

AUTOMATED TABULAR ITINERARY VISUALIZATION

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Introduction

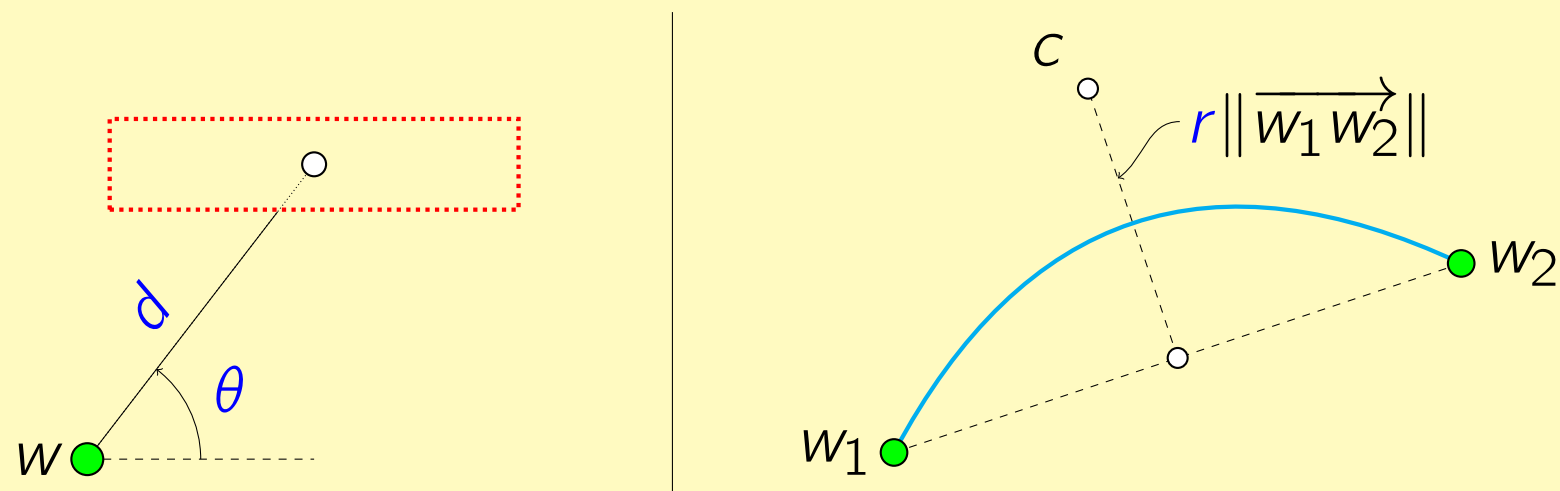
Goal: Generate itinerary layout to communicate stop locations, names, and connectivity.

