Adapting Wind Flow Principles to Visualizing Movement within Public Urban Transportation Networks

Nicole Crawford, Paula Kusumaputri, Quentin Perrot
PROBLEM

Urban transport networks are complex and constantly changing. With each change, urban flow mutates. City planners are currently unable to visually understand how different transport mediums influence passenger usage and direction temporally.

SOLUTION

Adapt wind map features to create principles for urban flow through transportation networks. **Implement a proof of concept dynamic map** that represents usage of urban transportation networks via flow visualization. This will facilitate a city planner’s analysis of traveller flows across multiple transportation networks simultaneously.
PRIOR WORK 1 - Visualizing Flow
Representing Flow Patterns by Using Streamlines with Glyphs
PRIOR WORK 1 - Visualizing Flow
Representing Flow Patterns by Using Streamlines with Glyphs

Method: combine wind barb + streamlines to model wind patterns using different vector encodings

Design Goals: create coding enabling accurate wind speeds, make orientation + direction (along with wind speed) patterns clear, can see high/low wind speed areas at a glance
PRIOR WORK 2 - Visualizing Transportation

Bus Lines Explorer: Interactive Exploration of Public Transportation Data

Visual analytics for movement data

Interactive exploration and analysis of city buses movement data

Visual analysis of spatio-temporal urban data
HOW PROJECT IS DIFFERENT

Unmet Needs

City planners must currently interpret transport network flow through Excel files and static maps that lack a cross-transport-medium interpretation.

Cross-Domain Application

Wind flow visualization and its primary features of strength and direction, have yet to be adapted to transportation network visualizations.

From Static to Dynamic

Urban environments are inherently living and changing, and so the underlying city map should not be static (as most solutions are) but instead must mutate in response to flow across time.

Picturing the Urban Whole

Cross-transport-medium analyses are rare, but are important for city planning (i.e. allocation of resources to new transport means).
PROPOSED DESIGN (WIND FLOW MAP)
Modify and adapt design principles used in wind flow maps
PROPOSED DESIGN

Create dynamic map that represents usage of transportation networks.

- Display temporal, spacial, and usage information
- Iterate with a different focus each time:
  1. Flow
  2. Number of people/congestion
  3. Differentiate between modes of transportation
PROJECT PLAN

1. Extract principles from wind flow map
2. Adapt and create principles to transportation use case
3. Obtain transportation network dataset
4. Extract/analyze/process dataset (i.e. NYC bike data, subway data)
5. Build a static visualization prototype “wind map” for single transportation network
   a. Represent flow direction with movement, number of people with color
   b. Stations appear when traffic goes through them, disappear otherwise
6. Build an interactive/dynamic visualization prototype for single transportation network
   a. Speed up/slow down flow, enable click on stations, etc
   b. Evaluate designs with outside group
7. Build multi-mode / multiple transportation network dynamic visualization
   a. Apply principles to other modes of transportation
   b. Overlay onto bike map data
1. How should we differentiate between flow graph principles for multiple modes / multiple transportation networks?
2. How should we operationalize/visualize congestion for different modes of transportation?