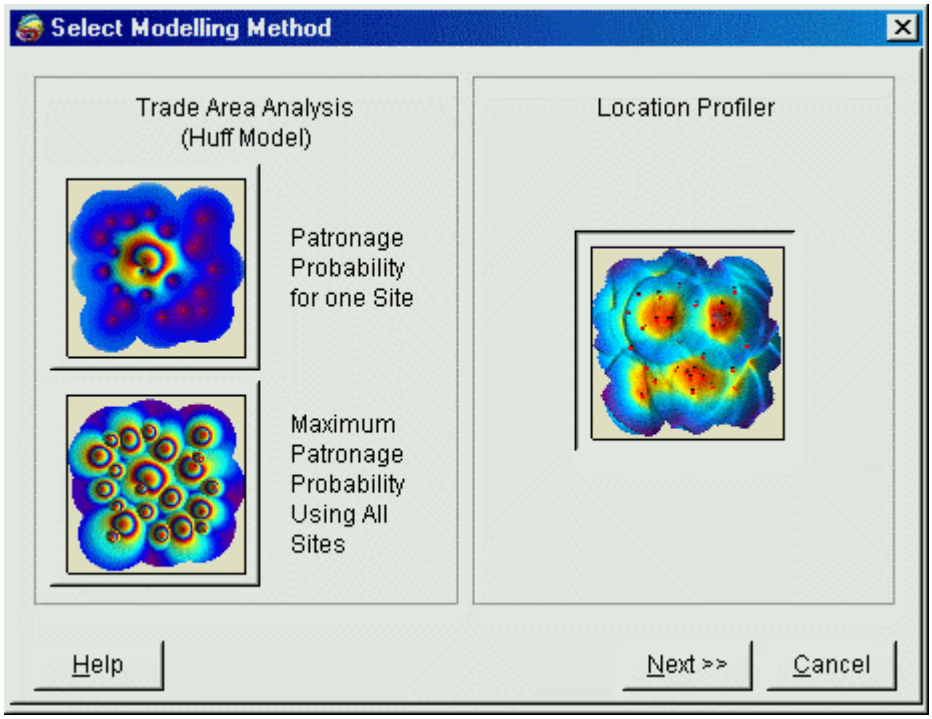
Using The Location Profiler

In its simplest definition, the *Location Profiler* is a modeling tool that computes and averages the distance to a series of points from anywhere within a map area. The algorithm generates a grid, where at each cell, a value is calculated that represents the average distance to all point locations surrounding that cell and lying within a defined search radius. By identifying those locations on the map that are the shortest average distance to all or some of the points, the grid file can be used to represent geographic centre(s) of activity. The model can be further refined to take into account weighting factors that specify the relative influence of each site compared with those surrounding it.