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



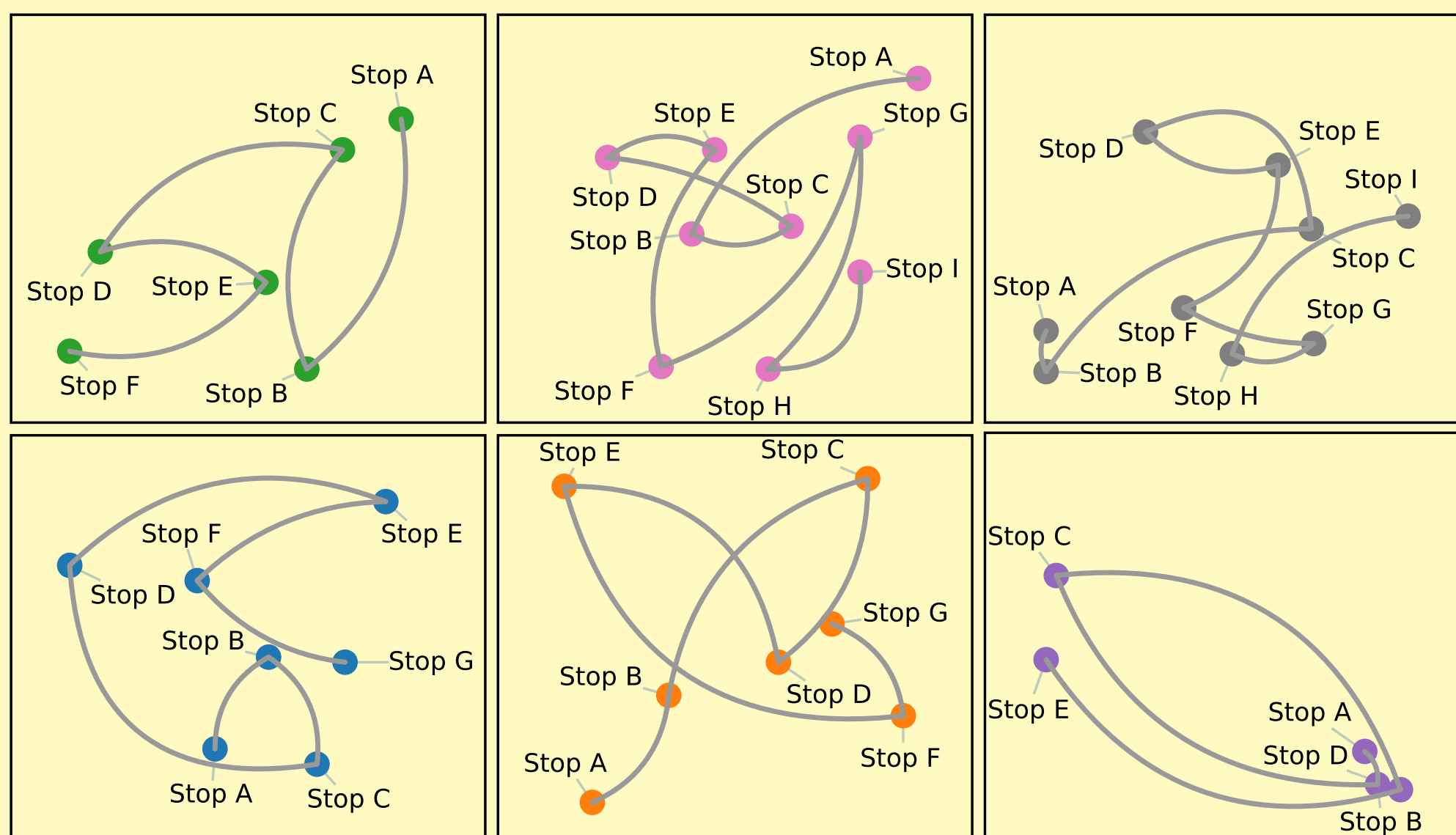
- Objective function $f_e(l)$: penalize layouts for violating readability or aesthetic goals
 1. **Labels** outside visible map area
 2. **Edges** overlapping non-incident **stops**
 3. **Labels** overlapping other **labels**
 4. **Edges** overlapping other **edges**
 5. **Labels** overlapping **edges**
 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 $\arg\min_l f_e(l)$

