Temporal GISes of Changing Administrative Boundaries: European Comparisons

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The need for geography

• Many countries have been publishing census and similar statistics for two centuries or more
• Most of these datasets are geographical
• They are also temporal as they are published at regular intervals
• Traditionally:
  – Spatial detail is only available for individual snapshots
  – Temporal exploration grossly simplifies space
Temporal GIS

• Opens up huge potential for exploring, analysing and visualising data through all three components:
  – Attribute
  – Space
  – Time

• Problem: Temporal GIS only poorly developed
Spatio-temporal architecture

• Three approaches:
  – Key dates (Ireland, Prussia)
  – Date stamping (GBHGIS)
  – Space-time composite (Sweden, Belgium)
Key dates

• Simply digitise boundaries at important dates and link attribute data to them.
Date stamping
Date stamping (2)

Arc Attribute Table

<table>
<thead>
<tr>
<th>County1</th>
<th>County2</th>
<th>County Boundary</th>
<th>Start</th>
<th>End</th>
</tr>
</thead>
<tbody>
<tr>
<td>Herefordshire</td>
<td>N</td>
<td>Y</td>
<td>0/0/0000</td>
<td>0/0/5000</td>
</tr>
<tr>
<td>Worcestershire</td>
<td>Y</td>
<td>Y</td>
<td>0/0/0000</td>
<td>0/0/5000</td>
</tr>
<tr>
<td>Herefordshire</td>
<td>N</td>
<td></td>
<td>0/0/0000</td>
<td>25/12/1858</td>
</tr>
<tr>
<td>Herefordshire</td>
<td>N</td>
<td></td>
<td>25/12/1858</td>
<td>0/0/5000</td>
</tr>
</tbody>
</table>

Polygon Attribute Table

<table>
<thead>
<tr>
<th>Name</th>
<th>County</th>
<th>Start</th>
<th>End</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bromyard</td>
<td>Herefordshire</td>
<td>0/0/0</td>
<td>0/0/5000</td>
</tr>
<tr>
<td>Hereford</td>
<td>Herefordshire</td>
<td>0/0/0</td>
<td>0/0/5000</td>
</tr>
<tr>
<td>Ledbury</td>
<td>Herefordshire</td>
<td>0/0/0</td>
<td>0/0/5000</td>
</tr>
<tr>
<td>Leominster</td>
<td>Herefordshire</td>
<td>0/0/0</td>
<td>0/0/5000</td>
</tr>
<tr>
<td>Martley</td>
<td>Worcestershire</td>
<td>0/0/0</td>
<td>0/0/5000</td>
</tr>
<tr>
<td>Tenbury</td>
<td>Worcestershire</td>
<td>0/0/0</td>
<td>0/0/5000</td>
</tr>
</tbody>
</table>
Space-time composite

1. Leominster
2. Bromyard
3. Bromyard
4. Bromyard
5. Bromyard
6. Leominster
Infant mortality, 1890s
Infant mortality, 1890s (2)
Infant mortality, 1990s

Legend:
- Less than 2.95
- 2.95 to 3.59
- 3.60 to 4.20
- 4.21 to 5.02
- 5.03 and above

Circles size is proportional to total pop. size (1990)

Data cover the period 1990-92.
Conclusions

• There are three main approaches to building temporal GISes of changing administrative units
• The key dates approach is the simplest but provides a good starting point for either of the others
• Once built systems such as these open up massive new potential for understanding the past
• A version of this paper is forthcoming in Transactions in GIS