracked objects were not deleted from the trials.

#### General:

- Better handling of frame times when too many are specified in the subject file.
- Fixed default frequency when creating frame times.

### **Apr 22, 2019 (1.0.4.4939)**

#### xManager:

- Added a button to clear the 3D configuration parameters for a view.
- Added code to check for invalid and duplicate names of sessions, configurations, views, and objects.
- Bug fix: file paths in widgets for the current object and trial were not updated when path variables were changed.
- White space and most special characters are no longer allowed in path variable names.
- Bug fix: scan data files could not be deleted from a session.
- Bug fix: "relative" checkbox did not work if the subject file was opened by double-clicking on it.

#### X4D:

- Added a label to the time widget to show when the trial is asynchronous.
- Fixed a bug that was causing excessive memory usage during tracking when the app was launched from xManager.
- Added error dialogs when writing of pose map files fails.
- Bug fix: occasional crash when selecting/deselecting objects in the 2D windows.

### **Apr 12, 2019 (1.0.4.4929)**

#### xManager:

- View names are now required to be unique.
- Bug fix: source\_to\_image is now properly updated in the subject file when view names are changed.
- Fixed a bug related to updating voxel size when switching image file format from dicom to tiff.

#### Orient3D:

- ROI names can no longer contain spaces.
- Fixed a bug that caused a crash when loading a surface file without a subject.

#### Surface3D:

- Fixed a large memory leak.
- Bug fix: cropping to labels did not work properly.

#### X4D:

- Bug fix: after 4D tracking, transforms of tracked bones did not update properly.

### **Mar 29, 2019 (1.0.4.4915)**

#### xManager:

- Bug fix: landmark names could not be changed.
- Bug fix: the first shortcut path was not editable.

#### CalibratedDSX:

- Fixed some window flickering problems with Quadro cards.

#### Orient3D:

- Fixed some window flickering problems with Quadro cards.

#### Surface3D:

- Added a warning message when saving surface files when an ROI surface file already exists.

#### X4D:

- Fixed a bug related to clearing posemap graphs when a new trial is selected.
- Fixed a bug that made the 2D interaction frame very small when an object was selected in the 3D window.
- Fixed a bug related to moving the wrong object during interaction in the 2D windows.
- Fixed a bug that crashed tracking optimization when `view_weight = 1.0`.
- Fixed a bug related to cleaning posemap graphs when the object combo is set to no object.
- Bug fix: mocap constraints were not being applied when posemap graphs were edited.
- Fixed several bugs in the application of mocap constraints when interacting with an object.
- Fixed a bug in the Evaluate command related to the names of the generated files.
- Bug fix: playback of local minima did not work for asynchronous trials.
- Bug fix: single-frame optimization was not adding the bone pose to the pose map for asynchronous trials.
- Fixed a bug that was causing a crash when performing single-frame optimization with asynchronous trials.
- Fixed a bug in the display of anatomical frames during 2D trackball interaction for asynchronous trials.

#### General:

- Fixed some bugs in the handling of shortcut paths and data file paths, especially when network drives are used.
- Added support for negative frame and reporting times.

**Jan 11, 2019 (1.0.4.4719)****xManager:**

- Selecting DICOM or TIFF format in image file widget now unsets the origin parameter.
- Selecting DICOM format in image file widget now unsets the voxel size parameter.
- Added option to Z-flip image data (reflect across the XY plane) during loading.
- Fixed a bug that prevented the “load folder” option from working.

**CalibrateDSX:**

- Processed xray images now use red to show thresholding.
- Added a way to override the [DLT-calculated] pixel size when correcting the calibration trial.
- Fixed several bugs related to updating window level and slice number during various actions.

**Locate3D:**

- Fixed a bug in the selection and deselection of points in the POI graphs.

**PlanDSX:**

- Fixed several bugs related to selecting and generating DRRs for CT objects.

**X4D:**

- **Support has been added for calculating and displaying up to 32 DRRs at once.**
- Fixed a bug that was resetting the parameters in the Image Optimization widget too often.
- Fixed a bug that was causing flickering of xray image intensity when changing reporting times.

**General:**

- Applications now give proper warning or error messages when CUDA cards or OpenGL graphics drivers are missing.
- Improved the loading screens for most of the applications.
- Added or improved descriptions of app parameters in all applications.

