Working with Multi-Sensor Imagery and Raster Data

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Agenda

• Introduction to the Imagery Platform
• Imagery content on the living Atlas (Landsat/Sentinel/NAIP)
• Image Management – Mosaic Dataset, Image Services
• Working with Satellite Imagery
• Working with Multidimensional data
• Map Production
  - Ortho Mapping in ArcGIS Pro, Drone2Map, Ortho Maker, SiteScan
• Other key image modalities and data types
  - Stereo
  - Motion imagery
  - Oriented imagery
5 Key Imagery Capabilities of ArcGIS
Imagery is Crucial

Vital part of any GIS
Imagery Content on the Living Atlas

NAIP
Landsat
Sentinel
Elevation
Terminology

- Raster format – defines how pixels are stored
- Raster type – defines the metadata to be read and used for processing
- Raster function – on-the-fly processing of pixels
- Mosaic dataset – data model in a geodatabase for managing imagery
- Image service – data model for accessing mosaic dataset technology as a web service
ArcGIS Integrates All Types of Imagery
Understanding Imagery Products

Over 150 Raster formats
Over 70 well known sensors

Add as:
- Raster types
- Raster products

From:
- File System
- Cloud store (via ACS)

ADS, Applanix, ASTER, CDRG/ECRG, CIB, DEIMOS-2, DMCii, DTED, DubaiSat-2, FORMOSAT-2, Frame Camera,
GeoEye-1, GF-1 PMS / WFV, GF-2 PMS, GF-4, HJ 1A/1B CCD, HRE, IKONOS, Image service definition, Image
service reference, ISAT, Jilin-1, KOMPSAT-2&3, Landsat 1–5 MSS, Landsat 4–5 TM, Landsat 7 ETM+, Landsat 8, LAS
/LAS Dataset, MATCH-AT, Mosaic dataset, NCDRD, NITF, Pléiades, QuickBird, RADARSAT-2, RapidEye, Raster
catalog, Raster dataset, Raster process definition, Sentinel-1, Sentinel-2, Sentinel-3, Sentinel - 5SOCET SET, SPOT
5 / 6 / 7, Table, Terrain, TH-01, UAV/UAS, Web services, WorldView-1,2,3&4, ZY02C HRC / PMS, ZY3-CRESDA /
ASMAC
Image Management
Mosaic datasets: primary data model

- Primary data model
- Spatially-indexed Catalog
- Multi-resolution
- Multivariate
- Multidimensional
- multiple sources
- multiple formats and sensors
- Maintain Image quality
- Published as rich web services
- Enables
  - Dynamic Mosaicking
  - On-the-fly processing
Demo

Raster products

Mosaic datasets
Scientific Multidimensional Data

Big data
- Large volume (Volume)
- Many types of data (Variety)
- Grow rapidly (Velocity)

Multidimensional
- Time
- Depth
- Height

Formats
- netCDF
- Grib
- HDF

Meteorological
- Temperature
- Precipitation
- Wind speed

Terrestrial
- Soil moisture
- NDVI
- Land cover

Oceanographic
- Salinity
- Sea Surface Temperature
- Ocean current
Multidimensional Raster Data Cube

Increasing Demand to handle large scientific datasets, deep temporal data stacks, Image Cubes, Data Cubes

- Mosaic Dataset
- Multidimensional Mosaic Dataset

CRF – Optimized for cloud storage and processing – Output for Raster Analytics
Multidimensional CRF – Optimize for multiple variables/dimensions
Transposed CRF – Enable rapid dimension access and analysis
Working with a single multidimensional dataset
Managing collections of multidimensional data
Map Production from Imagery
Creating precise imagery derived products

Satellite, Aerial Cameras & Drones

Orthophoto production
  Aerotriangulation & Block Adjustment
  Digital Elevation Model Generation (DSM & DTM)

Photogrammetric data model supporting many use cases
  Dynamic image services (orthorectify on the fly)
  Creation of custom basemaps
  Stereo display and 3D feature extraction
  Oblique imagery
  Image coordinate system & Mensuration

ArcGIS Pro Advanced - Ortho Mapping
ArcGIS Image Server - Ortho Maker
ArcGIS Image Analyst – Stereo
Drone2Map for ArcGIS
Map Production from Imagery
Creating precise imagery derived products

Drone2Map
Stand Alone App for Windows

SiteScan
Drone processing in the cloud

ArcGIS Pro
Ortho Mapping Workflow

Ortho Maker
WebApp on ArcGIS Image Server
Ortho mapping in ArcGIS Pro
Drone2Map
SiteScan
Imagery is collected in all kinds of ways and different types.....

Stereo
Motion Imagery
Oriented Imagery
Stereo Display and Data Capture

• Stereo display
  - “Stereo Map” view in ArcGIS Pro
  - Easy navigation of stereo pairs
  - Support active & passive shutter glasses, anaglyph

• Stereo feature extraction
  - 3D cursor - capture points, lines, polygons

• Stereo measurements
  - Pro measurement tools are “stereo aware”

Focused on GIS user requiring stereo vs professional data capture

Requires ArcGIS Image Analyst
Demo
Stereo Imagery
Motion Imagery (FMV) - ArcGIS Pro 2.5

Visualization, Exploitation, and Management of georeferenced video

- Play video files or live streams, with moving video footprints and sensor location
- Extract georeferenced frames for reporting or analysis
- Capture important features on the map or in the video
- Integrated 2D and 3D displays for situational awareness
Summary

ArcGIS as an Imagery platform
Mosaic dataset data model
Work with different types of data
Categories of applications
  - Foundation mapping
    Map buildings, parking, landuse, landcover
    Get things from imagery to GIS
  - Situational awareness
    Timeaware, oblique
  - Scientific analysis
    Is that crop really soy beans, etc..
    Answer scientific questions
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Tonight

6:30 pm – 9:00 pm

Networking Reception

Smithsonian National Museum of Natural History
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Log in to access the survey

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Questions?

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