MetroViz: Visual Analysis of Public Transportation Data

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Fig. 1. In the Clouds: Vancouver from Cypress Mountain.

Abstract— Motivation
Public transportation, including buses and rail lines, is an important resource for urban residents. Knowing how well the public transportation is serving the public is important for schedule optimization and resources allocation. Ridership and adherence are two main dimensions for evaluating the level-of-service (LOS) [1, 5].

Approach
Using the technology of Automatic Vehicle Location (AVL), Automatic Passenger Count (APC) and Global Positioning System (GPS), ridership data and adherence data of public transportation have been collected. In this paper, we developed a visualization system for exploring public transportation data. We designed a map view for exploring stops and routes, and a calender view for exploring ridership and adherence information of trips over years.

Results
In the first round of usability testing, two researchers from the Center For Advanced Transportation Technology (CATT), and six Computer Science PhD students from the University of Maryland took part in a study in which they used our system to explore the bus transit data of Blacksburg, Virgina. The participants were able to use our system to explore bus stops, bus routes and ridership and adherence of bus trips.

Conclusions
TODO

Index Terms—Public transportation, visual analysis

1 Introduction

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2 Related Works

Analyzing Automatic Vehicle Location (AVL) and Automatic Passenger Count (APC) Data

Rancic et al. [11] present a tracking system using AVL data to analyzing city bus transit traffic. Chen [2] introduces a model to simulate bus operation and passenger demand based on AVL and APC data.

Travel Time Predicting

Lee et al. [6] introduce a real-time travel time prediction method based on multiple samples of similar historical trajectory. Tiesyte and Jensen [13] propose a method to predict the future movement of a vehicle based on the identification of the most similar historical trajectory. Predic et al. [10] use real-time AVL data and historical data to predict bus motion and bus arrival time.

Route Choosing

Nguyen et al. [9] consider buses as moving objects, and use temporal maps to represent the movements of buses in spatio-temporal domain to help passengers choose approatiate routes. Liu et

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Manuscript received 31 March 2013; accepted 1 August 2013; posted online 13 October 2013; mailed on 4 October 2013.
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al. [7] propose a bus trip planning system to help passengers choose the most appropriate lines and transfers, based on traffic data.

Trajectory Visualization

Tominski et al. [14] use a hybrid 2D/3D display to show the trajectories and associated attributes in their spatial-temporal context. Scheepens et al. [12] improve density maps to help explore trajectories using multiple density fields.

Flows Visualization

Guo [4] develops a visualization framework to interactively explore large-scale spatial flows. Cui et al. [3] propose an edge-clustering method to reduce edge crossings and visualize geometry graphs.

Improving Bus Scheduling

Kimpel et al. [3] discuss efforts of using the TriMet [*] APC and AVL data to improve buses scheduling. Yu and Yang [16] develop a dynamic holding strategy to optimize the holding strategy.

Schedule Adherence

Mai et al. [8] extend the Marey graph by adding schedule adherence and passenger load information to measure transit performance.

Level-of-Service (LOS) Estimation

Camus et al. [1] propose a way to estimation the level-of-service (LOS) based on AVL data. Hammerle et al. [5] analyze the AVL and APC data of Chicago Transit Authority to estimate service reliability.

Maps on Mobile Device

Wang and Chi [15] introduce a focus+context method to visualize metro map on small displaying area of mobile devices.

Public Transit Services

Wmata [*]: Washington Metropolitan Area Transit Authority. TriMet [*]: Public Transit in the Portland Area. BT [*]: Blacksburg Transit provides bus transportation primarily to and from the campus of Virginia Tech.

3 System Overview

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4 Data Processing

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5 Visual Design

5.0.1 Map View

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5.0.2 Route View

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5.0.3 Calender View

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5.0.4 Trip View

TODO: Peter

5.0.5 Stop View

TODO: Josh

6 Evaluation

6.0.6 Methodology

TODO: Varun

6.0.7 Results

TODO: Josh

7 Discussion and Future Work

TODO: Peter

8 Credits

Rejected Ejector Seat Reservation

Acknowledgments

The authors wish to thank A, B, C. This work was supported in part by a grant from XYZ.

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