The Select Modeling Method Dialogue

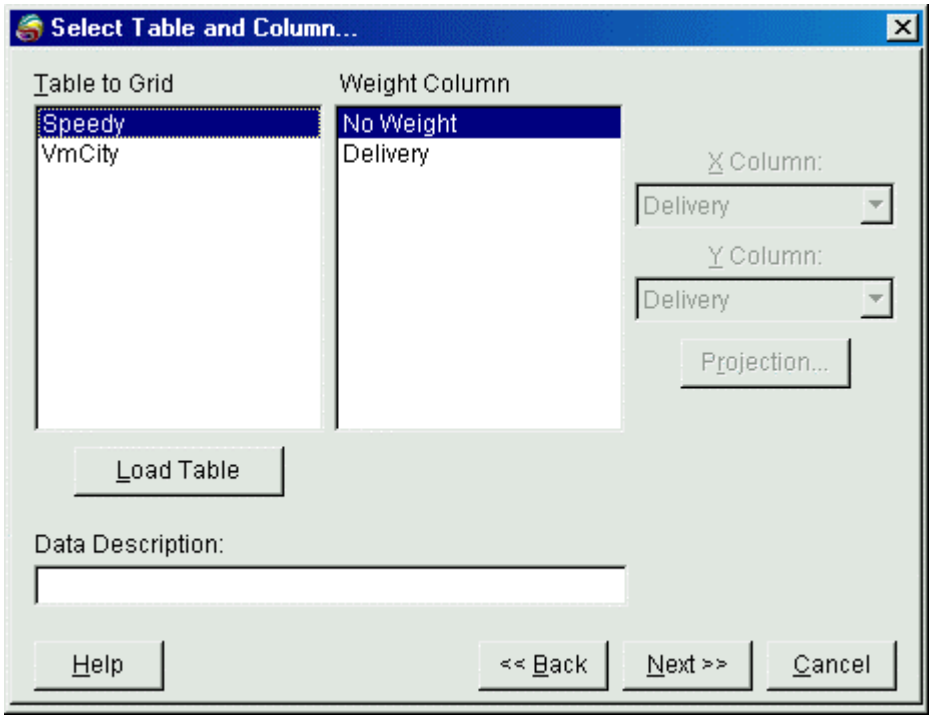


Creating grids using modeling in *Vertical Mapper* involves the use of a modeling Wizard that streamlines the process and makes the dialogues easier to use. The Wizard is initiated from the main *Vertical Mapper* pull-down menu using the *Vertical Mapper* > *Create Grid* > *Modeling* command.

- From the ***Select Modeling Method*** dialogue, choose the *Location Profiler* button.
- Selecting the ***Next*** >> button brings the user to the *Select Table and Column* dialogue box.

The Select Table and Column Dialogue

The ***Select Table and Column*** dialogue box is used to identify the MapInfo table and data column that contains the information to be processed. In addition, the user is requested to enter descriptive information to identify the grid file that is included as part of the meta data string.

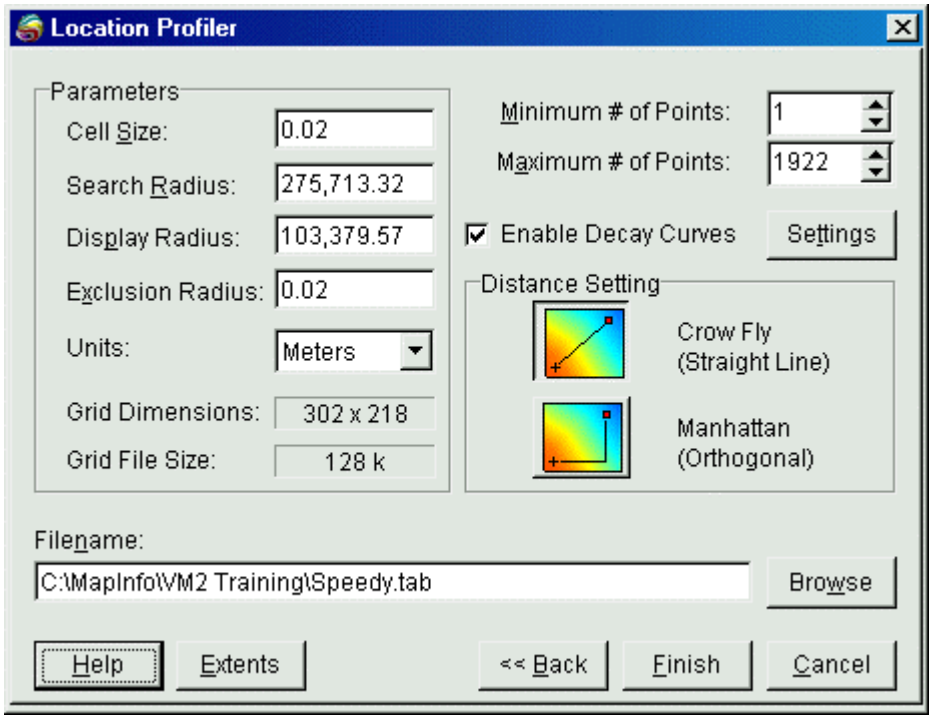


1. From the ***Table to Grid*** list, choose the appropriate MapInfo table of points that contains the geographic location of the each point. From the ***Weight Column*** list, choose the column that contains the weighting value for each site record. If no weighting value has been assigned to the point records, choose the ***No Weight*** entry from the list. Remember, weighting factors are values that specify the relative influence of each site compared with those surrounding it.
2. There is also an option to use an unmapped MapInfo data file (an X,Y,Z file) that has not been converted to a vector point table using the *Create Points* command in MapInfo. Here, the user may choose columns containing the X and Y coordinates for each point as well as the coordinate system (Projection) of the location data. This is useful for data files containing an excessively large number of records (in the millions) where it would add considerably to the processing time to first create vector points in MapInfo. This feature extracts the X and Y location information for the data directly from the column entry for use in the interpolation calculations.
3. Use the ***Data Description*** field to type an annotation up to 31 characters that is carried as a header in the grid file.

