# Using the Trade Area Modeler

In *Vertical Mapper*, trade area analysis is accomplished using a spatial interaction model, the Huff Model, that determines the probability of an individual patronizing a particular retail site based upon such criteria as the attractiveness of the store and the distance one must travel to get to the store. When *Vertical Mapper* generates a grid, the location of each grid node is considered to be the location of a potential customer. The calculation involves estimating the probability that a customer at that site (grid node) will patronize a particular store.

The Select Modeling Method Dialogue

Creating grid files 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.
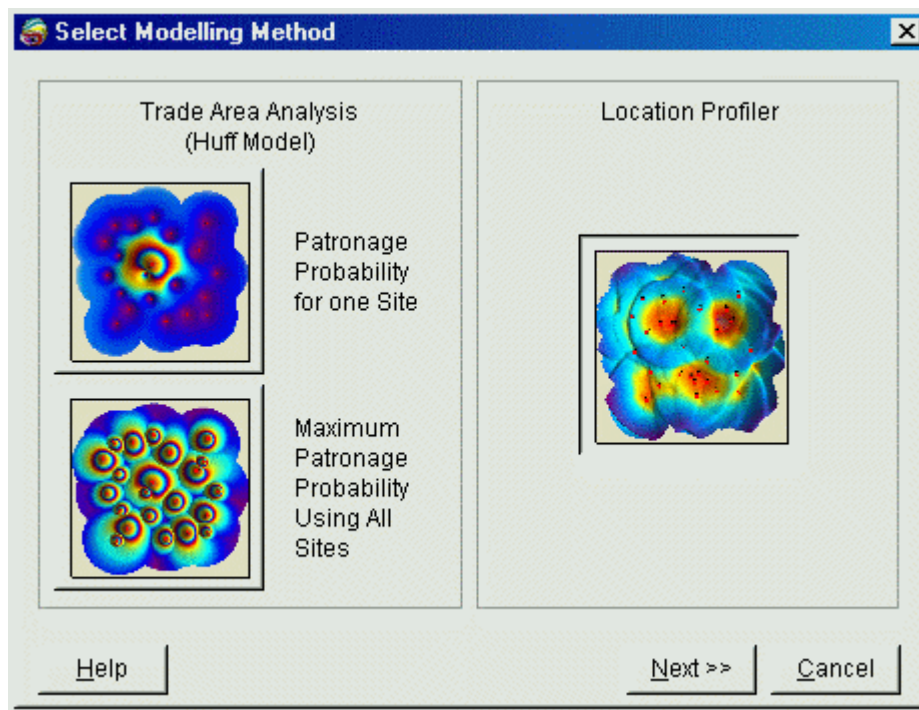
- From the **Select Modeling Method** dialogue and the **Trade Area Analysis (Huff Model)** section, choose one of two methods of calculating trade area probability. The graphical icon associated with each method is designed to illustrate the manner in which each technique deals with the point data to create a grid of probability values. Here, the user can generate a probability grid for a single store or, in one pass, compute the patronage probability values for every store in the database and extract the maximum probability value at each grid location.

In selecting the **Patronage Probability For One Site** option, the modeling parameters, while accounting for the influence of stores surrounding the target site on the overall trend, are based on the simple relationship that patronage probability decreases as distance from the store increases.
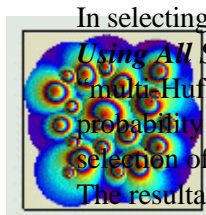
In selecting the ***Maximum Patronage Probability Using All Sites*** option, also known as the "multi-Huff", a grid is created of the maximum probability that a customer, when presented with a selection of stores, will patronize any one of them. The resultant grid of maximum probability values effectively identifies areas where people are least serviced thereby allowing the user to identify new store locations. It also effectively identifies areas where there is great competition for customer business and detects retail sites that may be negatively affecting the revenue potential of adjacent locations.

