

Development of a Mode Detection Algorithm for GPS-Based Personal Travel Surveys in New York City

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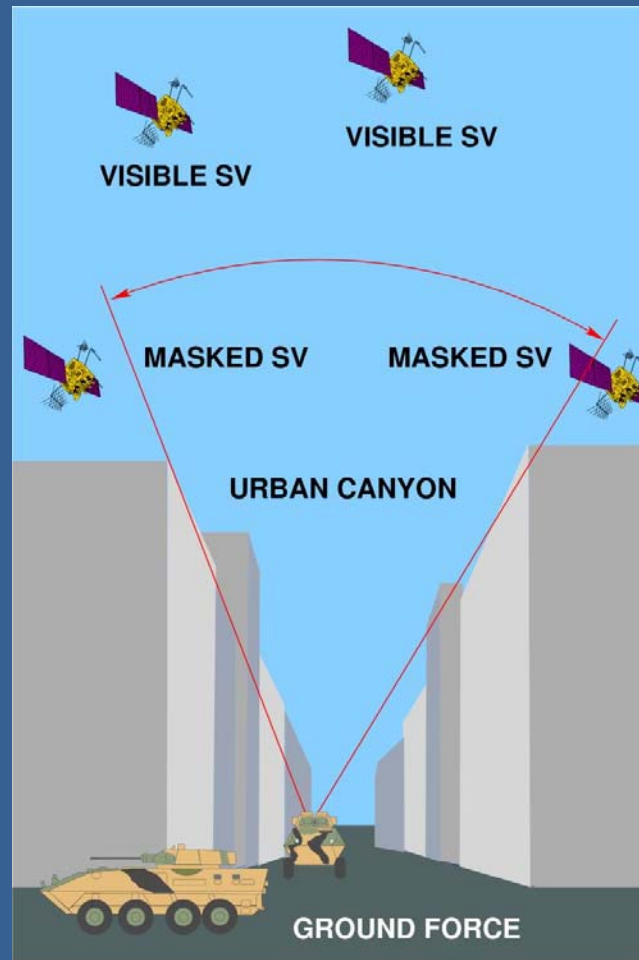
Quick History of Personal Travel Surveys

- ongoing shift from “traditional” paper diaries to GPS-based surveys
- advantages:
 - easy, precise collection of travel time, distance, route choice
- disadvantages:
 - trip purpose?
 - travel mode?

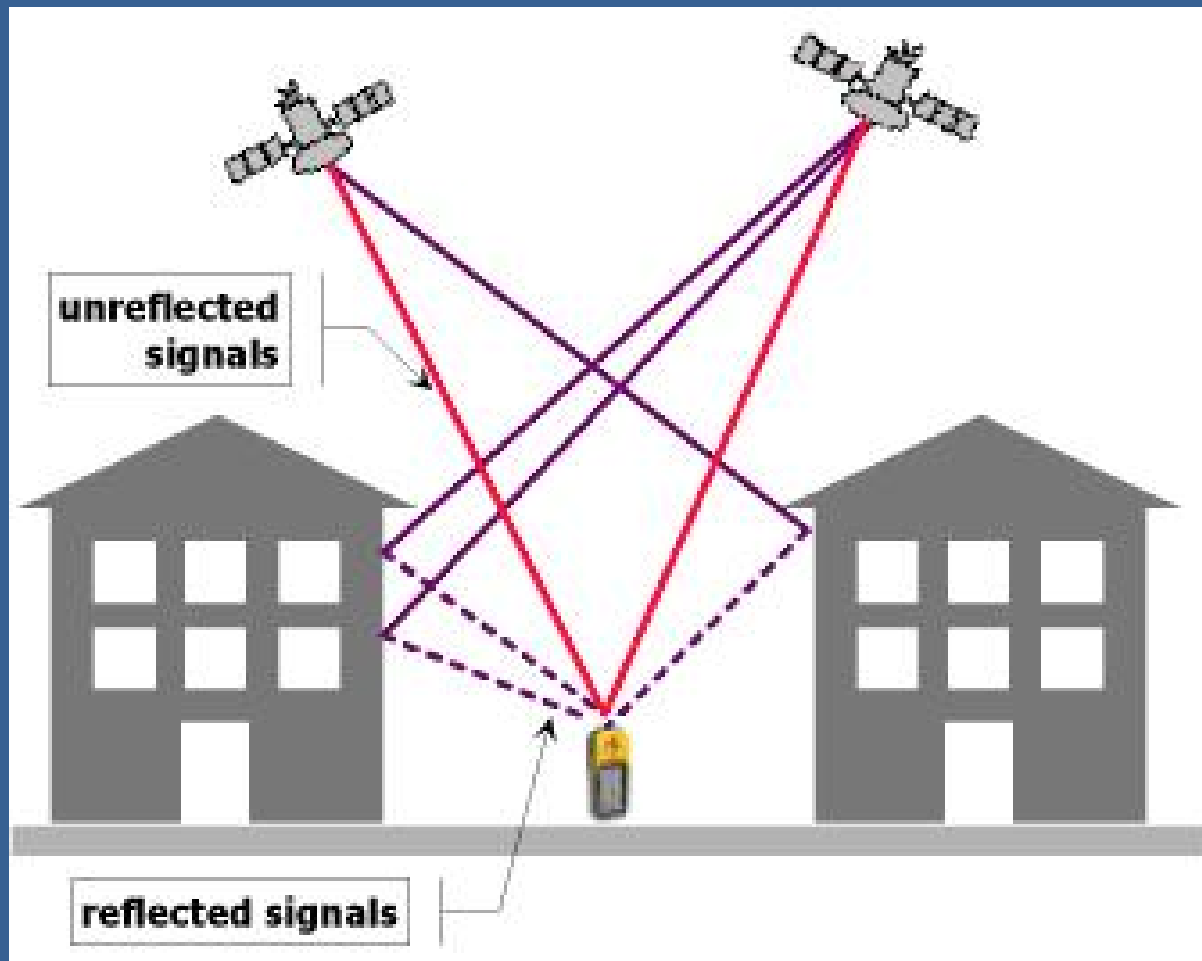
Objectives of Algorithm

- determine mode used from raw GPS data
- consider 5 modes:
 - car
 - bus
 - subway
 - commuter rail
 - walk
- account for potential GPS signal distortion in high-density New York City