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

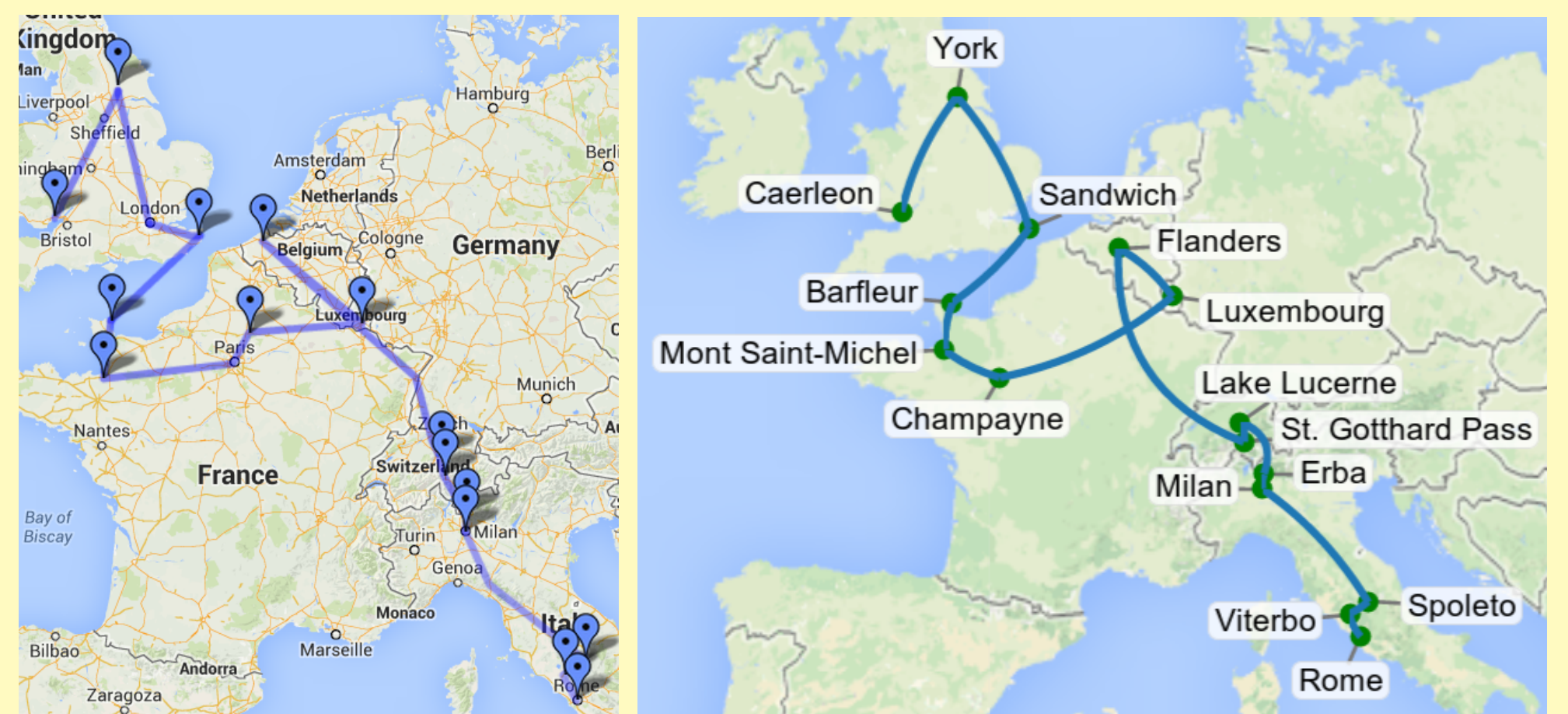
Eastern Europe Vacation and Cruise			
Day	Dest	Activities	Guides
1	Vienna	Hotel check-in	...
2	Vienna	City tour	
3	Vienna	Transfer to Budapest	
	Budapest	City tour	
4	Mohacs	Pecs excursion	
	Villany	Wine tasting	
5	Vukovar	Yugoslav Civil War tour	
	Novi Sad	Walking tour	
6	Belgrade	City tour	
7	Iron Gates	Full day cruising	
8	Vidin	Belogradchik excursion	
9	Giurgiu	Palace of Parliament	
10	Rousse	Disembarkation	
	Plovdiv	Walking tour	
11	Erdine	Lunch stop	
12	Istanbul	Tour Topkapi Palace	

