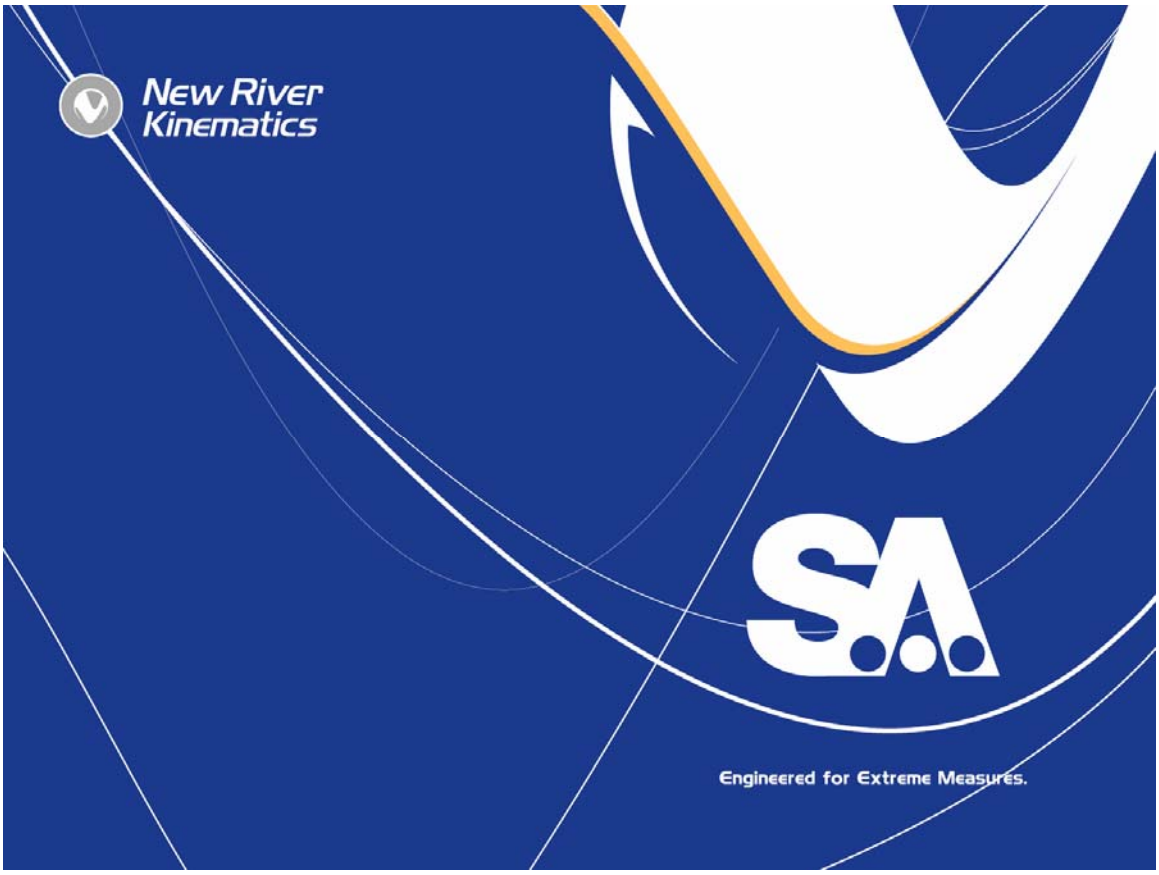

SA Training Topics

New River Kinematics, Inc.

SpatialAnalyzer™ Training Topics

08-02-2007

Spatial Analyzer training classes are customized for breadth and depth of coverage based upon attendee interest areas and class duration. Classes typically cover material from the following list.

OVERVIEW OF SA

Metrology Architecture
- Instruments – CAD – Analysis – Traceable!
- Object Oriented Open Architecture
- Communication Architecture

SA's Components
- Easy to Use Graphical Environment
- Visualize → Communicate
- Common User Interface for Instruments
- Encapsulates unique instrument capabilities
- Watch Windows – Dynamic Build in 3D and 6D
- Multiple On-Line Instruments (simultaneously)
- Wireless and PDA Solutions
- Advanced Analysis Technology
- Integrated Reporting
- ISO Combined Uncertainty and Analysis

Tool Sets for Application Solution
- Templates and MPs → Automation
- Templates
- MP →Script of Measurement Process
- Direct CAD Controlled Assembly Automation
- Multiple Instruments and Stations

SA INSTRUMENT INTERFACES

What is an Instrument Interface?

