

Hup-Me

Inferring and Reconciling a Timeline of User Activity from Rich Smartphone Data

David Montoya

Serge Abiteboul

Pierre Senellart



System overview

■ Goal

- Infer the **Multimodal Itineraries** traveled by a user

■ Input

- Smartphone Data (GPS, GSM, Wi-Fi, Accelerometer, Bluetooth)
- Transportation Network + Transit Schedules (OpenStreetMap + GTFS)

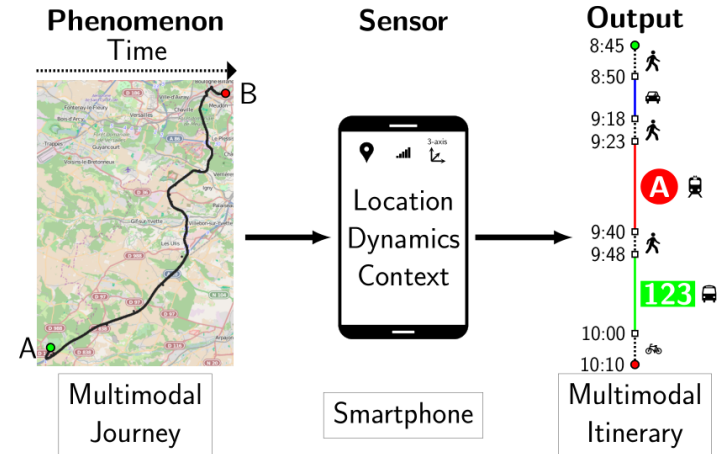
■ Output

- Multimodal Itinerary for modes: **foot, bike, car, bus, tram, metro and train**



■ Novelty

- Rich sensor data
- Exploits Transit Schedules
- Exploits missing data (lost GPS signal)



Transportation Network, Paris, France - CC-BY-SA Maximilian Dörrbecker, OpenStreetMap

Algorithm and Evaluation

■ Transportation Network

- OpenStreetMap aligned with Transit Schedules over the Paris region

■ Two-Phase Algorithm

1. “Multimodal map-matching” using a Particle Filter over a Dynamic Bayesian Network
2. Transit Line Recognition from Transit Schedules

■ Future Work

- Include Personal Data (e.g. calendar, mails) to predict the user’s itinerary

42.5 hours of annotated journeys from users in the Paris region

Confusion matrix by transportation mode

Predicted mode accuracy (%)

	foot	bike	car	bus	train	tram	Time (min)	
Actual mode	foot	87	8	1	1	2	1	1068
bike	2	98	0	0	0	0	69	
car	5	2	82	10	0	0	718	
bus	4	5	0	90	1	0	419	
train	12	0	2	3	83	0	149	
tram	15	3	6	1	0	75	129	
Precision	91	36	96	80	81	92	2552	

Transit Line recognition rates

	bus	train	tram
Accuracy (%)	95	78	99
Total Time (min)	381	127	98