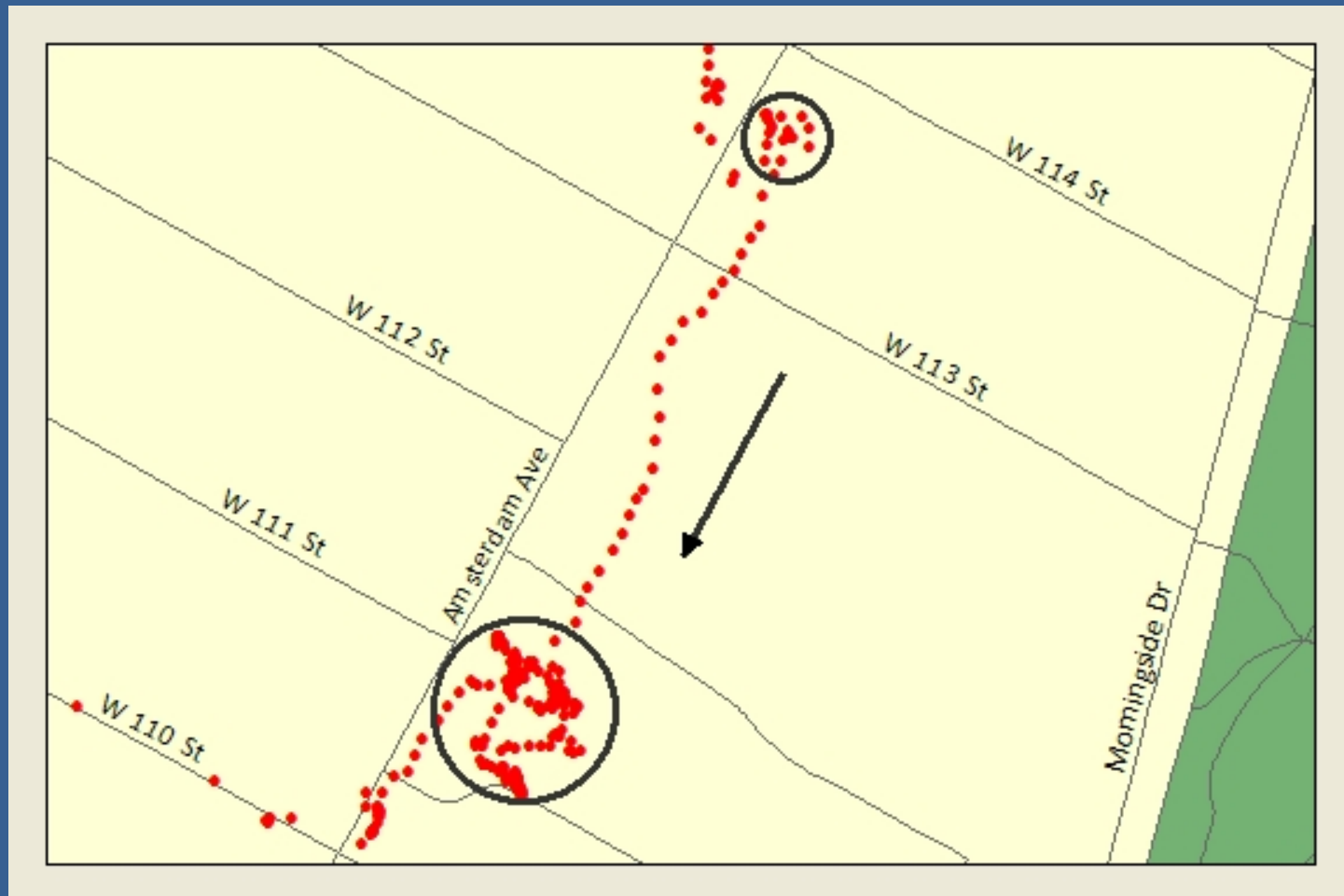
Urban Canyon Effect: Reason 1



Urban Canyon Effect: Reason 2



Step 1: Division of Data into Trips



Step 2: Division into Trip Segments

Assumptions:

1. underground travel when 2 consecutive points are more than 120s and 250m apart
2. walk segment at every modal transfer

Step 2: Division into Trip Segments

Characteristics of walk segments:

- at least 60s long
- maximum speed $\leq 10\text{km/h}$
- average speed $\leq 6\text{km/h}$

Step 3a: Aboveground Subway/Rail Detection



Step 3b: Car vs. Bus

How to distinguish a bus from a car?

A bus segment:

- begins and ends near a bus stop
- travels only along bus routes
- has a maximum speed lower than 55mph
- has a maximum acceleration lower than 1.5m/s^2

Step 3c: Signal Gaps



Results

- 79.1% success rate
- urban canyon effect causes lower success rates in high-density neighborhoods

Benefits for NYMTC

Future regional household travel surveys:

- more accurate
- possibly multi-day data
- more cost-effective

Acknowledgments

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Questions?