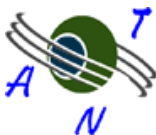


Data Preparation to Simulate Public Transport in Micro-Simulations using OSM and GTFS

Glenn Cich

Hasselt University - IMOB

24 May 2016



Overview

- 1 Introduction
- 2 OSM
- 3 GTFS
- 4 Candidates Locations GTFS Stops
- 5 Conclusion

Overview

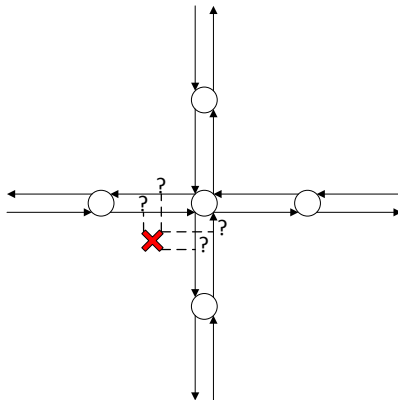
- 1 Introduction
- 2 OSM
- 3 GTFS
- 4 Candidates Locations GTFS Stops
- 5 Conclusion

Introduction: Problem Context

- 1 Open-source data available for simulations
 - Openstreetmap (OSM)
 - Network of links and nodes
 - General Transit Feed Specification
 - Public transit stops
 - Time tables
 - ...
- 2 Data (in many cases) not connected
 - Not known on which link a GTFS stop is connected

Introduction: Goal

- 1 Create algorithm
 - Assign each GTFS stop to a OSM link
 - Taking into account side of the road



Introduction: Problems

- 1 Assignment algorithm
 - Based on graph theory
 - Based on candidate positions for each GTFS stop (= Projected stops)
- 2 Combinatorial problem
- 3 High complexity
- 4 → **Reduce complexity of input data as much as possible**
- 5 → **Keep all valuable information**

Overview

1 Introduction

2 OSM

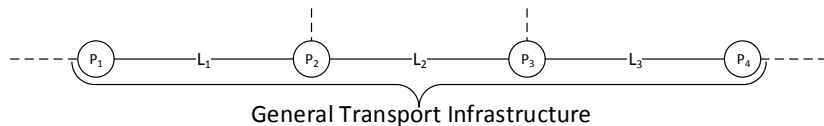
3 GTFS

4 Candidates Locations GTFS Stops

5 Conclusion

OSM: Terminology

- 1 GeneralPoint
- 2 GeneralLink
- 3 GeneralTransportInfrastructure
- 4 GeneralRoad



OSM: Cleaning

- 1 Reset incorrect individual values
 - total number of lanes > 0
- 2 Reset incorrect group values
 - total number of lanes = number of forward lanes + number of backward lanes
- 3 Auto complete GeneralRoads
 - total number of lanes = 4, number of backward lanes = 2 and number of forward lanes = UNDEFINED \rightarrow number of forward lanes = 2
- 4 Enrich GeneralRoads with rules
 - Application specific rules
 - e.g. Speed highways Belgium is 120 [km/h]
- 5 Remove GeneralLinks with zero length
 - Useless

OSM: Reduction

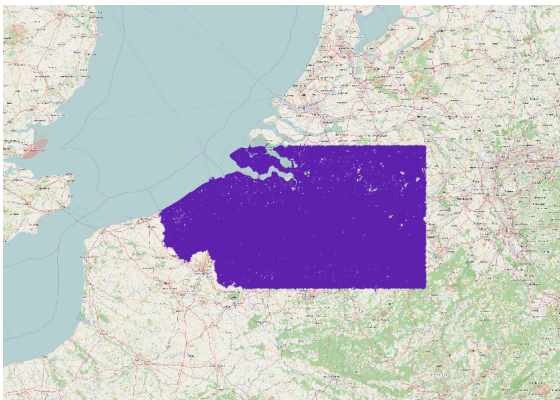
- 1 Remove redundant GeneralRoads
 - Specify list with types to keep
 - Specify list with types to drop
- 2 Change type of “unknown” GeneralRoads
 - Change type of roads which are not in both lists
- 3 Remove objects not belonging to the strongly connected graph
 - Assumption: world is fully connected

OSM: Preparation

- 1 Convert BOTH to FORWARD and BACKWARD
 - Needed for the side of the road of a bus stop

OSM: Research Area

- 1 Northern part of Belgium and the southern part of the Netherlands



OSM: Results

① Initial:

