Introduction to GIS with ArcGIS Pro

Coordinate Systems: Managing Projections and Transformations

Session 6

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Lecture Outline

- Introduction & Recap (5 minutes)
- Managing **Projections** (25 minutes)
- Coordinate **Transformations** (20 minutes)
- Guided Exercise & Q&A (10 minutes)

Course Outline

Week 0: Pre-Course Setup (Self-Paced)

- **Task:** This self-paced module must be completed before the first live class.
- **Topics:** Reviewing system requirements, understanding license options, downloading and installing ArcGIS Pro, and successfully signing in using the provided guidance.

Week 1: Getting Started with ArcGIS Pro

- **Class 1:** Introduction to ArcGIS Pro and Project Structure
- **Class 2:** Map Navigation and Data Exploration

Week 2: Working with GIS Data

- **Class 3:** Connecting to Data Sources
- **Class 4:** Populating a Geodatabase

Week 3: Coordinate Systems

- **Class 5:** Understanding Coordinate Systems
- **Class 6:** Managing Projections and Transformations

Recap of Season 5

- Geographic and Projected Coordinate Systems
- EPSG codes and WKID
- Different Coordinate Systems

Managing Coordinate Systems

in ArcGIS

Work with coordinate systems

- Spatial Reference of Individual Layers
- Spatial Reference of Map object

Set the coordinate system

- You can set the coordinate system of a map or scene directly, you can define it from a layer in the map or scene, or you can set it from another data source.
- In some specific workflows, you may need to use an unknown coordinate system.
- Choose a coordinate system
  - from a list
  - by spatial extent, geographic coordinate system, or projection property
  - from a layer
  - from a data source

https://pro.arcgis.com/en/pro-app/latest/help/mapping/properties/specify-a-coordinate-system.htm

Save coordinate systems

- If there are coordinate systems you use often in your projects, you can add them to your list of **Favorites** to make them easier to find.
- Favorites are available across all your projects.
- You can also save any coordinate system as a projection file (**.prj** file extension).
- Projection files can be used to define a coordinate system in geoprocessing.

https://pro.arcgis.com/en/pro-app/latest/help/mapping/properties/specify-a-coordinate-system.htm

Coordinate Transformation

in ArcGIS

Coordinate transformation

A transformation is used whenever the geographic coordinate system (or the underlying geographic coordinate system) of layer is not the same as the geographic coordinate system (or underlying geographic coordinate system) of the map.

Therefore **coordinate transformation** is also known as **geographic datum transformation**. It is also known as **geographic transformation**.

One the fly coordinate transformation

ArcGIS Pro reprojects data on the fly so any data you add to a map adopts the coordinate system definition of the first layer added.

As long as the first layer added has its coordinate system correctly defined, all other data with correct coordinate system information reprojects on the fly to the coordinate system of the map.

If layers have different datums, a geographic transformation is automatically applied to ensure they align accurately on the map.

Project data to a new coordinate system

- It is a best practice to work with data in the same coordinate system when performing edits or analysis on the data.
- It is recommended that you use one coordinate system for the map and all the data in it.
- Use the **Project tool** to project vector spatial data from one coordinate system to another.
- If you are working with raster data, use the **Project Raster tool**.

https://pro.arcgis.com/en/pro-app/latest/help/mapping/properties/geographic-coordinate-system-transformation.htm

Exercise

Exercise

1. Define a Projection to a Feature Class with Unknown SR
2. Transform a feature class with UTM projection to BTM projection
3. Apply different world projections and observe the shape, size, and orientation of different continents and countries.

Preview for Season 7

Symbolizing Layers: Fundamentals of Symbology

- Layer Symbology
- Color
- Shape
- Size
- Legend
- Scale Dependencies
- Transparency

References

Coordinate systems, map projections, and transformations in ArcGIS Pro

https://pro.arcgis.com/en/pro-app/latest/help/mapping/properties/coordinate-systems-and-projections.htm

Geographic datum transformations

https://pro.arcgis.com/en/pro-app/latest/help/mapping/properties/geographic-coordinate-system-transformation.htm

An overview of the Projections and Transformations toolset

https://pro.arcgis.com/en/pro-app/latest/tool-reference/data-management/an-overview-of-projections-and-transformations-toolset.htm