What's New In SA

CHAPTER 1

One of the advantages of SpatialAnalyzer is that development occurs at a brisk pace. New feature requests, bug fixes, and changes are implemented quickly, giving you the opportunity to start taking advantage of newly implemented features in a very short period of time. The following is a summary of the new additions.

SpatialAnalyzer Version **2023.2**

CAD Import

New Import Formats

Microstation DGN

Updated Import Formats:

- ACIS 2023, Autodesk Inventor 2024, Autodesk Navisworks 2024
- CATIA V5_6R2023, Creo 10.0, NX 2212, Parasolid 35.1
- Solid Edge 2023, SolidWorks 2023

Improvements to Alignments

Relationship Fitting

A major challenge in any optimization process is balancing speed and ensuring that the optimum solution is found. SA's current relationship fit process is the perfect balance in most situations but can stop prematurely in complicated fits. We added a Direct Search method as a fall back years ago which is on the extreme of always ensuring the best solution is found, but can be very slow.

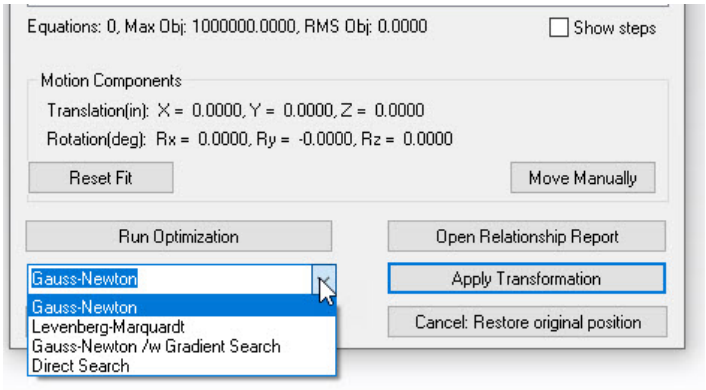
To add greater flexibility, this version adds two intermediate options to split the difference between speed and performance.

A version of the Levenberg-Marquardt solver has been implemented to support optimization via relationship minimization. This solver casts a somewhat wider net when solving for solution parameters https://en.wikipedia.org/wiki/Levenberg-Marquardt_algorithm.

In addition, an option was added to follow the Gauss-Newton solver (our stan-

dard approach) with a subsequent gradient search backup.

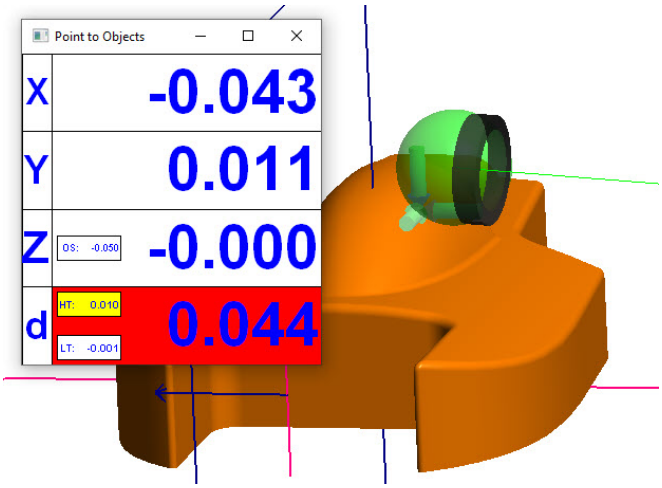
The *Move Object by Minimization Relationship* and *Move Collections by Minimization Relationships* functions now offer these additional options.



Additionally, when using points-to-objects, projected points will be compared component-wise rather than as a simple signed magnitude as was previously used to increase reliability in complicated fits.

Feature Inspection

Tolerance field visibility in watch windows has been improved. The text box size for tolerances and component offsets is now calculated proportional to the main box size and will scale accordingly.



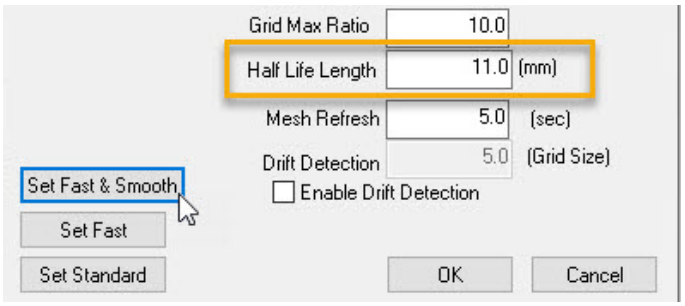
Added automatic cleanup for placeholder geometry and auto vectors when relationships are removed (including GR-Features, Average Point, Points to Objects, Clouds to Objects, and Vector Group to Vector Group relationships).