Simulation

Distributed Computing Architecture

Real Time Interfaces Types

Automatic Feature Measurements Profiles

Measurement Configuration Database

Integrated Ops-Checks (Fields Checks)

Drive process with Measurement Plans

Integrate multiple instruments for simultaneous use

Inspection and Build Mode

Wireless Interface Instrument

Multi-Lingual support

GENERAL USER OPTIONS AND PROCESSES

User Options

Graphics Mode

Shots Settings

Coordinate Frame Settings

Target (or Point) Settings

Units
- Length Area
- Increments

Analysis
- Uncertainty Options
- Automatic File Backup
- Geometry Fit Profiles

Scale-Bar Database
- How Scale-Bars are Used
- Adding a Scale-Bar

Group Association Database

Hidden-Point Bar Database

Security

Directories

Additional Subjects Time permitting
- Unified Spatial Metrology Network
- Relationship Optimizations
- Scale
- Bundle
- Measurement Plan
- Auto-Correspond Point Groups
- Splines and Surfacing
- CAD Data Exchange

HANDS-ON TRAINING EXERCISES

Ex 1: Instrument Setup and Field Checks

Ex 2: Instrument Setup Measurements

Ex 3: Basic Job Start to Finish

Ex 4: Instrument Interface and Analysis

Ex 5: Adding and Orienting another Station

Ex 6: Watch Windows

Ex 7: ADM Measurements

INTRODUCTION TUTORIAL

Block 1: The Basics

- Starting SA
- SA User Interface
  - SA Environment
  - Graphics View
- Toolbars and Menus
- Import CAD Model
  - CAD Model Units Conversion
  - Wireframe vs. Solid Model
- Database Treeview
- Construct a Frame
- Active Working Frame
- Changing Views
  - View controls
  - Viewpoint Control
  - Standard Pre-Set Views
- Manipulating (and Selecting) Objects
  - Hiding or Showing Objects
  - Moving Objects
  - Changing Object Colors
- Save the Job and Review
- Close SA

Block 2: Measurement and Analysis with SA

- Start SA
- Working Frame
- Construct a grid of points

- Construct points on a Surface
- How to View Point Coordinates in SA
- Adding an Instrument to a Job
- Copy Point Groups
- Renaming Point Groups
- Fabricate Observations (Simulation)
- Points with Measurements == Targets

Differences between Points and Targets
Point and Target Information Dialogs
Uncertainty Clouds
Fitting a Plane to Measurements
Plane Properties Dialog
Vector Group Properties Dialog
Create Best-Fit Plane
Analysis: Plane to Plane Angle
Save the Job and Review
Close SA

TRAINING TUTORIAL: JOB 1

Block 1: Import a Model and Points

Import the Model
Change current Working Color
Import Nominal Points
Select ASCII File Format
Save the Job and Review

Block 2: Add Instrument - Measure Reference Points

Selecting the Instrument to Add
Add an Instrument
Starting the Instrument Interface
Run Interface Module
Logging into the Instrument Interface
Instrument Interface
Measure Reference Points
Simulate Measurements à References
Visualize Measurement Rays
Save the Job and Review

Block 3: Best Fit into Part Coordinates

Instrument Locate
Controlling Best-Fit Transformations
Best-Fit Results Reporting
Control Best-Fit Report Details
Applying Best-Fit Transformations
Save the Job and Review

Block 4: Measure the Part

Control Scan with Grid of Points
Construct a Local Frame
Orient Local Frame
Local Frame → Working Frame
Construct a Grid of Points on Local Frame

Project Grid of Point to CAD Surfaces
Scan Surface with Projected Grid of Points
Save the Job and Review

Block 5: Analyze the Part

Saving a Close-up View
Query Points to Surfaces
Vector Group Properties
Numerical Spreadsheet Report from Vector Groups
Save the Job and Review

