Satellite and Aerial Imagery Support in ArcGIS

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Agenda

- Data Management in ArcGIS 10 – Mosaic Datasets
- Raster Types
- Raster Functions
- Processing Aerial Imagery
- Imagery in Desktop
  - Image Analysis Window
- SDK
- Open Discussion / Q & A
Sensor Image Data

- **Acquisition**
  - Spaceborne, Airborne, Terrestrial

- **Composed of Many Files**
  - Pixels, Metadata, Georeferencing

- **Typically Requires Processing**
  - Georeferencing
  - 3D Transformation (Orthorectification)
  - Pansharpening
  - Extract/Composite Bands
  - Enhancement
Data Management Issues

- Multiple Sources
- Multiple Formats
- Increasing Bit Depths and Bands
- Sensor Specific Metadata in Sensor Specific Format
- Large Collections
- Processing Requirements Vary
- Traditional Workflows Proliferate
  Intermediate Data
  - Quickly Escalates Storage Requirements
Mosaic Dataset

- Catalog of Imagery
  - References Source Image Data
  - Metadata
  - Stored in the Geodatabase
- Scalable (e.g. Landsat Services)
- Architectural Foundation
  - Intelligent Ingest
  - On-the-Fly Processing
  - Dynamic Mosaicking
Mosaic Dataset

- Authored Using Desktop
- Automated Using GP tools and/or ArcObjects
- Accessible as:
  - Image
    - On-the-Fly Processed
    - Dynamically Mosaicked
  - Catalog
    - Footprint Geometry
    - Metadata
  - Image Service
    - Image + Catalog + REST
Demo – Image Data Management

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Raster Types

• Terminology
  - Raster Format = “TIFF”
  - Raster Type = “QuickBird”

• “Product” Descriptor
  - file structure
  - bit depth
  - band information
  - metadata parsing
  - georeferencing
  - more…

• Sensor Specific
Raster Types

- Define On-the-Fly Processing Chains Applicable to Sensor
- Extendable using the SDK
- 23 in 10.0 (more coming…)

![Raster Types Image](image-url)
Raster Types

- Landsat example
  - Compose an MS Raster
  - Process the Pan Raster
  - MS + Pan = Pansharpened Raster
  - Ingest Metadata Fields
    - AcquisitionData, CloudCover, …
    - Ingested from .txt, mtl.txt, …

- Raster Dataset Type
  - Used for All Supported Formats
  - Handle Processed Imagery
Demo – Advanced Data Management

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Raster Functions

• Operation to be performed on one or more rasters
• Execution is On-the-Fly
• Can be chained together
• Can be applied at different levels
  - Mosaic Dataset
  - Raster(s) in a Mosaic Datasets
  - Raster(s) in Desktop
• Extendable using the SDK
• 24 in 10.0 (more coming…)
Raster Functions cont..

Radiometric Processing (value)

- Enhancement
  - Stretch, Convolution, Pansharpening,…
- Visualize
  - Hillshade, Shaded relief, Aspect, Slope,…
- Composite
  - Extract/Composite Bands

Geometric Processing (location)

- Reproject, Warp, …
- Orthorectification
  - RPC, Standard Frame
Raster Function Template

- Processing template that can be applied to multiple rasters
- Defines a chain of functions and a set of variables
- Raster Types utilize them to create different products from the same source data
- Easy to edit in Desktop
Demo – Raster Functions

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Frame Camera Support

• Issues
  - Increasing number of sensors
  - Huge number of frames
  - Huge volumes of data
  - Need to make data quickly accessible

• Mosaic Dataset provides
  - Reduced latency – Quickly serve
  - Reduced processing – Directly from Source
  - Graded product – Refined parameters over time
  - Reduced storage – processing on the fly
Frame Camera Support - Workflows

• Out of the box support
  - Photogrammetric Suites (MATCH-AT, ISAT,..)
  - Applanix DSS

• Custom Aerial Camera Support
  - “Table” Raster Type (Pictometry, UltraCam,..)
    • Table
    • Xml
Frame Camera Support – Table Contents

- Table - Containing Variable parameters
  - Exterior Orientation Parameters
    X, Y, Z, Omega, Phi, Kappa
  - Metadata
Frame Camera Support – XML Contents

- XML Contents
  - Raster Source
  - Spatial Reference
  - Camera Calibration
    - Principal Point, Focal Length, Konrady
  - Orientation Parameters
    - Variables Pointing to Fields in the Table
  - Processing information
    - Orthorectification, Pansharpening, Enhancement, …
Demo – Frame Camera Support

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Image Analysis Window

- One click access to common tools
- Process raster layers
- Enhancement tools
- Interpretation tools
- On-The-Fly processing
- Supported layers
  - Raster Dataset
  - Mosaic Dataset
  - Image Service
  - WCS
Demo – Image Management and IAW

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Customizing using the SDK

• Need for customization
  - New or Missing Sensor Support
  - New or Missing Processing

• ArcObjects SDK

• Resource Center
Customizing Raster Types

- Raster Type Factory
- Raster Builder
- Processing Templates
Customizing Raster Functions

- **Raster Function**
  - Main processing algorithm
- **Raster Function Arguments**
  - Function parameters

- **Raster Function UI**
  - UI for function parameters
  - Optional
Data Management Recommendations

• Single elevation service for Orthorectification

• Preprocessing
  - Calculate Pyramids
  - Calculate Statistics

• Consider Optimized Delivery Formats
  - TIFF w/JPEG 80

• Organize Imagery Into Collections of Similar Sensor
  - Homogeneous Mosaic Dataset

• Organize services
  - Color imagery, False color, NDVI, Master

• Imagery: Data management patterns and recommendations
Summary

- Data Management Solution in ArcGIS 10 – Mosaic Datasets
- Sensor Support via Raster Types
- On-the-Fly Processing using Raster Functions
- Frame Camera Support in ArcGIS 10
- Image Analysis Window in Desktop
- Best practices when working with sensor data.
Questions

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www.esri.com/sessionevals
 Imagery Blog