Cloud Based Inspection

Real-time Meshing

Additional Real-time mesh settings have been added to control the level of smoothing and to optimize performance with the new *Hexagon AS1-XL Scan-*

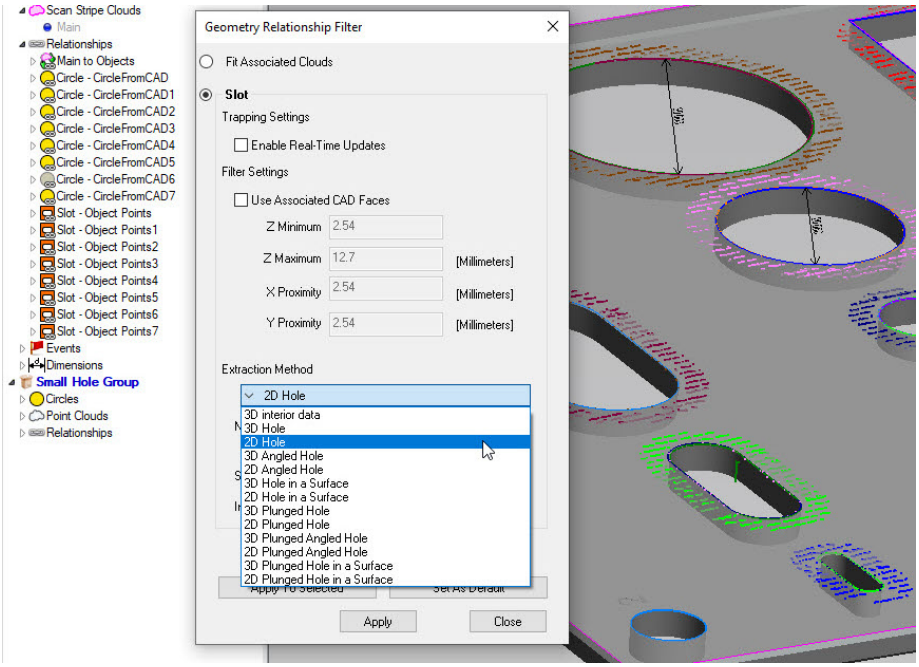
ner (also added in this version).



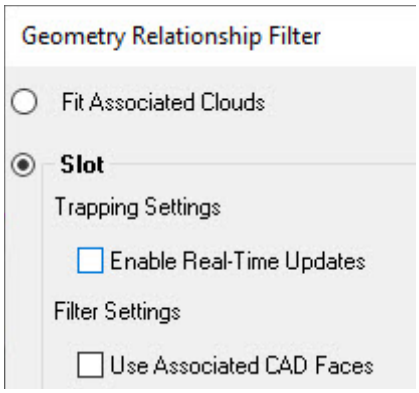
Point clouds now automatically switch to points display for selection operations. Real-time meshing blocked cloud point selection for some cloud processing operations.

Cloud Based Feature Extraction

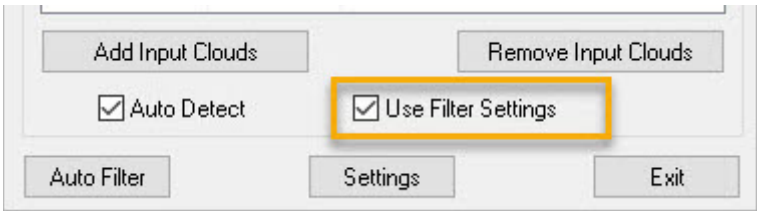
GR-Slots now offer a full range of extraction methods, much like those added for circles in the prior release. These include both 2D and 3D extractions, angled, plunged and surface hole cloud extraction options.



The GR-Feature data association process has been simplified in this version. The need to use Proximity Cloud selection has been eliminated. A cloud can now be directly associated with a GR-Feature and used as needed. A radio button provides optional direct fitting or allows a cloud to be used as the input for a dynamic filter process. This dialog has also been clarified for easier operations.



Added option to *Use Filter Settings* has been added to the **Filter Data to Nominal 3D Geometry** utility. This option allows you to use the saved individual settings from within existing GR-Features for the filter. Once complete, GR-Features now also retains the input cloud for further processing as needed.

