

NAME: [3D Weighted Mean of Points, v. 1.2a](#)

Aka: weightmean3d.avx

Last modified: March 11, 2004

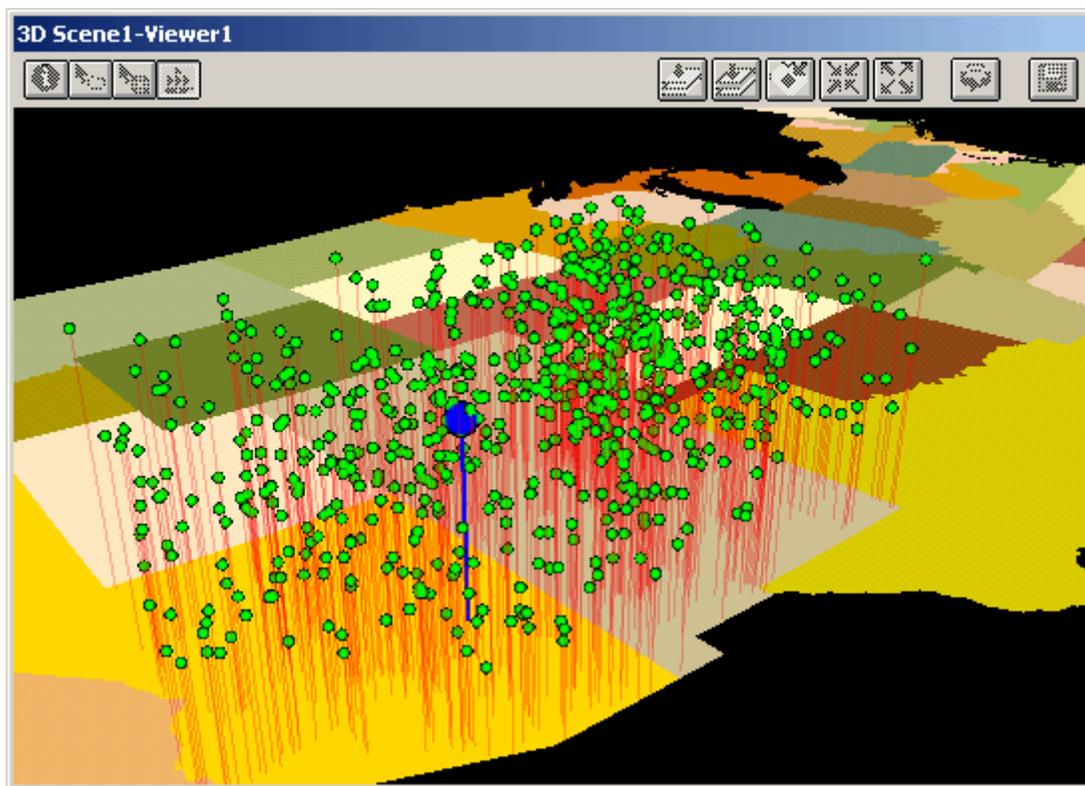
TOPICS: ArcView 3.x, 3D, Weight, Mean, Point, PointZ, Statistic, View, Analysis, Tools

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DESCRIPTION: This extension creates a new button on the VIEW toolbar which enables the user to calculate the 3D weighted mean of a group of points. These points can either be in the *Point* format, with elevation values included in a field in the point attribute table, or they can be in the *PointZ* format, in which the elevation values are embedded in the actual point. You have the option to create a RESULTS table, a new shapefile, and/or a graphic symbol of the weighted mean center.



3D Weighted Mean uses the following equations to calculate the weighted mean center of a cluster of three-dimensional points.

$$\bar{x}_{wc} = \frac{\sum f_i x_i}{\sum f_i} \quad \bar{y}_{wc} = \frac{\sum f_i y_i}{\sum f_i} \quad \bar{z}_{wc} = \frac{\sum f_i z_i}{\sum f_i}$$

where:

wc = Weighted Center

f = frequency (or weighting factor)

All or only selected records: You can either use all the points in the point theme for the analysis or only a selected subset of points. If any points in your theme are selected, then only those selected points in that theme will be used in the analysis. If no points in your theme are selected, then all points in that theme will be used in the analysis.

