Effective Coordinate Space Transformation Workflows

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Working with data sets between single-precision, non-geospatially aware applications (such as 3ds Max software, Revit software, and Inventor software) and double-precision, geospatially aware applications (like AutoCAD software, AutoCAD Civil 3D software, InfraWorks software, ReCap software, and Navisworks software) can be difficult and frustrating. This class will help you to better understand this confusing process and explore several effective and proven methods for exchanging data sets between these applications with a minimal loss of production time.
Key learning objectives

At the end of this class, you will be able to:

- Learn how to choose the ideal projection systems for geo-spatial data exchange
- Learn how to create custom coordinate systems for exchanging data between single- and double-precision CAD and design applications
- Learn how to create and modify simple scripts for translating data inside AutoCAD and AutoCAD Civil 3D
- Learn how to prepare CAD assets for export and consequently bring the resulting models back to CAD in the correct geo-spatial location
Double and Single Precision
What is the Difference?

Single Precision Numbers - 9 Significant Digits

0.123456789 12,345.6789 12,345,678.9

Double Precision Numbers - 15 Significant Digits

0.123456789876543 1,234,567,898.76543 12,345,678,987,654.3
Double and Single Precision
What is the Difference?

3,762,962,955 KM

SUN  MERCURY  VENUS  EARTH  MARS  JUPITER  SATURN  URANUS  NEPTUNE  PLUTO
Geospatial Basics

- **Projection**
  - **Mercator** - A conformal, cylindrical projection tangent to the equator
  - **Transverse Mercator** - Similar to the Mercator except that the cylinder is tangent along a meridian instead of the equator
  - **Universal Transverse Mercator (UTM)** – Based on a Transverse Mercator projection centered in the middle of zones that are 6 degrees in longitude wide
  - **Lambert Conformal Conic** – A conic, conformal projection typically intersecting parallels of latitude, standard parallels, in the northern hemisphere.
  - **State Plane** – A standard set of projections for the United States based on either the Lambert Conformal Conic or transverse Mercator projection, depending on the orientation of each state
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Geospatial Basics

- Projection
Geospatial Basics

- Datum - Explains coordinate spaces in a vertical space relative to the center of the planet

![Diagram showing Earth's datum and coordinate systems](image)
Geospatial Basics

- GIS – Geographic Information System
  - A system designed to capture, store, manipulate, analyze, manage, and present all types of spatial or geographical data

Source: GAO.
The Process

- Example of data degradation
The Process

- Custom Coordinate System
  - Pick a translation reference point
The Process

- Create a Project Coordinate Information File
  - Project Coordinate System
  - Translation Reference Point, Project Space in Project
  - Translation Reference Point in the opposite Project Scale
  - Project False Easting and Northing
  - Custom False Easting and Northing
  - Custom Coordinate Space
The Process

- **Method 1 – Autocad Script**

```
expert 5 layer u * t * on * move all
963307.9940',678305.7901' 0,0 zoom e expert 0
```
The Process

- Method 2 – Create Custom Coordinate System
The Process

- Recap to Single Precision (3ds max, Revit, etc.)
- Infraworks from Single Precision (3ds max, Revit, etc.)
- Civil 3D from Single Precision (3ds max, Revit, etc.)
- Navisworks from Single Precision (3ds max, Revit, etc.)
- Global Mapper to Single Precision (3ds max, Revit, etc.)
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- Give instructors feedback in real-time.