Adapting Wind Map Principles to Visualizing Urban Transportation Networks

PROBLEM + MOTIVATION

- Urban transport networks are complex and constantly changing, and city planners are currently unable to visually understand how different transport mediums influence passenger usage and direction temporally.
- How can we extract principles from existing flow visualizations to create a flow visualization that represents usage of urban transportation networks?

APPROACH

- Adapt wind map features to create new encodings and principles for urban flow through transportation networks.
- Utilize principles and encodings commonly found in existing transportation network visualizations.

ENCODINGS + VISUALIZATION

Transportation Network Characteristics

- Travel path and bidirectionality (edges traveled and order traveled in)
- Path density (number of people traveling on given edge)
- Congestion (comparison of edge/node capacity + number of travelers)
- Travel time (speed at which people travel an edge)

Wind vs Transportation Visualization Encodings

<table>
<thead>
<tr>
<th>Vector Line Encodings</th>
<th>Wind Characteristics</th>
<th>Transportation Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direction</td>
<td>Angle (End of line disappears to background)</td>
<td>Capacity -- more red, more congested</td>
</tr>
<tr>
<td>Length</td>
<td>Spacing difference (bidirectionality)</td>
<td>More people travelling in that direction</td>
</tr>
<tr>
<td>Color</td>
<td>Darker line, greater strength</td>
<td>Density</td>
</tr>
<tr>
<td>Density</td>
<td>Denser = greater wind strength</td>
<td>Movement</td>
</tr>
<tr>
<td>Movement</td>
<td>Speed encodes wind strength</td>
<td></td>
</tr>
</tbody>
</table>

RESULTS

- Control allowed more specific data analysis since viewers had lower-level access to data, but experimental allowed more intuitive gauge of the overall higher-level flow.
- Experimental enables easier and quicker Interpretation transportation network characteristics (eg congestion) when the viewer needs to make spatial/geographical-related decisions.

FUTURE WORK

- Visualizing multiple transportation network on a single map
- Experimenting with different types of wind flow diagram encodings