Projected vs. Unprojected Views: If your original data are in Lat/Long coordinates (the Geographic Projection) and your View has been projected, then you have the option of calculating RESULTS data based on either the Geographic Projection or your View Projection. The choice of projections can dramatically affect the location of the mean of the point coordinates used in the analysis.

Results: Upon completion, you will have one or all of the following depending on your choice:

1. A **Results** table.
2. A **Shapefile**, containing a single point representing the weighted mean center of the point theme. This shapefile will contain the same shapetype as your input theme (i.e. it will be either a *Point* or a *PointZ* shapefile, depending on what you're original point theme was).
3. A **Graphic Symbol** displayed on the view representing the weighted mean center of the point theme.

Both the **Results** table and the **Shapefile** will have a single record with the following fields:

1. **Weight fld:** Field name of the Weighting field from the Point Theme.
2. **Num_recs:** The total number of points used in the analysis. Remember that if any of the points were selected prior to the analysis, then only those points will be used in the analysis.
3. **X_Coord:** The X-coordinate of the weighted mean center.
4. **Y_Coord:** The Y-coordinate of the weighted mean center.
5. **Z_Coord:** The Z-coordinate (or elevation value) of the weighted mean center.

REQUIRES: This extension requires either a PointZ theme with a numeric Weighting field, or a Point theme with both an Elevation field and a numeric Weighting field.

This extension also requires that the file "avdlog.dll" be present in the ArcView/BIN32 directory (or \$AVBIN/avdlog.dll) and that the Dialog Designer extension be located in your ArcView/ext32 directory, which they usually are if you're running AV 3.1 or better. The Dialog Designer doesn't have to be loaded; it just has to be available. If you are running AV 3.0a, you can download the appropriate files for free from ESRI at:

<http://www.esri.com/software/arcview/extensions/dialog/index.html>

REVISIONS: The 1.1 revision (Sept. 19, 2003) provides the option to calculate the unweighted mean center of the points.

The 1.2 revision (Nov. 21, 2003) modifies the update script to avoid an "AVArray" error and modifies the calculation script to ignore null points.

The 1.2a revision (March 11, 2004) modifies the calculation script to ignore null weight values, and produces a report notifying you if any null points or weight values were encountered.

Recommended Citation Format: For those who wish to cite this extension, the author recommends something similar to:

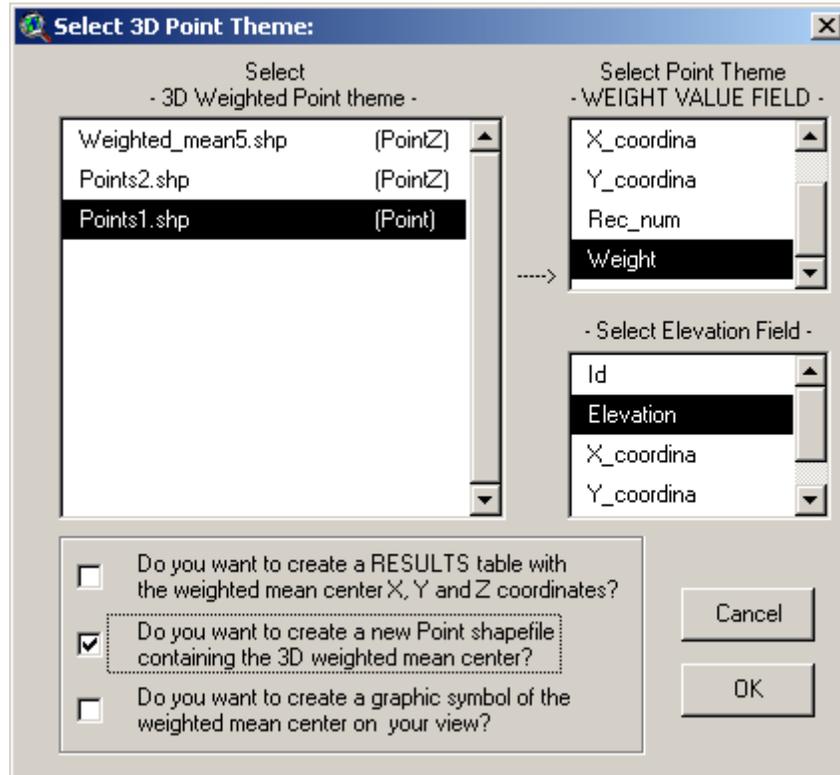
Jenness, J. 2004. 3d weighted mean of points (weightmean3d.avx) extension for ArcView 3.x, v. 1.2a. Jenness Enterprises. Available at:
http://www.jennessent.com/arcview/3d_weighted_mean.htm.

