Authors

Matthew Kay (University of Washington)
Tara Kola (Tufts University)
Jessica R. Hullman (University of Washington)
Sean A. Munson (University of Washington)

Title

When (ish) is My Bus? User-centered Visualizations of Uncertainty in Everyday, Mobile Predictive Systems

Venue (conference, booktitle, etcetera)

CHI '16 Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems
Pages 5092-5103

Year : 2016

Number Citations: 55

The Aim of the paper

Existing uncertainty visualizations may not align with user needs or how they naturally reason about probability. We present a novel mobile interface design and visualization of uncertainty for transit predictions on mobile phones based on discrete outcomes.

Conclusion

In this paper, we identify general design requirements for visualizing uncertainty on mobile applications as well as domain-specific design requirements for visualizing uncertainty in transit arrival times. From these, we propose a mobile interface for communicating uncertainty in real time transit predictions in a way that supports users' goals. We developed and evaluated candidate visualizations, including a novel discrete representation of continuous outcomes designed for small screens, quantile dotplots.

How the work informs your project

User-centered design ideology and method.

Authors

Till Nagel
Benedikt Groß

Title

Shanghai Metro Flow - Multiple perspectives into a subway system

Venue (conference, booktitle, etcetera)

IEEE VIS 2014 Arts Program, VISAP'14: Art+Interpretation, Paris, France, November 9th-14th 2014

Year : 2014

Number Citations: 11

The Aim of the paper

With our work, we wanted to illustrate the distortions of Shanghai's metro network, and question if and how strongly such schematic subway maps affect our understanding of the city.

Conclusion

With Shanghai Metro Flow we presented an artistic visualization exhibit providing three plus one perspectives into the complex system of a metropolitan subway network. We briefly outlined our vision, and explained the animation with three scenes, and the juxtapositioned poster. Each visualization combines established techniques with an highly aesthetic form in order to attract people to observe and dwell on different aspects of urban mobility. With our appealing visualizations we hoped to encourage viewers to reflect on their individual perception of our environment.

How the work informs your project

One of our traffic flow design learned from the artistic work Shanghai Metro Flow. But we improved it by adding the effect of lighting bulb for different lines.

Authors

Wei Chen
Fangzhou Guo
Fei-Yue Wang

Title

A Survey of Traffic Data Visualization

Venue (conference, booktitle, etcetera)

IEEE TRANSACTIONS ON INTELLIGENT TRANSPORTATION SYSTEMS, VOL. 16, NO. 6, DECEMBER 2015

Year : 2015

Number Citations: 117

The Aim of the paper

Data-driven intelligent transportation systems utilize data resources generated within intelligent systems to improve the performance of transportation systems and provide convenient and reliable services. Traffic data refer to datasets generated and collected on moving vehicles and objects. Data visualization is an efficient means to represent distributions and structures of datasets and reveal hidden patterns in the data.

Conclusion

This paper introduces the basic concept and pipeline of traffic data visualization, provides an overview of related data processing techniques, and summarizes existing methods for depicting the temporal, spatial, numerical, and categorical properties of traffic data.

How the work informs your project

We learned from the techniques mentioned in this paper and the examples mentioned in this paper.

Authors

Zuchao Wang
Min Lu
Xiaoru Yuan
Junping Zhang
Huub van de Wetering

Title

Visual Traffic Jam Analysis Based on Trajectory Data

Venue (conference, booktitle, etcetera)

IEEE TRANSACTIONS ON VISUALIZATION AND COMPUTER GRAPHICS, VOL. 19, NO. 12, DECEMBER 2013

Year : 2013

Number Citations: 220

The Aim of the paper

In this work, we have presented an interactive visual analysis system to an alyze traffic jams in a realistic large scale road network.