TRAINING TUTORIAL: JOB 2

Block 1: Create Template File

Start SA
Configure Template File
Set Background Toggle
Add Default Views
Configure User Options
Save Template File
Close SA

Block2: Using Templates

Start SA
Open Template File
File Names and Templates
Default Template
Save the Job and Review
Review

Block 3: Comparing Groups with Relationships

Relationships
Import Reference and Survey Points
Create a Relationship
Relationship Branch in Database Treeview
Construct a Local Frame from Points and Vectors
Local Frame Properties
Working Frames
Relationship Reports
Changing Working Frames
Multiple Frames and Relationships Reports
Create Frame to Frame Relationships
Save the Job and Review

Block 4: Best Fit Point Groups

Applying the Best-Fit Transform to Other Objects
Change automatically monitored by Relationships
Relationship Tolerances
Save the Job and Review

Block 5: Using Queries

Query Group to Group to make a Whisker Plot
Setting Vector Group Properties
Hiding Vector Groups
HTML Reporting
Optional: Editing the HTML Report Template
Save the Job and Review

Block 6: Callout Views and MS Office Reporting

Microsoft Office Reporting
MS Office Report Process Steps
Initialize
Add Content
Save and Close
Clip Board Graphics

TRAINING TUTORIAL: JOB 3

Block 1: Setting up the Job

Add an Instrument
Import Actual Points
Simulate Measurements
Import Nominal Points
Save the Job and Review

Block 2: CTE Scale Compensation

Configure a Local Frame for the Scaling Origin
CTE Scale Compensation
Scaling Origin
Groups to Scale
CTE Compensation Properties
Scale Effects and Settings
Save the Job and Review

Block 3: Best-Fit Scale Compensation

Best Fit Transform with Scale
Scale Analysis
Uncertainty Fields
Save the Job and Review

Block 4: Computing and Reporting Uncertainties

Reporting Uncertainties
Query 3D Scale Differences
Save the Job and Review
Tutorial: Relationship Fitting

Block 1: Add Simple Design Geometry

Add a Cone
Add a Plane
Add a Circle of Points
Save the Job and Review

Block 2: Add an Instrument + Fabricate Measurements

Add an Instrument
Simulate Measurements with Noise
Eliminating shots that intersect the object
Measurement Re-Activation
Save the Job and Review

Block 3: Make Relationships

Make Points to Object Relationships
Save the Job and Review

Block 4: Move the Instrument and the measured points follow

Dragging an instrument
Save the Job and Review

Block 5: Optimize with Relationships

Transform by Minimizing Relationships
Weighted Relationship Fitting
Save the Job and Review

Block 6: Add Additional Constraints with Relationships

Add a Clocking Plane
Add a Clocking Plane Relationship
Minimize all Relationships Simultaneously
Save the Job and Review

LASER TRACKER INTERFACE TUTORIAL

Block 1: Add Instrument

- Run Interface Module
- Overview of the Tracker Interface
    - Instrument Index and Target Naming
    - "Measurement, Home, and ADM Controls"
    - ADM Reset and Drive
- Measurement Profiles and Target/Retro Interface
    - Two Face Measurements
    - Single Pt. to SA
    - Stable Point
    - Watch Update
    - Spatial Scan
    - Sphere Surface
    - Scan Circle (Pin) and Scan Circle (Hole)
    - Scan Plane
    - Cross Section
- Modify Sphere Profile to configure Tooling Ball Profile
- Setting a Measurement Delay
- Managing Measurement Profiles
- Measure
- Measurement Profiles
    - Single Points
    - Adding Reflectors and Targets to the Interface
- Ops Checks / Field Checks
- Close Instrument Interface

Block 2: Adding a Second Station

- Watch Windows

Block 3: Additional Topics

- General Tracker Settings
- SA Point Request
- Environmental Monitoring
- Tracker Interface Units
- Importing Tracker Data
- Viewing Current Position
- Tracker Status

TOTAL STATION TUTORIAL

Block 1: Basic Introduction to Theodolite Manager

Gathering Data
Re-Connecting

Block 2: Moving an Instrument

Block 3: Adding a TDM5005 Instrument