- Selecting the ***Next>>*** button after selecting the desired Huff modeling method 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.
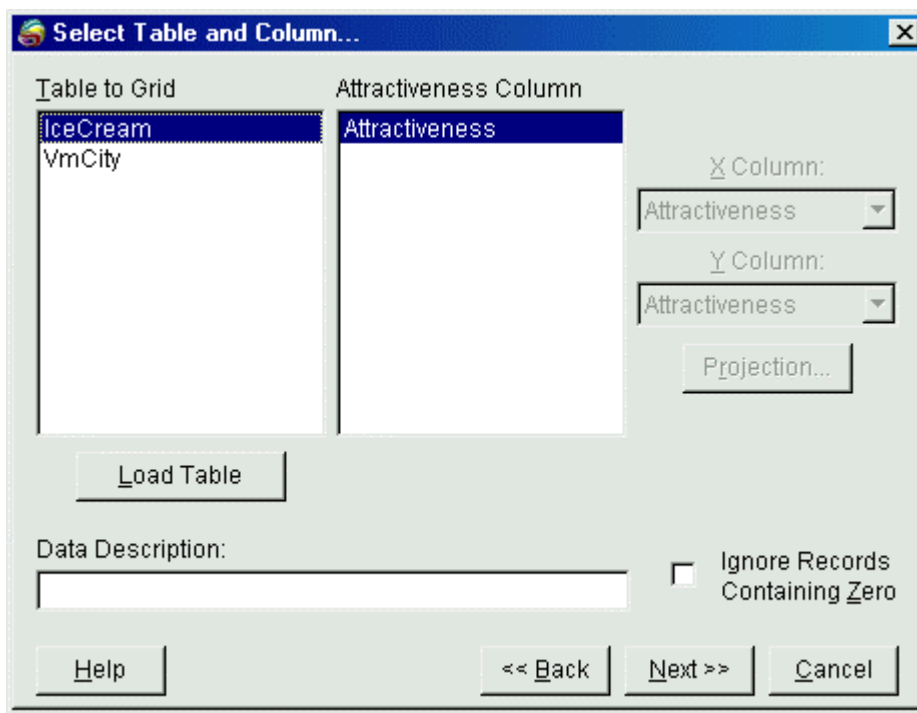

1. From the ***Table to Grid*** list, choose the appropriate MapInfo table of points that contains the geographic location of the each store/site. From the ***Attractiveness Column*** list, choose the column that contains the attractiveness value for each site record. Remember, store/site attractiveness is a relative number that can be defined by parameters such as total floor space

or shelf space, number of parking spaces, age of the store, or any combination of elements which defines the appeal of an individual retail site.

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. Check *Ignore Records Containing Zero* to include only non-zero records.

- 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.