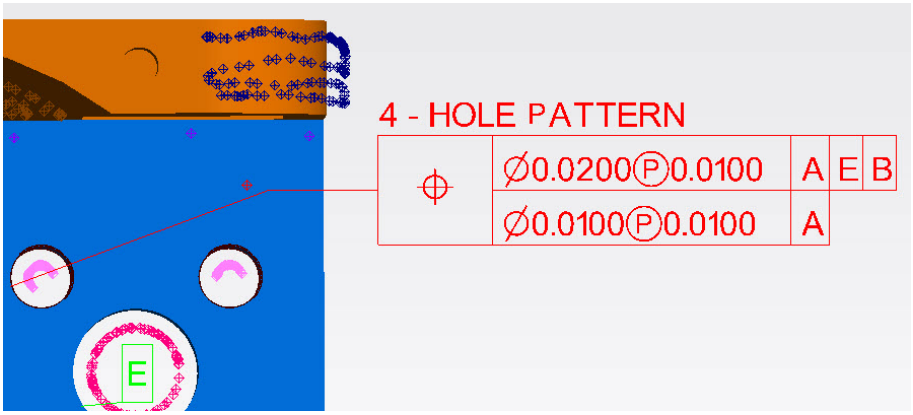


Significant improvements have also been made in this version to increase cloud filtering speeds. Extraction of GR-Features offer improved data segmentation and threading.

GD&T Improvements

The default tolerance zone for cone perpendicularity and parallelism checks are now pre-set to cylindrical to facilitate most inspections.

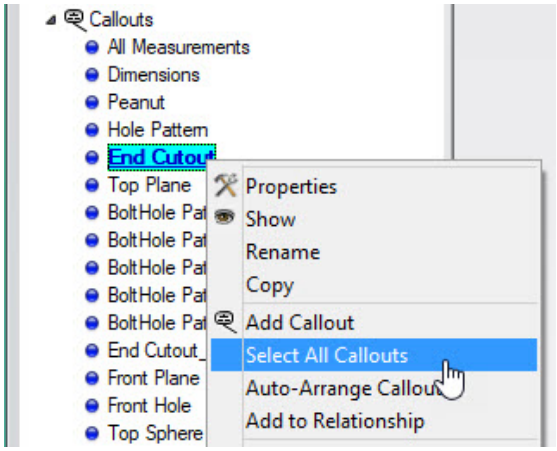
The Projected Zone for lower tier of composite true position checks will now be active when upper tier is active and displayed as part of the annotation in the graphics.



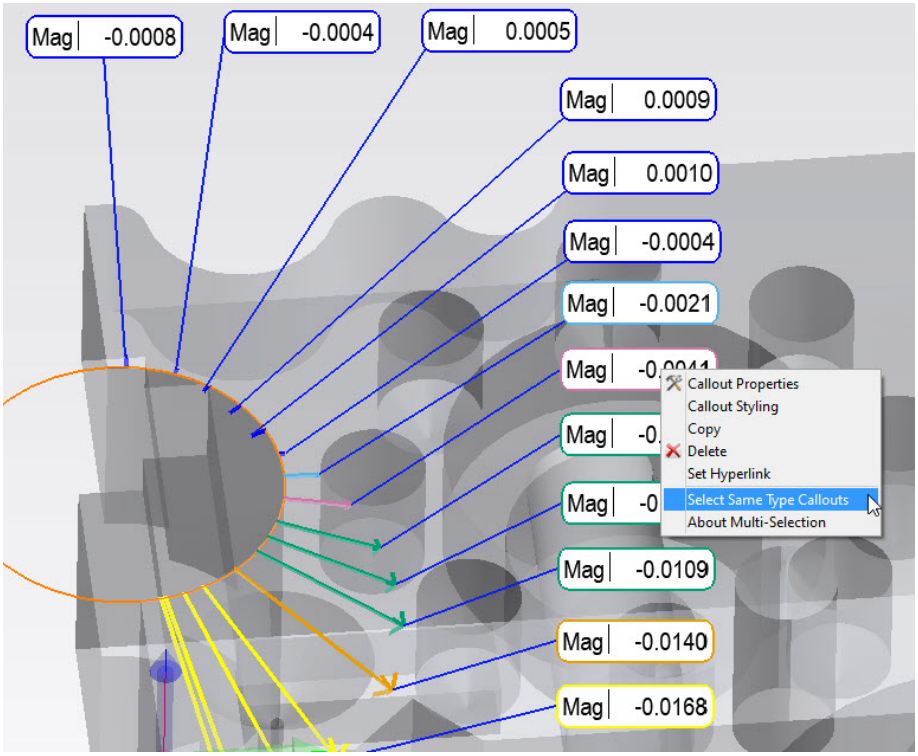
Reporting

Improved Callout Selection

A new option has been added "*Select All Callouts*" to the Callout View tree right-click menu. This option allows a user to quickly select all callouts in view for editing purposes.



