

An Additional Dimension for Analysis

New geoprocessing tools in the 3D Features toolset

3D GIS moves beyond visualization in ArcGIS 10. The analysis of 3D vector features is a major focus of this release of the ArcGIS 3D Analyst extension. Now geoprocessing tasks can use closed multipatches and 3D features. The new suite of 3D set operators includes Intersect 3D, Union 3D, Inside 3D, Is Closed 3D, and Difference 3D. Skyline and Skyline Barrier expose 3D vector analyses designed spe-

cifically for virtual city workflows. Existing geoprocessing tools have been enhanced so they work more effectively with 3D data. For example, the Select By Location tool dialog box uses 3D distances, and multipatch objects can now participate in the Line Of Sight tool. Network datasets have full 3D connectivity. The accompanying table lists the new 3D geoprocessing tools in ArcGIS 10.

Geoprocessing tool	Description
Add Z Information	Examines each 3D shape and adds selected properties as attributes to the input feature class. The output options vary based on the input shape type.
Construct Sight Lines	Constructs lines between each of the observer points and each of the target features.
Difference 3D	Computes the geometric intersection of two volumes defined by closed multipatch features based on the geometric intersection of their patches, then subtracts all the volumes of one feature class from the other and writes the result to a new output feature class.
Feature To 3D By Attribute	Adds a height dimension based on one or two attributes. The height (z-value) of the shape of each feature in the input feature class is set to the value found in the user-specified height field in that feature class.
Inside 3D	Tests each feature to determine if it falls inside a multipatch feature. If it does, the tool writes an entry to a new table indicating which feature it fell within.
Intersect 3D	Computes the geometric intersection of two volumes defined by closed multipatch features based on the geometric intersection of their patches. Features or portions of features that overlap in the two layers and/or feature classes will be written to the output feature class.
Intersect 3D Line With Multipatch	Computes a geometric intersection of the input line and multipatch features and returns the number of points of intersection. Points (of intersection) and/or lines (resulting from input lines being broken at intersection points) can optionally be written to output feature classes.
Is Closed	Tests each multipatch to see if it completely encloses a volume, then adds a new field with a flag for each multipatch feature in the input layer or feature class indicating if that feature is closed or not.
Near 3D	Determines the distance from each feature in the input features to the nearest features within the search radius.
Skyline	Generates a line or multipatch feature class containing the results from a skyline silhouette analysis. The analysis is conducted from observer points above a functional or virtual surface and will also consider features that are encountered during the analysis. When used in conjunction with other tools, especially the Skyline Barrier tool, shadow volumes and other such features can be created.
Skyline Barrier	Generates a multipatch feature class representing a skyline barrier or shadow volume. The barrier is in a sense a surface and looks similar to a triangle fan formed by drawing a line from the observer point to the first vertex of the skyline, then sweeping the line through all the vertices of the skyline. A skirt and base can optionally be added to form a closed multipatch, giving the appearance of a solid. It is possible to create this closed multipatch so that it can serve as a shadow volume. If the input is a silhouette (a multipatch feature class) rather than a skyline (a polyline feature class), the multipatch is extruded into a shadow volume.
Skyline Graph	Calculates sky visibility and optionally generates a table and a polar graph. The table and graph represent the horizontal and vertical angles going from the observer point to each of the vertices on the skyline.
Union 3D	Computes the geometric intersection of the patches of overlapping multipatches, then aggregates the multipatches together. The number of features created as output depends on the tool's settings.

New geoprocessing tools in the 3D Features toolset