Please let me know if you cite this extension in a publication (jeffj@jennessent.com). I will update the citation list to include any publications that I am told about.



General Instructions:

- 1) Begin by placing the "weightmean3d.avx" file into the ArcView extensions directory (../Av_gis30/Arcview/ext32/).
- 2) After starting ArcView, load the extension by clicking on **File --> Extensions...** , scrolling down through the list of available extensions, and then clicking on the checkbox next to the extension called "3D Weighted Mean of Points." It will probably be near the bottom of the list, since these extensions are generally sorted according to the alphabetical order of the filename ("weightmean3d.avx").
- 3) Decide which point theme contains the points you're interested in, and if you want to run this extension on all those points or just a subset of them. If you want to find the weighted mean center of a subset of the points, then start by selecting those points you're interested in. If any points are selected, then this extension will operate on only those selected points.
- 4) From your View toolbar, click on the  icon. This brings up the **Select 3D Point Theme** dialog box:

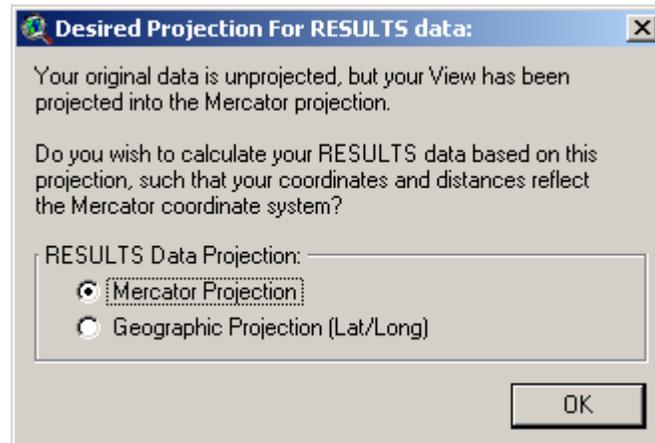


The **3D Weighted Point Theme** list contains all the *Point* and *PointZ* themes from your view. When you select the one you want, then the **Weight Value Field** list will fill up with all the numeric fields from that point theme. Select the field that contains the numeric weights of each point. If you select a *Point* theme, then you will also be prompted to choose the field containing elevation values.

Next, select the output you want. Your weighted mean center can be represented with a RESULTS table, a new *Point* or *PointZ* Shapefile and/or a graphic symbol. Both the RESULTS table and the Shapefile Point Attribute Table will contain a single record containing the name of