**Nov 19, 2018 (1.0.4.4559)****xManager:**

- Added a command “apply path” to path shortcuts, so a newly created shortcut can be applied to existing file paths.
- Added features and warning dialogs to adding and deleting path shortcuts. For example, when a shortcut is created it can be applied to existing files, and when deleted it is removed from all file paths.
- Made the import of LCS transform matrices from files much more robust.

- Fixed the bug that file paths could not be relative to the subject file folder unless they used a shortcut path.
- Fixed the bug that re-loading a subject file after getting the “file modified” message would crash the program.

#### CalibrateDSX:

- Added the parameter “smoothing threshold”, for adaptive averaging during smoothing.
- Improved the progress dialogs when correcting xray images.
- Fixed the bug that xray correction failed when the images were both padded and resized.
- Fixed the bug that POI propagation would not work unless there was at least one with poses in both views.

#### Locate3D:

- Fixed the bug that POI graphs were not updated when the pose map cutoff frequency was changed.
- Added a command to recalculate 3D POI locations for asynchronous trials (for use after the pose map contains a few poses).
- Improved the GUI behavior of the POI widget.

#### Orient3D:

- Improved the algorithm for generating image file data.
- **You must now Ctrl-left-click on the LCS frame in the 3D window to manipulate it using the trackball.**
- **Fixed the bug that projection of ROIs was broken.**
- Made the import of LCS transform matrices from files much more robust.

#### PlanDSX:

- **You must now Ctrl-left-click on an object in the 3D window to manipulate it using the trackball.**
- Several improvements to trackball interaction, including picking and placement of the trackball, and its behavior during scaling.
- 2D DRR windows now have a border color and title that matches the view in the view table.
- Fixed the bug that objects from OBJ files with material definitions were not being displayed properly.
- Fixed the bug that object files in configuration files were not able to use relative paths.

#### Surface3D:

- Fixed the bug that sometimes the scan data file loaded was not the one selected in the dialog.

#### X4D:

- **Improved the performance of 4D tracking via CUDA and CPU threading enhancements.**
- Added a dialog with system information (CPU, GPU specs).
- Improved the options for selecting GPUs for each view.
- Fixed the bug that TIFF file of metric image for view 1 had a bad name (this file is output by the “Evaluate” command).

**Oct 8, 2018 (1.0.4.4481)**

## General:

- Changed the origin of CT image data to be consistent with the origin of xray images. Because of this change, if you want to load tracking results from a previous version of X4D into this version, you will need to add an offset to the reference frame definition of every tracked object. This offset is equal to half of the voxel size in each of the X, Y, and Z dimensions.

## xManager:

- Prevented duplicate names for landmarks and pois.
- Forcing “.dsx” extension when saving subject file.
- Fixed a bug related to updating files in the calibration trials when the name of a POI or landmark was changed in an object.
- Fixed a bug related to specifying the default frequency when an xray file is added to a trial.
- Fixed a bug preventing pose maps from being updated when an object's LCS is changed.

## CalibrateDSX:

- Added support for correcting xray images without performing distortion correction.
- Fixed a bug preventing CMZ files from being created if the path in the subject file is empty (X4D as well).
- Fixed a bug related to the calculation of the correct XY coordinates when Ctrl-click is used to pick a point.
- Fixed a bug related to aspect ratio of view 1 window when first trial is loaded (Locate3D as well).

## Locate3D:

- Fixed a bug related to Y scaling of graphs when the Y range is zero (X4D as well).

## Orient3D:

- **Added a tool for generating image data (simulated CT) from surface models.**
- Added support for specifying an “inner” surface model of an object, representing the inner cortical boundary.
- **Added a tool for making sure an object's surface model is in the same reference frame as its image data.**

## Surface3D:

- Added erode and dilate commands for editing segmentation labels.
- Redesigned the interaction for editing segmentation labels. The paint and erase brushes now have correctly sized cursors and can be dragged for continuous painting/erasing.
- All image segmentation editing actions can now be undone and redone.
- Added a command to reverse the image slices (mirroring in Z dimension).
- Fixed a bug causing incorrect voxel sizes for TIFF images loaded without a subject file.
- Fixed a bug preventing the landmark widget from being enabled in some cases.
- Fixed a bug affecting selection of segmentation labels when a second image file is loaded without a subject file.