Additionally, a new menu option "*Select Same Type Callouts*" has been added to the right-click menu of callouts in the graphical view. This option allows selection of callouts of the same type, such as vector callouts, for common formatting.



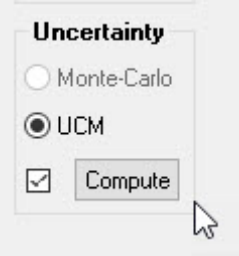
User Interface Improvements

An option has been added to the Automation tab of the User Options to *Enable Relationship Automatic Construction* for relationship as part of various alignments, such as Best-Fit. These relationships can be used to easily repeat an alignment and the ability to disable this operation can be helpful for some scripted procedures.

Uncertainty Calculations

Expanded Geometry Uncertainty Calculations

Added uncertainty analysis for line, plane, circle, cylinder, and sphere geometry relationships through the use of the Uncertainty Context Manager (UCM). This alternative computation option allows dependant uncertainties to be used from a networked instrument.



Updates to the Uncertainty Context Manager

The UCM network tree is now saved with the SA job file.

Instrument Updates

Leica Trackers and Arms

Added support for the new Hexagon Absolute Scanner AS1-XL. This scanner is supported with both Hexagon's Absolute arms and AT960 trackers.

This version also includes enhancements to the *Minimum Angle (Deviation) Filter* for scanning operations. The *Maximum Distance* is now randomized around

the set value, to eliminate artifacts in the filtered data. The default values for the minimum angle have also been improved.

Laser Trackers

API Trackers

Added support for the V-probe "*Smart Probe Button*". Button events are now provided from the vProbe2 and iScan3D and SA responds accordingly.

These events include: 1) Single button press, 2) Double click, and 3) Button hold and each of these events can be customized as needed. *NOTE*: The events are only sent when the beam is not locked onto the probe/scanner.

Additionally, improved messaging and history events have been added to clarify the current status of Virtual Level operations.

Leica Trackers

AT960 -

Added LMF version 1.10 which includes support for precise Timestamps (PTP) in SA. The high precision timestamp can easily be recorded within SA through the use of Point Sets in a scan operation.

The ability to use Auto-Proximity measurements with an integrated line scanner such as the AS1 has been improved.

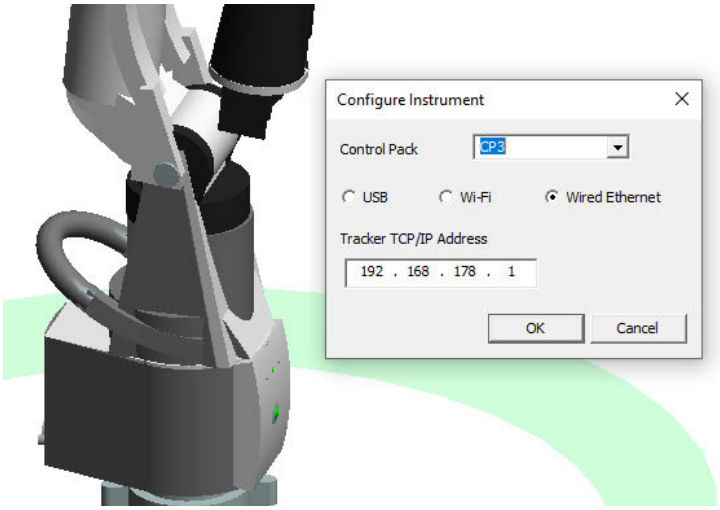
Error messages, event logging and reporting of Orient to Gravity (OTG) operations have also been added and improved.

CMM Arms

Hexagon Absolute Arms

The interface is now updated to RDS v.6.4. This supports the new Hexagon Absolute Scanner AS1-XL.

The interface also fully supports connecting to multiple arms within a single session through RDS. RDS still allows only one arm at a time to be run, but switching between them can be faster through the use of a logon dialog: **Configure Instrument**.



Total Stations and Theodolites

Leica Total Stations and Multi-Stations (MS60)

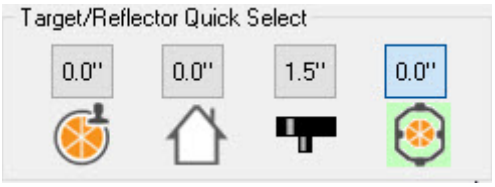
Surface Vector Intersection (Batch of Vectors) Measurements have been improved both for direct interface control and through Scripted operations.

