

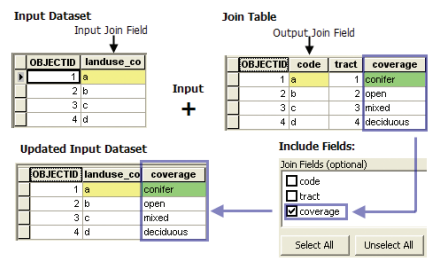
Top 10

New geoprocessing features in ArcGIS 9.3

Of the many improvements to the ArcGIS geoprocessing framework, here are 10 additions to ArcToolbox that will certainly make geoprocessing tasks both easier and faster.

10. New Join Field Tool

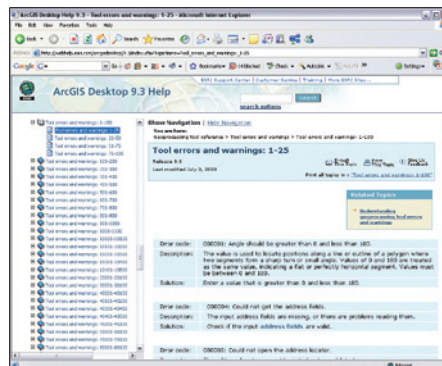
At the 2007 ESRI International User Conference, many attendees asked how they could permanently add fields from one table to another. At that time, the solution required using the Add Join, Add Field, and Calculate Field tools. With ArcGIS 9.3, the new Join Field tool, located in a Joins toolset in the Data Management tools performs the work of those three tools in just one step and a fraction of the time.



Like the Add Join tool, the Join Field tool accepts two tables, each with a common attribute field. The tool joins the two tables based on this field, and you have the option of selecting which additional fields you want to include in the final output. The Join Field tool output is a permanent update of the input table or feature class.

9. Standardized and More Informative Error Messages

Warning and error messages for geoprocessing operations are now standardized. Each message has a unique number. When a warning or error comes up on a tool dialog box, progress dialog box, or command line window, click the number to open a detailed description. This description lists the probable causes of the error or warning, makes suggestions for remedying the situation, and provides links to relevant help topics. Error codes returned by geoprocessing operations can also be used in scripts and script tools. Messages can be identified by scanning the tool's errors and warnings page for appropriate error and warning codes. Once the appropriate code is identified, the error code and any information that needs to be included in the message (normally referenced as <value>) can be added to scripts and script tools.



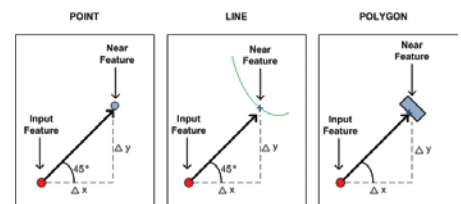
8. Near Tool Works with Lines and Polygons

In ArcGIS Desktop 9.3, the Near tool offers additional proximity analysis for ArcInfo users. More feature types can be used for this analysis, and additional results are generated and saved as output. Previously, the Near tool computed the distance from each point in a coverage to the nearest arc, point, or node in another coverage and recorded that distance in the attribute table for the point coverage. The Near tool in ArcGIS 9.3 takes point, polyline, polygon, and multipoint feature types and determines the distances of Input features from features added to the tool as Near features based on the search radius specified.

Two new fields—NEAR_FID (the feature ID of the Near feature found) and NEAR_DIST (the distance between the Input features and the Near features)—are added to the attribute table and populated with the results of this analysis. Checking the Location and Angle boxes in the Near tool dialog box saves two additional calculations. The Location parameter creates and populates the NEAR_X and NEAR_Y fields, which contain the x and y coordinates of the Near features. The Angle option creates the NEAR_ANGLE field and stores the angle value from the Input feature to the nearest point on the Near feature. This value is measured in degrees from 180° to -180°. When multiple Near features are specified, an additional field, NEAR_FC, is created, which contains the pathname of the layer or feature class used as Near features. Locate the Near tool in the Proximity toolset of

the Analysis tools in ArcToolbox (available at the ArcInfo license level). If the Input features layer contains selected features, the Near tool uses only the selected features and sets nonselected features to -1.

The three accompanying diagrams show how the Near tool calculates the distances from an Input feature to a Near feature when that feature is a point, line, or polygon. If Near features are polylines, the location on the polyline closest to the Input feature will be used. If the Near feature is a polygon (as shown in this example), the distance is calculated from a point on the polygon boundary that is closest to the Input feature. In either case, if the Near feature polyline or polygon touches or intersects a feature from the Input features, the distance will be zero. If no search radius is specified, the radius will be set large enough to calculate a distance to each Input feature.



How the Near tool calculates the distances from an Input feature to a Near feature when that feature is a point, line, or polygon

7. Generate Near Table Tool

Because the Near tool modifies the attributes of the input feature class, it can cause problems when the input dataset is read only. With ArcGIS 9.3, the new Generate Near Table tool creates a new table containing the proximity information instead of modifying the input feature class as the Near tool does. This tool also contains an option to find the distances to all features, not just the nearest feature.