Conclusion

In a data driven approach we clean the GPS trajectories from sensor errors and fix apparent errors in the road network. With the cleaned data we can a ccurately map the driving trajectories to the road network and subsequentl y, compute road speeds. After estimating free flow speed on each road segme nt, we automatically detect traffic jam events at roads based on relative l ow- road-speed detection. The concatenation of these events in propagation graphs shows how a traffic jam propagates both in space to adjacent roads a nd in time. Based on the automatic computing results, we then build a visua l interface for interactive exploration of the detected traffic jam informa tion both in detail on a road segment as well as on a higher level in a spa tial view on a map and in a small multiples view with propagation graphs.

How the work informs your project

Learn from their data cleaning method as well as data analysis method.

Authors

Jiansu Pu (The Hong Kong University of Science and Technology)
Siyuan Liu (Carnegie Mellon University)
Ye Ding (The Hong Kong University of Science and Technology)
Lionel Ni (The Hong Kong University of Science and Technology)

Title

T-Watcher: A New Visual Analytic System for Effective Traffic Surveillance

Venue (conference, booktitle, etcetera)

2013 IEEE 14th International Conference on Mobile Data Management

Year : 2013

Number Citations: 36

The Aim of the paper

To tackle the challenges and assist in the understanding of trajectory data to improve traffic analysis we develop an interactive visual analytics system, T-Watcher, for monitoring and analyzing complex traffic situations in big cities via taxi trajectory data for Regions, Roads, and Vehicles

Conclusion

In this paper, we have presented an interactive visual analytics system, T-Watcher, for monitoring and analyzing complex traffic situations in big cities via taxi trajectory data. Several new integrated traffic fingerprinting designs have been elaborated. We also designed a novel visual structure called cell-glyph to compare instantaneous situations with statistical information. Our system consists of three major modules (the region fingerprint, the road fingerprint, and the vehicle fingerprint). The region fingerprint allows users to investigate overall statistical information of important hot spots in the city and to suggest some interesting locations for further exploration.

How the work informs your project

Understand how the interactive visual analytics system, T-Watcher, developed in the paper by them, for monitoring and analyzing complex traffic situations in big cities via taxi trajectory data works.

Authors

Afian Anwar (Computer Science and Artificial Intelligence Lab
Massachusetts Institute of Technology)
Till Nagel (Interaction Design Lab University of Applied Sciences Potsdam)
Carlo Ratti (Senseable City Laboratory Massachusetts Institute of Technology)

Title

Traffic Origins: A Simple Visualization Technique to Support Traffic Incident Analysis

Venue (conference, booktitle, etcetera)

2014 IEEE Pacific Visualization Symposium

Year : 2014

Number Citations: 28

The Aim of the paper

To aid their decision making and help them understand how past incidents affected traffic, we propose Traffic Origins, a simple method to visualize the impact road incidents have on congestion.

Conclusion

The main contribution of this paper is a visualization technique to highlight the impact that traffic incidents have on congestion. We draw attention to a road incident through the use of an expanding circle that reveals the state of the road network in the immediate vicinity of the incident, thereby enabling users to see the before and after effects of the incident. A proof of concept demonstration at a public exhibition showed that our visualization method was aesthetically pleasing and understandable by both transportation experts and members of the public.

How the work informs your project

We learned from their visualization technique to highlight the impact that traffic incidents have on congestion

Authors

Till Nagel (MIT Senseable City Lab, Massachusetts Institute of Technology)
Martina Maitan (Future Urban Mobility Group, SMART)
Erik Duval (Department of Computer Science, KU Leuven)
Andrew Vande Moere (Department of Architecture Urbanism and Planning, KU Leuven)
Joris Klerkx2 (Department of Computer Science, KU Leuven)
Kristian Kloeckl (MIT Senseable City Lab, Massachusetts Institute of Technology)
Carlo Ratti (MIT Senseable City Lab, Massachusetts Institute of Technology)

Title

Touching Transport - A Case Study on Visualizing Metropolitan Public Transit on Interactive Tabletops

Venue (conference, booktitle, etcetera)

AVI '14 Proceedings of the 2014 International Working Conference on Advanced Visual Interfaces

Year：2014

Number Citations: 22

The Aim of the paper

In this paper, we introduce Touching Transport, a case study enabling casual exploration of urban mobility in Singapore through a set of visualizations on a multi-touch tabletop. Our aim is to enable users to discover personally relevant stories and explore suitable subsets of data, while making visualizations more attractive and easy to use through playful interactions and a visually engaging design.