- 776 483 GeneralTransportInfrastructures
- 1 336 260 GeneralLinks
- 969 907 GeneralPoints

② After cleaning and reduction:

- 580 211 GeneralTransportInfrastructures
- 900 702 GeneralLinks
- 693 068 GeneralPoints

③ After BOTH → FORWARD/BACKWARD conversion (Preparation)

- 1 132 382 GeneralTransportInfrastructures
- 1 764 648 GeneralLinks
- 693 068 GeneralPoints

Overview

- 1 Introduction
- 2 OSM
- 3 GTFS
- 4 Candidates Locations GTFS Stops
- 5 Conclusion

GTFS: Terminology

- 1 agency.txt
- 2 stops.txt
- 3 routes.txt
- 4 trips.txt
- 5 stop_times.txt
- 6 calendar.txt

GTFS: Algorithms

- 1 Unresolved References Removal - Simplification
 - Data without references to other files
 - Duplicate stop sequences (not interested in time dimension)
 - A-B-C
 - A-B-C
 - B-C-D
 - → weight value
 - Same GTFS stop serviced multiple times with a small time interval
 - A-B-B-C

GTFS: Results

- ① Deleted:
- 0.00% agencies
 - 42.62% Calendar Dates
 - 15.06% Route
 - 19.13% Stops
 - 97.45% Stop Times
 - 97.50% Trips

Overview

1 Introduction

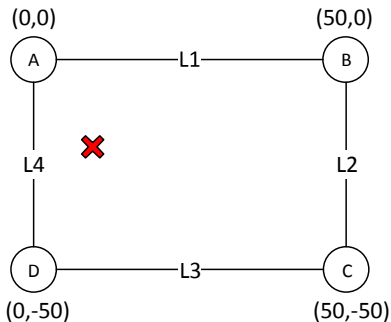
2 OSM

3 GTFS

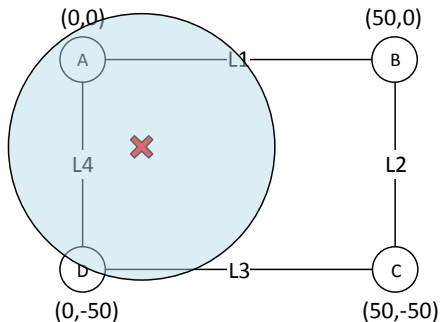
4 Candidates Locations GTFS Stops

5 Conclusion

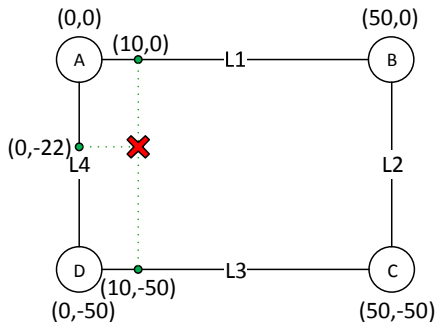
Candidates Locations GTFS Stops: Algorithm



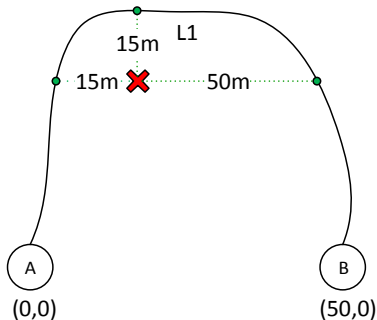
Candidates Locations GTFS Stops: Algorithm



Candidates Locations GTFS Stops: Algorithm



Candidates Locations GTFS Stops: Algorithm



Candidates Locations GTFS Stops: Results

- 1 Total of 30 654 GTFS Stops
- 2 Total of 127 066 Projected Stops
- 3 = 4.15 Projected stops on average

#Projected Stops/GTFS stop	Occurrence Frequency
1	161
2	16 196
3	255
4	3 276
5	161
6	5 450
7	95
8	2 030
9	66
10	2 964

Overview

- 1 Introduction
- 2 OSM
- 3 GTFS
- 4 Candidates Locations GTFS Stops
- 5 Conclusion

Conclusion:

- 1 Achieved some nice reductions
 - OSM
 - GTFS
- 2 Final algorithm is completed
 - Clean OSM
 - Clean GTFS
 - Assign GTFS bus stops to OSM links
 - Export to desired output format

Questions?



The research reported was partially funded by the IWT 135026 Smart-PT:

Smart Adaptive Public Transport (ERA-NET Transport III Flagship Call 2013 "Future Traveling").