6. Better Performance Using ArcSDE Data with Geoprocessing Tools

With ArcGIS 9.3, there are three major improvements to performance when using ArcSDE data with geoprocessing tools.

- With this release, better management of ArcSDE connections has resulted in the most dramatic performance improvement. Instead of creating multiple connections to ArcSDE for one execution of a tool, only one connection is created. (This issue was also resolved for ArcGIS 9.2 by Service Pack 5.)
- The performance of the Append tool has improved because the spatial index of the output dataset is created only once instead of many times.
- Many improvements to the internal topology analysis engine used by overlay tools has greatly enhanced the performance of tools in the Analysis toolbox when using large ArcSDE datasets.

5. Python Scripts Run in Process

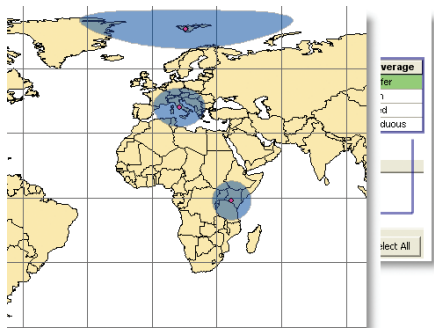
In ArcGIS 9.2, all Python [.py] script tools created a separate process and executed outside the application process. This resulted in a delay of as much as 5 to 10 seconds when a script tool was starting up. ArcGIS 9.3 takes advantage of the fact that the application is already running, which greatly improves script tool performance in two major areas: initial startup of a script tool and the use of cursors within the script tool. It also greatly improves the startup performance of script tools that use smaller datasets as inputs.

4. Geodesic Buffers

In ArcGIS 9.2, the Buffer tool created buffer polygons that assumed all coordinates represented a flat Euclidean space instead of a spherical space such as the earth. In ArcGIS 9.3, the Buffer tool will create geodesic buffers if

- Features to be buffered are points or multipoints.
- Input features are in geographic coordinates (i.e., longitude/latitude).
- Buffer distance is in Euclidean linear units (i.e., feet, meters).
- Output buffer polygons will take into account that longitudinal distance varies with latitude.

The geodesic buffer approach yields buffers that are not affected by the distortions that are



inherent in a projected coordinate system. This approach is an especially critical one when generating buffers for features stored in a geographic coordinate system. It's important because, although the conversion from degrees of latitude is fairly constant throughout the coordinate system, the conversion from degrees of longitude to linear distances varies greatly as you move away from the equator.

3. Script Tool Validation

Your script tools can now behave like system tools (the tools that come with ArcGIS). You can enable parameters based on values in other parameters, provide keyword lists that dynamically change, put parameters into different categories, calculate default values on the fly, and update the description of output data for use in ModelBuilder. These capabilities are all found on the new Validation tab on a script tool's property page.

2. New Spatial Statistics Tools: Ordinary Least Squares Regression and Geographically Weighted Regression Tools

The Spatial Statistics toolbox has powerful pattern analysis tools to help answer "Where?" questions such as

- Where in the United States are people consistently dying at young ages?
- Where are students consistently receiving high test scores?
- Where do an unexpectedly high number of traffic accidents occur?

The new regression analysis tools in ArcGIS 9.3 allow you to answer the next logical set of questions, the "Why?" questions such as

- Why are people consistently dying at younger ages in particular places across the United States?
- Why are students consistently obtaining high test scores at particular schools?
- Why do so many traffic accidents occur in particular locations?

Ordinary Least Squares (OLS) Regression is a commonly used global linear regression method used to generate predictions or to model a dependent variable or process in terms of its relationship to a set of explanatory variables. It creates a single equation to represent those relationships. OLS is the starting point for all regression analysis (including all spatial regression analysis). However, it often breaks down when used with spatial data in cases where the relationships being modeled change across the study area. For example, an education variable might be a good predictor of crime rates

in one part of the study area but may not be significant in another part of the study area.

Geographically Weighted Regression (GWR), on the other hand, allows data relationships to vary. GWR is one of several spatial regression techniques increasingly used in geography and other disciplines. It provides a local model of the variable or process you are trying to understand/predict by fitting a regression equation to every feature in the dataset. GWR constructs these separate equations by incorporating the dependent and explanatory variables of features falling within a particular user-specified bandwidth of each target feature. ArcGIS 9.3 includes documentation with additional information on these topics, Regression Analysis Basics and Result Interpretation. This documentation contains strategies and graphics that help you apply these methods effectively.

1. Batch Grid: Deferred Validation

While using a tool in batch mode ultimately saves time, filling in the batch grid was a slow process if more than 10 rows needed to be entered. This was because every value in every row was validated whenever you clicked in a grid cell. In 9.3, you control when validation occurs. You can validate when you wish by clicking the Check Values button in the lower right of the batch grid. Of course, validation always occurs when you click the OK button.

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