Geography 12: Maps and Spatial Reasoning

Lecture 8: Cartometry: Position and distance

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The map as a model

If the map model is geometrically faithful to the real world and accurate, then the map can serve as a model of the real world.

We can make measurements, navigation decisions, and analyze or interpret the landscape from maps, and assume the same conclusions apply to the real world.

Cartometry

- Making measurements from maps
- Measurements link to reality through map scale

What can we measure?

- The “Feature” model of maps
- The world contains:
  - Point features
  - Line features
  - Area features
- So the map contains:
  - Point symbols
  - Line symbols
  - Area symbols
  - Labels
The map legend

- In the feature model, the legend is the key or index that allows us to interpret symbols as features
- So common, the ESRI map fonts are included in Word Processors

The USGS topographic map symbols
POINT features e.g. Buildings

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Legend</th>
</tr>
</thead>
<tbody>
<tr>
<td>🏘️</td>
<td>Building</td>
</tr>
<tr>
<td>🏙️</td>
<td>School, house of worship</td>
</tr>
<tr>
<td>🏔️</td>
<td>Airport taxi</td>
</tr>
<tr>
<td>🏘️</td>
<td>Built-up area</td>
</tr>
<tr>
<td>🏕️</td>
<td>Forest headquarters</td>
</tr>
<tr>
<td>🏥️</td>
<td>Fire station/office</td>
</tr>
<tr>
<td>🏦️</td>
<td>Guard station or watch station</td>
</tr>
<tr>
<td>🏅️</td>
<td>Racetrack or raceway</td>
</tr>
<tr>
<td>🏅️</td>
<td>Airport, good landing strip</td>
</tr>
<tr>
<td>🏅️</td>
<td>Helipad, bad landing strip</td>
</tr>
<tr>
<td>🏅️</td>
<td>Well, irrigation well, water well, artesian well</td>
</tr>
<tr>
<td>🏅️</td>
<td>Tower</td>
</tr>
<tr>
<td>🏅️</td>
<td>Dam</td>
</tr>
<tr>
<td>🍑</td>
<td>Golf course</td>
</tr>
<tr>
<td>🏅️</td>
<td>Forest</td>
</tr>
<tr>
<td>🏅️</td>
<td>Cemetery</td>
</tr>
<tr>
<td>🏅️</td>
<td>Water in motion area</td>
</tr>
<tr>
<td>🏅️</td>
<td>Cannes</td>
</tr>
</tbody>
</table>

Nowhere, OK
550800mE 3890837mN 14S
Point Features

Human features
Cadastral features
Mines and caves
Projections and grids

Measures for points

- Position (coordinates)
- Two positions (distance, bearing)
- Sequence of coordinates (line length, number of points, distance(s), bearing(s))
- Set of points (list of coordinates, measures of central tendency, measures of variation)

Also, bearings from basic trig
This implies….

- Given two coordinate pairs:
  1. Can calculate distance between them
  2. Can compute the bearing between them

Measuring distance on the earth

<table>
<thead>
<tr>
<th>Number of minutes to cover 1 MILE</th>
<th>WALK</th>
<th>RUN</th>
</tr>
</thead>
<tbody>
<tr>
<td>WOMEN</td>
<td>15</td>
<td>10</td>
</tr>
<tr>
<td>CRICKET</td>
<td>25</td>
<td>13</td>
</tr>
<tr>
<td>CROSS COUNTRY</td>
<td>30</td>
<td>16</td>
</tr>
<tr>
<td>TRAIL</td>
<td>40</td>
<td>22</td>
</tr>
</tbody>
</table>

Longer distances
Even longer distances

Measuring on the map

Can also measure direction in the real world!

Direction
North using Polaris

Typical compasses

Bearings & the compass

Mirror compass
The military compass

Azimuths and quadrats: S77°E

Equivalents

Magnetic north is not true north

UTM GRID AND 1988 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET
Distance estimation from bearings

Known object size -> Distance. E.g. 1m object is 1 mil at 1km

Declination

Globally

Declination changes over time

1590
Declination (degrees east)
Summary

- The map model and cartometry
- Features have dimension: Point, Line, Area (and text)
- Dealt with point symbols on topo maps
- Can measure distance and direction from map, earth or by using coordinates
- Grid, true and magnetic north differ