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

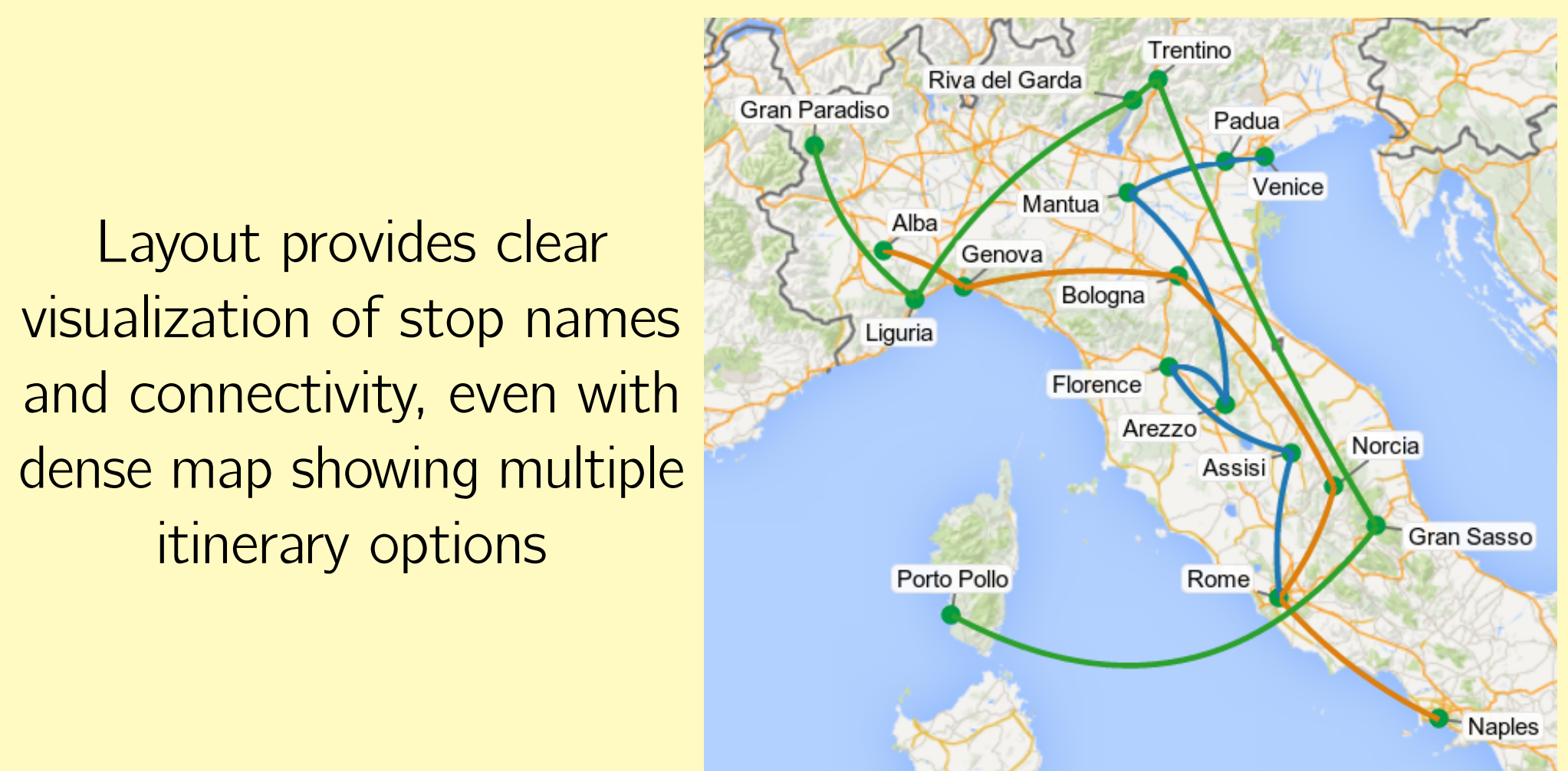
Different from map layouts of GPS routes and trajectories

- 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

- [1] M. D. Adelfio and H. Samet. Itinerary Recognition: Travelers, like Traveling Salesmen, Prefer Efficient Routes. In *GIR 2014*.
- [2] M. D. Adelfio and H. Samet. Automated Tabular Itinerary Visualization. In *ACM SIGSPATIAL GIS 2014*.