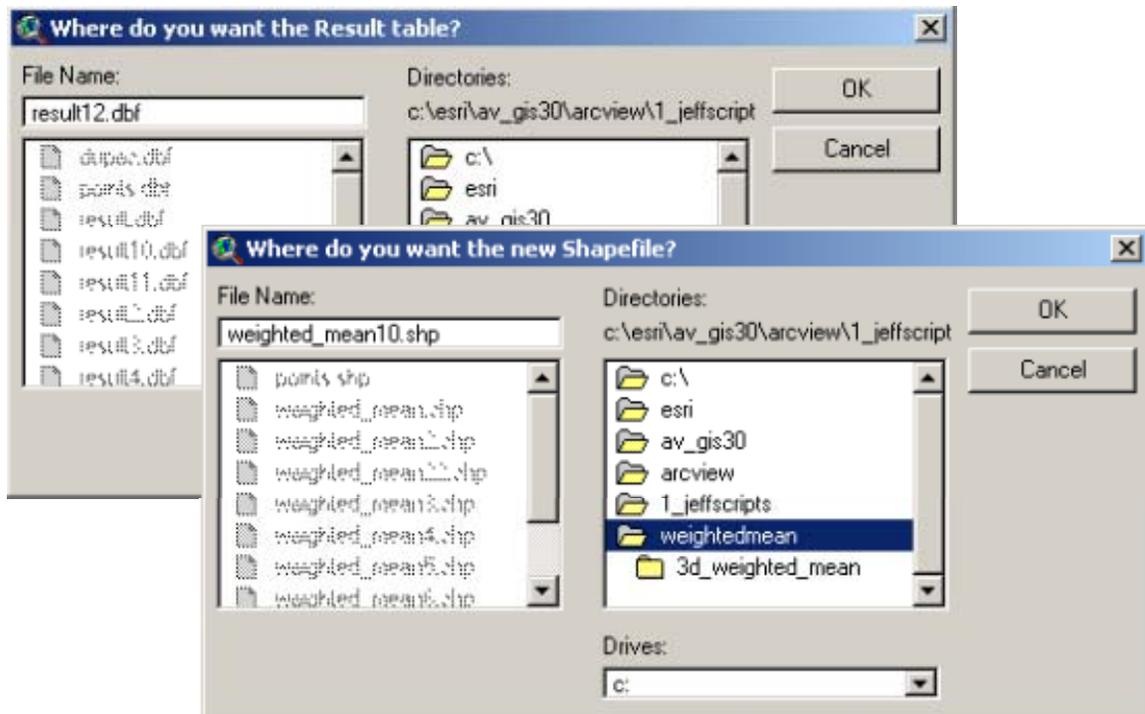
the Weighting Field, the number of records used in the analysis, and the X, Y, and Z coordinates of the weighted mean center.

5) Select Projection of RESULTS data: This option only applies if your original data are in Latitude/Longitude coordinates (i.e. the "Geographic" or "Unprojected" projection) and your View is set to some user-specified projection. In this case you have the option of calculating the nearest features based on either your View projection or on the original Geographic projection.



This choice can have a dramatic effect on the calculated weighted mean center of your points. Coordinates measured in "degrees" become especially problematic the farther you get from the equator, since longitudinal degrees are not the same as latitudinal degrees. A degree in longitude is always longer than a degree in latitude, so the east/west distances between your points are artificially weighted more than the north/south distances. The author recommends that you calculate your RESULTS data based on your View Projection rather than the Geographic projection, unless you have some specific reason to need the results to be based on latitude and longitude coordinates.

6) Specify Hard Drive Locations to save the RESULTS table and/or the new Shapefile: If you choose to calculate either a RESULTS table or a new Shapefile, you will be prompted to specify a location on the hard drive to save the information. These are standard ArcView Dialog Boxes and should be familiar to most users. These files are permanent and will not be deleted when ArcView is shut down.



Enjoy! Please contact the author if you have problems or find bugs.

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Updates to this extension and an on-line version of this manual are available at

http://www.jennessent.com/arcview/3d_weighted_mean.htm

Please visit *Jenness Enterprises* [ArcView Extensions](http://www.jennessent.com/arcview/3d_weighted_mean.htm) site for more ArcView Extensions and other software by the author. We also offer customized ArcView-based [GIS consultation](#) services to help you meet your specific data analysis and application development needs.

