CityLines: Designing Hybrid Hub-and-Spoke Transit System with Urban Big Data

Abstract—Rapid urbanization has posed significant burden on urban transportation infrastructures. In today’s cities, both private and public transits have clear limitations to fulfill passengers’ needs for quality of experience (QoE): Public transits operate along fixed routes with long wait time and total transit time; Private transits, such as taxis, private shuttles and ride-hailing services, provide point-to-point transits with high trip fare. In this paper, we propose CityLines, a transformative urban transit system, employing hybrid hub-and-spoke transit model with shared shuttles. Analogous to Airlines’ services, the proposed CityLines system routes urban trips among spokes through a few hubs or direct paths, with travel time as short as private transits and fare as low as public transits. CityLines allows both point-to-point connection to improve the passenger QoE, and hub-and-spoke connection to reduce the system operation cost. To evaluate the performance of CityLines, we conduct extensive data-driven experiments using one-month real-world trip demand data (from taxis, buses and subway trains) collected from Shenzhen, China. The results demonstrate that CityLines reduces 12.5%-44% average travel time, and aggregates 8.5%-32.6% more trips with ride-sharing over other implementation baselines.

CONCLUSION

In this paper, we make the first attempt to develop CityLines system for urban scale transportation services, that employs a hybrid hub-and-spoke transit model. The model allows both point-to-point connection to improve the passenger quality of experience and hub-and-spoke connection to reduce the system operation cost. CityLines employs a two-step optimization framework to enable a scalable solution to the optimal hybrid hub-and-spoke planning problem. Comparing with
other implementation baselines, the evaluation results (obtained with real world transit data) demonstrate that CityLines reduces 12.5%-44% average travel time, and aggregates 8.5%-32.6% more trips with ride-sharing.

**SYSTEM REQUIREMENTS:**

**HARDWARE REQUIREMENTS:**

- System: Pentium IV 2.4 GHz.
- Hard Disk: 40 GB.
- Floppy Drive: 1.44 Mb.
- Monitor: 15 VGA Colour.
- Mouse: Logitech.
- Ram: 512 Mb

**SOFTWARE REQUIREMENTS:**

- Operating system: Windows 7/UBUNTU.
- Coding Language: Java 1.7, Hadoop 0.8.1
- IDE: Eclipse
- Database: MYSQL

**REFERENCES**