- Once this dialogue has been completed, choose the ***Next*** >> button to open the ***Huff Model*** dialogue box or choose << ***Back*** to return to one or more dialogues back.

#The Location Profiler Dialogue

Once the points and their appropriate weighting values have been exported to a temporary file, the ***Location Profiler*** dialogue box appears. This dialogue summarizes information relating to the point table and allows a number of user-defined parameters to be set in the *Location Profiler* algorithm.



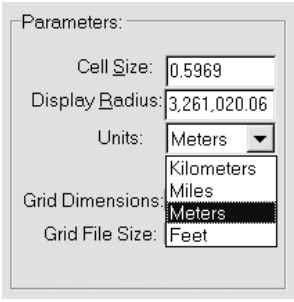
- The ***Parameters*** section of the dialogue allows a number of settings to be made that determine the manner in which the location grid is created.

    1 ***Cell Size*** is defined in the native coordinate system units of the table. Note that the grid dimension (in cell units) varies inversely with cell size: the smaller the cell, the larger the grid file. The value chosen should be a compromise between the degree of resolution required for analysis and visualization purposes and the processing time and file size. As a guide, the ***Grid Dimensions*** (in cell width and height) and ***Grid File Size*** (in kilobytes) values are shown in the dialogue and are updated as *Cell Size* is adjusted.

    2 ***Search Radius*** defines the maximum size, in radius units, of a circular zone centred around each grid node that is used to select point locations. For each point location lying within this search zone, the distance between the grid cell (the centre of the zone) and the point is measured. By default, the search radius is set to select all of points in the point table. If the point table is large, reduce the number of grid calculations by increasing the cell size. Otherwise, decrease the search radius.

    3 ***Display Radius*** defines the size, in radius units, of a circular zone centred around each grid node within which a point must lie in order for that grid cell to be assigned a value and be displayed. This setting is used to control the extent of grid creation in areas of the map that do not contain data, such as the outer margin of the map area.

    4 The ***Units*** field refers to the unit of horizontal distance measurement used in the model calculation (cell size, search radius, display radius). If the point table is set to a Latitude/Longitude coordinate system, then *Units* can be can be set to kilometres, miles, metres, or feet as selected from a drop-down list.



However, all distance calculations when applied to the model will automatically be converted to arc lengths corrected for earth curvature (oblate spheroid model). If the table is mapped to a defined projection in MapInfo, then the *Units* field defaults to the distance unit set in MapInfo's projection file (Pythagorean distance) and can be changed only by re-projecting the file to a new coordinate system and saving to a new file.

1 ***Max. # of Points*** sets an upper limit on the number of point locations measured from each grid cell. Used in combination with the search radius setting, the model will stop searching for point locations once either setting has been maximized. The default setting is the total number of points found in the table.

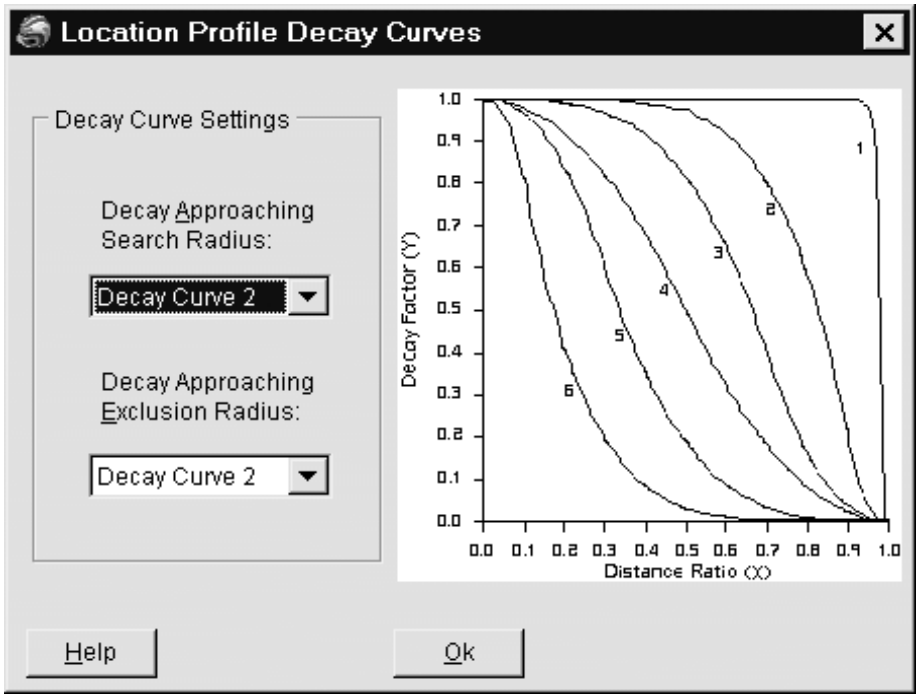
2 ***Min. # of Points*** sets a lower limit on the number of point locations that must be found from each cell before a calculation is made. The default value is 1.