#### X4D:

- **Made frame-by-frame tracking optimization 6 times faster when using CUDA (4D optimization not affected yet).**
- Added option to select which GPU to use for each xray view.
- Added xray\_opacity parameter for adjusting the opacity of xray images in all windows.
- DRRs can now be generated and processed on computers without a CUDA graphics card.
- Fixed a bug related to reading trial-specific xray/drr settings from a subject file.
- Fixed a bug preventing the “best pose so far” from being initialized with the starting pose.
- Fixed a bug related to adding poses to the “saved pose” list during ASA optimization.
- Fixed a bug preventing the program from launching if it was not on the primary monitor the last time it was closed.
- Fixed a bug related to applying the proper smoothing parameters when a pose map is reloaded from a file.

#### Jul 3, 2018 (1.0.4.4277)

#### xManager:

- **Fixed file association so a double-click on a .dsx file will launch xManager.**
- **Fixed a bug that would give a false error message after a valid license activation.**

#### CalibrateDSX:

- **Added support for correcting xray images without performing uniformity correction.**
- Fixed a bug related to a bad aspect ratio in the 2D windows when the trial data is asynchronous.
- Fixed a bug related to updating the applications when Edge Threshold or Centroid Threshold were changed.
- Fixed a bug related to the display of crosshairs for digitized POIs.

#### Locate3D:

- Changed the behavior of graphs (scaling, selecting, etc.) to match the behavior of X4D graphs.
- Added support for Ctrl-click to force a POI at the clicked location.
- Fixed a bug that caused a crash if POI pose maps needed to be interpolated when applying an object pose.
- Computing object poses from POIs no longer interpolates POI pose maps to calculate poses for all reporting times.
- Fixed a bug related to a bad aspect ratio in the 2D windows when the trial data is asynchronous.
- Fixed a bug related to updating the applications when Edge Threshold or Centroid Threshold were changed.
- Fixed a bug related to the display of crosshairs for digitized POIs.

#### Surface3D:

- The voxel size in image files can now be overridden by specifying the size in the subject file.

#### X4D:

- Implemented generation of DRRs from surface models.
- DRR generation will happen on two GPUs if two GPUs are present.
- During an optimization, the DRRs in the 2D windows are now updated only when a new best pose is found (or when any user interaction causes a redraw event).
- Fixed a bug that was preventing DRRs from being generated for some TIFF CT image files.
- Fixed a bug that could cause a crash when switching between tracked objects in a trial.
- The DSX Configuration and Mocap Model widgets are now disabled during an optimization.
- Save Dialogs: The choice of units is now saved in the file dialog when any file in which units are specified is written.
- “show mocap markers” no longer shows markers with empty names or names that start with “\*”.

**Apr 23, 2018 (1.0.4.4160)**

## PlanDSX:

- Implemented generation of DRRs from surface models.
- Added trackball interaction for manipulating objects in the scene.
- Made several improvements to how configurations are saved and imported.

## X4D:

- For x-ray files, can now read a folder of individual TIFFs instead of a single TIFF stack.
- “Local minima” poses are saved during bone tracking with ASA, and can be reviewed when tracking is complete (if the global minimum is not the correct pose).
- Added the “view\_weighting” parameter so one view can be weighted more than the other during tracking.
- Fixed a bug related to initializing values in the Xray/DRR Settings widget.
- Added the option to linearly interpolate pose map splines.

## Orient3D:

- Fixed the Miranda tibia LCS algorithm (sometimes the Y axis was backwards).
- Fixed several bugs involving saving of the LCS to the subject file.

**Mar 13, 2018 (1.0.3.4054)**

## CalibrateDSX:

- Enhancements to output of 3D configuration calculation results.
- Bug fixes related to correcting large x-ray files.

## Orient3D:

- Landmarks are now updated properly when the LCS is changed.

**Mar 07, 2018 (1.0.3.4045)**

## xManager:

- Several bug fixes.

#### CalibrateDSX:

- Enhancements to POI prediction and 3D configuration calculation.

#### Surface3D:

- Improvements to manual editing of segmentation and image rotation.

### **Feb 20, 2018 (1.0.2.3986)**

#### General:

- Bug fixes.

#### X4D:

- Events are added to CMZ file to mark start and end of xray-based tracking.

### **Feb 14, 2018 (1.0.1.3974)**

#### xManager:

- Subject-object POIs can be imported from file.

#### CalibrateDSX:

- Added grid\_centroid\_min\_size parameter for use in distortion correction.
- Renamed intensity\_threshold parameter to white\_threshold.
- Added image\_threshold parameter for use in uniformity correction.

#### Surface3D:

- Added option to rotate the image.
- Proper handling of re-saving segmented image when the initial segmented image is in DICOM format.

### **Jan 31, 2018**

- Initial Release of DSX Suite, a Dynamic Stereo X-ray System.

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