CRII: CPS: CityLines: Designing Urban Hub-and-Spoke Transportation System with Data-Driven Cyber-Control

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CPS PIs meeting 2017

1. Background and Dataset

Background:

- Global urbanization
- Increasing burden to urban transportation

Urban mobility datasets:

- **Duration:** 2009 - 2016
- **Geographical Region:** US and the world
- **Source:** Taxi GPS, Bus, Subway Transactions

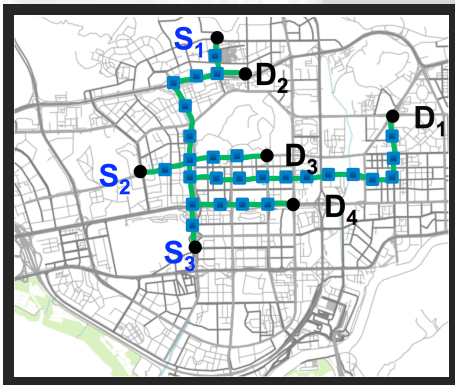
2. Motivations

Future Smart Urban Transit Service

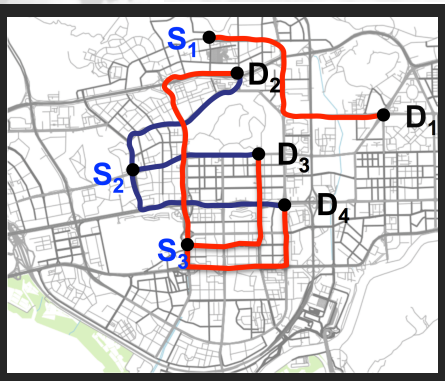
Service: Serve dynamic demands from passengers
Cost: As low as public transits
Travel time: As low as private transits

Hub-and-spoke transit mode:

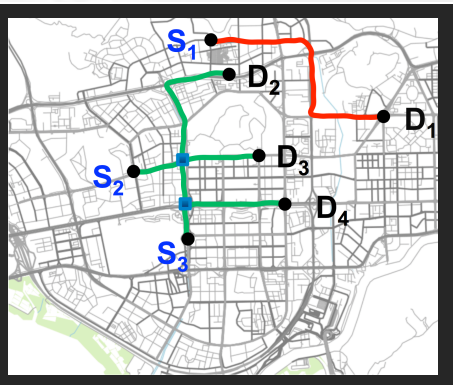
- **Traffic move along spokes connected via a few hubs**
- **Less operation cost, thus lower travel cost**
- **Less stops/transfers, thus lower travel time**



Public Transits
Fixed route mode

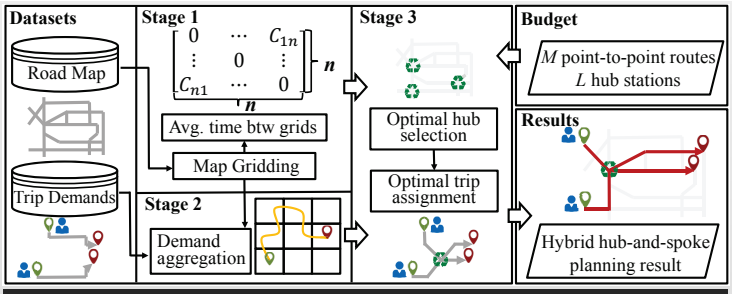


Private Transits
Point-to-point mode



CityLines
Hybrid hub-and-spoke mode

3.Our Solution, Evaluation Results, Demo System



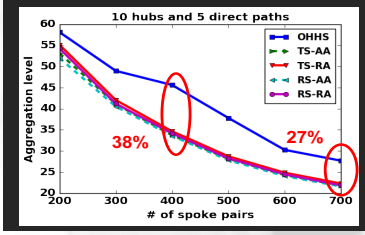
Solution Framework:

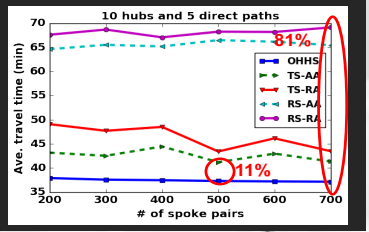
- **Optimal Hub Selection (OHS)**
- **Optimal Trip Assignment (OTA)**

Results:

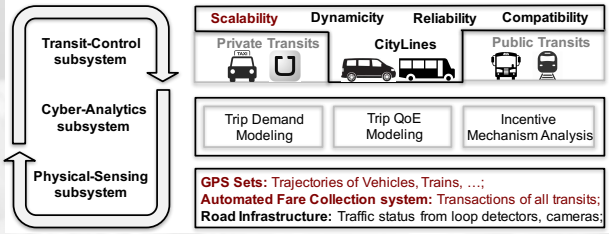
(i) Average Travel Time: 11%-81% Reduction Rate
(ii) Aggregation Level: 27-38% Increase

Comparison with Baselines





CityLines Project Vision



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Demo System:
Scan QR Code➔

Publications

[1] Jie Bao, Tianfu He, Sijie Ruan, Yanhua Li, Yu Zheng, *Planning bike lanes based on Sharing-bike's trajectories, ACM SIGKDD 2017.*

[2] Guanxiong Liu, Yanhua Li, Zhi-Li Zhang, Jun Luo, Fan Zhang, *CityLines: Hybrid Hub-and-Spoke Urban Transit System, ACM SIGSPATIAL GIS 2017.*

[3] Guanxiong Liu, Yanhua Li, Zhi-Li Zhang, Jun Luo, Fan Zhang, *CityLines: Designing Hybrid Hub-and-Spoke Transit System with Urban Big Data. (Under Submission.)*