3 The ***Distance Setting*** defines the manner in which distances are measured, in map units, between each grid cell and the point locations. One of two techniques can be set in the model.

1 ***Manhattan (Orthogonal)***  measures the distance between the grid cell and the point location using the X and Y difference between the two sites, i.e.,it combines the total X-axis and Y-axis distance that must be covered to reach a destination. For Latitude/Longitude data the distance is measured first traveling north/south then east/west. This option is provided to approximate distances when traveling on road networks which are oriented in a square grid pattern.

2 ***Crow Fly (Straight Line)***  measures the distance between the grid cell and the point using a straight line path.

- The ***Enable Decay Curves*** check box, when enabled, provides access to a another dialogue that is used to control the application of decay functions to the weighting values attached to each point location. Note that, if no weighting column was selected in the previous dialogue, the ***Enable Decay Curves Settings*** button is disabled.



1 If a weighting column has been identified, the user may choose to disable the decay functions using the check box. Distance decay should be applied only when it is assumed that data points lying close to the grid cell are more relevant than those lying farther from the grid cell. In other words, as the distance from the grid node to the data points approaches the search radius, the relative contribution of these points to the distance averaging calculation should approach zero. A decay value of 1 (100 percent contribution) is defined for data points close to the grid node, falling to zero (0 percent contribution) for data points at a distance right at the search radius from the grid node. Decay functions can also be applied to the exclusion zone. Using the same model, the decay value is 0 for points at the grid node (0 percent contribution) and increases to 1 for data points at a distance close to that of the exclusion radius (100 percent contribution).

1 ***Decay Approaching Search Radius*** is calculated using one of the supported curves in the drop-down list. Each decay function defines a smooth curve with negative slope that always starts at coordinate (0,1) with a slope of zero and always ends at coordinate (1,0) with a slope of zero. The coordinates of the inflection point (where the slope of the curve either stops increasing in value or stops decreasing in value) and the slope at this point is recorded for each function.

a) ***Decay Curve 1*** defined by an inflection point at (.99,.01) having a slope of -99.
b) ***Decay Curve 2*** defined by an inflection point at (.9,.2) having a slope of -5.
c) ***Decay Curve 3*** defined by an inflection point at (.7,.4) having a slope of -3.
d) ***Decay Curve 4*** defined by an inflection point at (.5,.5) having a slope of -2.
e) ***Decay Curve 5*** defined by an inflection point at (.3,.6) having a slope of -3.
f) ***Decay Curve 6*** defined by an inflection point at (.1,.8) having a slope of -5.

1 ***Decay Approaching Exclusion Radius*** is calculated using one of the supported curves in the drop-down list. Each decay function defines a smooth curve with a positive slope that always starts at coordinate (1,0) with a slope of zero and always ends at coordinate (1,1) with a slope of zero. The coordinates of the inflection point and the slope of the curve at this point are recorded for each function.

a) ***Decay Curve 1*** defined by an inflection point at (.01,.01) having a slope of 99.
b) ***Decay Curve 2*** defined by an inflection point at (.05,.4) having a slope of 20.
c) ***Decay Curve 3*** defined by an inflection point at (.05,.1) having a slope of 10.
d) ***Decay Curve 4*** defined by an inflection point at (.1,.2) having a slope of 5.
e) ***Decay Curve 5*** defined by an inflection point at (.3,.4) having a slope of 3.
f) ***Decay Curve 6*** defined by an inflection point at (.5,.5) having a slope of 2.

- The user is prompted to enter a file name for the new grid in the ***Filename*** area.

1 The ***Extents*** button opens an information box that summarizes the geographic size and the Z-value range of the point database as well as recording the data units.

- The user may either select the ***Finish*** button to complete the gridding process or, if modifications to the previous dialogue are required, the **<< *Back*** button to return to one or more dialogues back.

- Once the grid is created, it appears in a MapInfo Map window with a default colour palette applied. The user may change the colour range assigned to the grid file using commands discussed in Chapter 7.