AUTOMATED TABULAR ITINERARY VISUALIZATION
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Introduction

Goal: Generate itinerary layout to communicate stop locations, names, and connectivity.

Insight: Use curved edges with non-linear optimization
- Reduces overlaps (with other edges, stops, labels)
- Leaves space for text labels
- Use optimization to set curvature of quadratic Bézier edges

Approach

- Parameters for each stop/edge
  → d, θ control label placement
  → r controls edge curvature

- Objective function \( f_e(l) \): penalize layouts for violating readability or aesthetic goals
  1. Labels outside visible map area
  2. Edges overlapping non-incident stops
  3. Labels overlapping other labels
  4. Edges overlapping other edges
  5. Labels overlapping edges
  6. Labels overlapping stops
  7. Small angles between incident edges
  8. Deviation of edge curvature ratios from target
  9. Distance of labels from corresponding stops

Optimization by Simulated Annealing

Compute approximate solution to \( \text{argmin} f_e(l) \)

1. Generate initial layout with randomized parameter values
2. Tweak parameter values and compute objective function
3. All improvements accepted; regressions with probability \( p \)
4. Decrease \( p \) as process continues and for major regressions

Randomly Generated Itineraries

Itineraries

Data source: itineraries in spreadsheet or table format

<table>
<thead>
<tr>
<th>Day</th>
<th>Dest</th>
<th>Activities</th>
<th>Guides</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vienna</td>
<td>Hotel check-in</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vienna</td>
<td>City tour</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vienna</td>
<td>Transfer to Budapest</td>
<td>City tour</td>
<td></td>
</tr>
<tr>
<td>Budapest</td>
<td>City tour</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mohacs</td>
<td>Pecs excursion</td>
<td></td>
<td></td>
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<tr>
<td>Villany</td>
<td>Wine tasting</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Novi Sad</td>
<td>Walking tour</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Belgrade</td>
<td>City tour</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Iron Gates</td>
<td>Full day cruising</td>
<td></td>
<td></td>
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<tr>
<td>Vidin</td>
<td>Belogradchik excursion</td>
<td></td>
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<tr>
<td>Gargiu</td>
<td>Palace of Parliament</td>
<td></td>
<td></td>
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<tr>
<td>Rousse</td>
<td>Disembarkation</td>
<td></td>
<td></td>
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<tr>
<td>Plovdiv</td>
<td>Walking tour</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Novi Sad</td>
<td>Lunch stop</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Istanbul</td>
<td>Tour Topkapi Palace</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Ordered sets of stops along travel routes
- Geotagger associates lat/lon values with stops

Different from map layouts of GPS routes and trajectories
- GPS route maps: precise paths between turns
- Trajectory maps: precise geographic locations
- Itinerary maps: locations, names, and connectivity of stops, don’t need geographic precision for edges

Resulting Layouts

Curved edges and stop labels (right) improve on default rendering with Google Maps (left)

Layout provides clear visualization of stop names and connectivity, even with dense map showing multiple itinerary options

References