Session 7A: Optimizing Telecommunications Data Object Processing in MapInfo Professional & MapBasic

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- Company: Pitney Bowes
Objective

- Learn tips and tricks to optimize the processing of telecommunications data for display and analysis.

- Find out about object processing improvements planned for MapInfo Professional and MapBasic, and how those improvements will extend your capabilities.
Tips and Tricks Agenda

- Cleaning, splitting, combining, disaggregating and thinning of coverage areas for area overlap and proportion overlap calculations
Tips and Tricks Agenda

• Creating and altering objects for cell sector generation
Tips and Tricks Agenda

- Buffering coverage areas with a negative width for service prequalification and network planning
Area Overlap and Proportion Overlap calculations

- **Objective**
  - Calculate the area and/or percentage of one object that is covered by another object.

- **Example**
  - What is the area and proportion of each zip code that is covered by wireless coverage.

- **Solution**
  - Use MapBasic AreaOverlap & ProportionOverlap functions

- **Issue**
  - AreaOverlap and ProportionOverlap functions do not perform well on large complex region objects
Alternative for Area Overlap and Proportion Overlap

1) Split a copy of one set of region objects (e.g. coverage areas) by the overlapping set of region objects (e.g. zip codes) using the Split function

- MapBasic Code Example
  
  \[sCmd = \text{"Objects Split Into Target Data Market=Market "}\]

  Run Command sCmd
Alternative for Area Overlap and Proportion Overlap

2) Calculate the areas of the split region objects (e.g. coverage areas) and the overlapping set of region objects (e.g. zip codes) using a SQL Update statement and Area function

- MapBasic Code Example continued

  Update gsNewCovTabName set CovBoundaryArea = Area(obj, "sq mi")
3) Join the overlapping set of region objects (e.g. zip codes) and split region objects (e.g. coverage areas) tables where the overlapping set of region objects contain the split region objects

- MapBasic Code Example continued
  - SELECT ZipCodes.ZIP, ZipCodes.Name, ZipCodes.St, ZipCodes.MIPct, ZipCodes.BoundaryArea, gsNewCovTabName.CovBoundaryArea FROM ZipCodes, gsNewCovTabName WHERE ZipCodes.obj Contains gsNewCovTabName.obj INTO tmpResults
Alternative for Area Overlap and Proportion Overlap

4) Divide the area of all the split region objects (e.g. coverage areas) by the other region object (e.g. zip code) areas that they are located within using the Update Column function.

- MapBasic Code Example continued
  ```mapbasic
  Update tmpResults set
  MIPct=Round(CovBoundaryArea/BoundaryArea* 100, 0.01)
  ```
Alternative for Area Overlap and Proportion Overlap

5) Aggregate the percentage overlap value for each zip code record using a SQL Query.

- MapBasic Code Example continued
  
  SELECT Sum(MIPct), ZIP, Name, St, St_FIPS, BoundaryArea, CovBoundaryArea FROM tmpResults GROUP BY ZIP ORDER BY ZIP INTO tmpResults2
Alternative for Area Overlap and Proportion Overlap

- Issue: Invalid object processing errors
  - An almost collinear triangle with 3 points that is less 1/2 meter in length in a wireless coverage table that overlaps a corner of a zip code.
  - Splitting this object with the zip codes results in an invalid polygon causing the following error.
Alternative for Area Overlap and Proportion Overlap

- Disaggregate region objects that are too complex using the Disaggregate function.

- Remove potential problem polygons of a very small area (e.g. 0.01 sq mi) using the Objects Snap function.