Several Instrument Toolbar Updates have been made:

- A Query option has been added to the Instrument Toolbar. This provides a means to record a full discrete measurement when a position update is desired.
- The level compensator button now displays an out of range icon. It also has been converted to a status display only to avoid accidental use. Compensator control is accessed through the settings.

- Several changes were also made to improve synchronization when changes were made onboard the instrument including level status, weather settings, and target definitions. This includes the ability to define targets onboard the instrument for use in SA. The Leica Cap-

tivate target icons have also been added to help clarify which definition was used to define a particular target.



Total Stations (Theodolite Manager interface)

The full total station toolbar is now available for Leica scopes connected through Theodolite Manager (sokkia instruments continue to use the Theodolite toolbar). This includes several helpful options:

- Added support for Power Search Left and Right.
- Added level compensation status which updates based on the instrument settings.
- Added query button to facilitate accurate position updates.

Additionally improvements have been made to stable point accuracy. An options is available to load targets defined on the scope into SA for supported models.

Photogrammetry Systems

AICON DPA

Updated to work with Aicon SDK 20.00.09

Room Scanners

Leica Pxx ScanStations

The user interface to the Pxx scanner has been updated to streamline operations. Additional, target scan options are now available. See SAReadme for details.

The MP command "Scan within perimeter" has been updated.

Laser Projectors

LAP

Added support for more than one gateway including prompting dialogs and automatic detection. See SAReadme for details.

MP/SDK Scripting Updates

Updates to Existing MP Commands

- **Do Relationship Fit.** Exposed additional optimization solver options and added an objective function return result.
- **Move Collection by Minimizing Relationships.** Exposed additional optimization solver options.

- **Load HTML Form.** Added window size controls
- **Auto-Correspond Closest Point Dialog.** Added Wait for Completion argument which offers an option to allow the MP to continue during the measurement operation.
- **Target Computation Method.** Added new mode to simply deactivate all prior measurement shots within a target, instead of removing them.
- **Ask for String (Pull-Down Version).** Added return argument "Answer Index".

New MP Commands

- **Load HTML Form in Edge Browser.** This command allows the use of the MS Edge Browser rendering engine to display HTML forms which allows option to utilize integrated capabilities.
- **Construct Point Cloud Limiting Probing Directions.** Offers an option to build a new cloud using points limited based on probing direction.
- **Close Auto-Correspond Closest Point Dialog.** Now that the MP can continue processing during the auto-correspond operation a new command was needed to close the dialog.
- **Construct Mirror from Two Points.** Constructs a mirror plane based on two measured points, one reflected and the second measured directly.
- **Enable/Disable Relationships for Optimization.** Offers a means to include or exclude specific relationships for an optimization.
- **Set Automatic Relationship Construction State.** This toggles the option in the users options to automatically build relationships with alignments.

Support for JSON files processing

- **Open JSON File.** Opens a JSON file.
- **Close JSON File.** Closes a previously opened JSON file.
- **Get JSON Tree Pointer List.** Generates a list of all available JSON pointers at a node and returns a string ref list.
- **Get JSON String Value.** Returns a String from a specified location or concatenated list of strings.
- **Get JSON Double Value.** Returns a Double value from a specified location.
- **Get JSON Integer Value.** Returns an integer value from a specified location.

- **Get JSON Object Value.** Returns the object typically used to contain key/value pairs.
- **Get JSON Array Size.** Returns an array containing zero, one, or more ordered elements, separated by a comma.

Bugs and Fixes

- Expanded 'Query Results' dialog to facilitate longer text.
- Modified percentage reporting so that it will not report zero fractions when the percentage is a whole number.
- The cloud filer process for circles was incorrectly clipping data in the interior of a 3D circle. This has been corrected.
- Fixed cloud offset problem with GD&T check evaluations which previously always set input point offsets derived from clouds to zero.
- Fixed Line Property dialog on Cancel operation. It will no longer truncate doubles with pre-defined large precision (more than 8 decimal places).
- Fixed uncertainty reporting in point list view to support cylindrical and spherical coordinate uncertainty reporting for UCM generated uncertainty covariance matrices.
- Corrected angle tolerance evaluation. All internal computations and angle evaluations are performed in degrees. Conversion to other angular units is supported for reporting or exporting only. Delta, tolerance limits, and out-of-tolerance values are always reported with a sign in the range of -180° to 180°