#TheHuff Model Dialogue

The *Huff Model* summarizes information relating to the site table and allows a number of user-defined parameters to be set in the algorithm that controls the creation of the Trade Area Analysis grid.
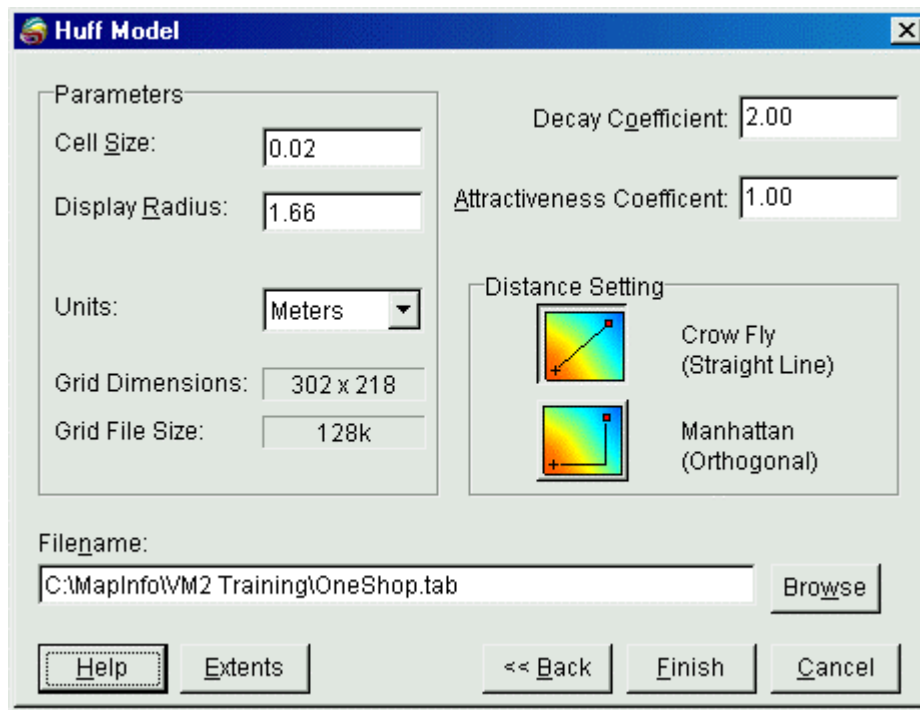
- The *Parameters* section of the dialogue allows a number of settings to be made that determine the

manner in which the probability grid is created.

1   *Cell Size* is defined in the native coordinate system units of the map. 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   *Display Radius* indicates the radius around each store or site within which probability values will be calculated. The default display radius is set to equal 50 percent of the maximum diagonal extent of the entire data set.

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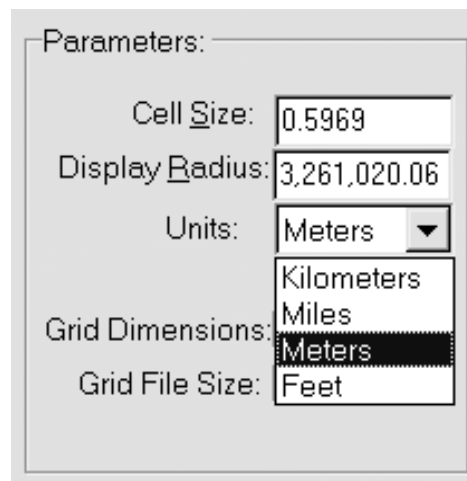

However, all distance calculations when applied to the model will automatically be converted to arc lengths corrected for earth curvature (oblate spheroid model). If the table is mapped to a defined projection in MapInfo, then the *Units* field defaults to the distance unit set in MapInfo's projection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

1   The *Decay Coefficient* is an exponent that models the rate of decay in drawing power of the sites as potential customers are placed farther and farther away from the site. Increasing the exponent will decrease the relative influence of the site on more distant customers. An optimal setting is 2.

1   The *Attractiveness Coefficient* is an exponent to which the Store Attractiveness value is raised to allow the user to account for non-linear behavior of the attractiveness variable. The default value is 1 which assumes linear behavior.

2   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 that 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.

Tip: If you are solving a data set that spans a large distance, ie., province, state, country, then it is wise to convert to Latitude/Longitude coordinates if your data is not already in this form. If you are working at the city level there are two points to consider. There will be minimal error in the distance calculations if your data is in a projected map form and lies close to the central meridian or standard parallels of the projection. You should convert your data to Latitude/Longitude coordinates if the data is centred a long way from the meridian or parallels of the projection.

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

1   The << *Back Data Extents* button opens an information box that summarizes both the geographic size and the attractiveness value range of the site data base 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, select << *Back* to return to one or more dialogues back.

Note: If running the *Patronage Probability For One Site* option of the *Trade Area Analysis* model, upon selecting *Finish*, the function will direct you to *Use the Pick Tool to Select One Site*.

The tool from the *Vertical Mapper* ButtonPad is then automatically enabled,

changing in appearance to a colour icon that allows you to select the site from the open MapInfo table of site location before proceeding with the grid processing.