- MapBasic Code Example
  - Objects Disaggregate Into Table gsNewCovTabName
  - Objects Snap From Selection Cull Area 0.01 Units "sq mi"
Alternative for Area Overlap and Proportion Overlap

- Clean coverage by removing self intersections, overlapping polygons, and spikes using Check Region objects and Clean object functions

- MapBasic Code Example

  Objects Clean From Selection Overlap
MapBasic Utility to Transform and Optimize Wireless Coverage Data
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Cell Sector Generation

• Based on latitude, longitude, azimuth, antenna_BW and radius values for each cell site.
• Thematically map quality of service by cell sector
Cell Sector Generation

- MapBasic Code example

\[
\begin{align*}
AZ & = 90 - \text{Azimuth} \\
\text{Ang1} & = AZ-\text{BeamWidth}/2 \\
\text{Ang2} & = AZ+\text{BeamWidth}/2
\end{align*}
\]

Create Pline Into Variable Wedge 1 (Longitude, Latitude)

For Angle = Ang1 to Ang2

Alter Object Wedge Node Add

(Longitude+cos(Angle*\pi/180)*radius, Latitude+sin(Angle*\pi/180)*radius*.8)

Next

CreateSector = ConvertToRegion(Wedge)
Buffering is used for many different purposes to help solve Communications business problems, such as:

- Determine if a dig is within proximity of harm, in “Call-before-you-dig” applications, where dig requests are interactively geocoded, and a spatial query determines if the geocoded location is within a buffer generated around the OSP.

- Search for existing or potential customers that are within a specified buffer/build out distance (e.g. 500 ft) around OSP network or around a specified location (e.g. address) to determine which customers can be considered “on net” for targeted marketing, dynamic prospecting, pre-qualification and planning for future expansion.
Buffering Coverage Areas with a Negative Width for Service Prequalification and Network Planning

- Buffering Coverage areas with a negative buffer width (e.g. - 500 ft) creates a smaller coverage area inside the original area.
- Buffering Coverage areas with a negative buffer width is used for:
  - Improving the reliability of a search-at-point boundary assignment to a interpolated geocoded address for Service Prequalification and Network Planning purposes.
  - Finding all boundary areas that overlap a specified boundary area but do not just share a border with it for determining which Public Safety Answering Point (PSAP) boundaries fall within a planned coverage areas, such as a county, for E911 planning.
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- MapBasic code example

  - Find the PSAP that the specified address location resides in
    
    cmdstring = "Select US_PsapBndy.Agency,
    US_PsapBndy.Mail_addr, US_PsapBndy.Strt_addr,
    GeoAddress where US_PsapBndy.Obj Contains GeoAddress.Obj into PSAP"
    run command cmdstring

  - Proceed if the address resides in a PSAP
    
    If TableInfo("PSAP",TAB_INFO_NROWS) > 0 Then

  - Get the PSAP agency name
    
    strPSAP = PSAP.Agency
Buffering Coverage Areas with a Negative Width for Service Prequalification and Network Planning

- MapBasic code example continued
  
  - Create a buffer of the specified width within the selected PSAP boundary
    **Create Object As Buffer From Selection Width -500 Units "ft" Type Spherical Resolution 100 Into Table PSAPbuffer Group by Rowid**

  - Check if the address location resides in the buffered PSAP area
    cmdstring = "Select PSAPbuffer.ID from PSAPbuffer, GeoAddress where PSAPbuffer.Obj Contains GeoAddress.Obj into Temp"
    run command cmdstring

  - Display a message to show the whether the address location resides in the buffered PSAP area and PSAP agency name
    If TableInfo("Temp",TAB_INFO_NROWS) > 0 Then
      strBuffer = "Inside Buffer"
    Else
      strBuffer = "Outside Buffer"
    End If
    Note strBuffer + Chr$(10) + " PSAP Agency: " +strPSAP
Meeting Communication Market Needs for Object Processing and Grid Based Analysis

- Key PB MapInfo initiatives for meeting these needs are:
  - Rewriting low level object processing code to gain the following benefits:
    - Improved Performance
    - Better handling of spatial data imperfections
    - Ability to work with larger datasets
    - Deliver new Combine and Buffer operations by November 2008

- Commitment to Grid based data and analysis tools
  - In the process of upgrading Vertical Mapper
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