Conclusion

The three visualization modes facilitate getting different perspectives on the data set, while the fluid interactivity integrates them into a unified user experience. Together, they provide people visual and tangible access to information about the public transit network, and enable understanding some of the vital dynamics of their city.

How the work informs your project

We learned from their interesting design and making our interactive data visualization more attractive to our users.

Authors

Till Nagel (MIT Senseable City Lab, Massachusetts Institute of Technology)
Erik Duval (Department of Computer Science, KU Leuven)
Andrew Vande Moere (Department of Architecture Urbanism and Planning, KU Leuven)

Title

Interactive Exploration of Geospatial Network Visualization

Venue (conference, booktitle, etcetera)

CHI EA '12 CHI '12 Extended Abstracts on Human Factors in Computing Systems

Year : 2012

Number Citations: 15

The Aim of the paper

This paper presents a tabletop visualization of relations between geo-positioned locations. We developed an interactive visualization, which enables users to visually explore a geospatial network of actors. The multi-touch tabletop, and the large size of the interactive surface invite users to explore the visualization in semi-public spaces.

Conclusion

The results of our usability studies, and the feedback gathered from the questionnaire demonstrate that this is a promising approach to exploring geospatial relationships in scientific networks. In designing the system, we learnt valuable lessons, which we summarize below. Rapid Adaption of Map Styles/ Visual Style of Weighted Connections/ Acceptance of Multitouch Interaction/ Radial Menu for Dense Geospatial Data/ Design Process.

How the work informs your project

Their design analysis and usability studies are very solid, we could improve our design based on their study.

Authors

Till Nagel (MIT Senseable City Lab, Massachusetts Institute of Technology)

Christopher Pietsch （Urban Complexity Lab, FH Potsdam）

Marian Dork （Urban Complexity Lab, FH Potsdam）

Title

Staged Analysis: From Evocative to Comparative Visualizations of Urban Mobility

Venue (conference, booktitle, etcetera)

2017 IEEE VIS Arts Program (VISAP)

Year：2017

Number Citations: 11

The Aim of the paper

In this paper we examine the concept of staged analysis through a case study on visualizing urban mobility exhibited in a public gallery space. Recently, many cities introduced bike-sharing in order to promote cycling among locals and visitors. We explore how citizens can be guided from evocative impressions of bicycling flows to comparative analysis of three bike-sharing systems. The main aim for visualizations in exhibition contexts is to encourage a shift from temporary interest to deeper insight into a complex phenomenon.

Conclusion

we have made two main contributions: first, we have proposed the notion of staged analysis as a choreographed process of breaking up a complex whole into its component parts in order to ease the understanding of a visualization in an exhibition space, second, we presented cf. city flows, an interactive installation that visualizes the flows of bike-sharing movements and their relations within and between urban districts.

How the work informs your project

Their design analysis and usability studies are very solid, we could improve our design based on their study.

Authors

Marian Dork (Department of Computer Science University of Calgary)

David Monteyne （Faculty of Environmental Design University of Calgary）

Title

Urban Co-Creation: Envisioning New Digital Tools for Activism and Experimentation in the City

Venue (conference, booktitle, etcetera)

HCI, Politics, and the City (CHI 2011 workshop)

Year：2011

Number Citations: 19

The Aim of the paper

With this paper we seek to shed more light on the use of digital tools in support of urban forms of civic participation. We outline a multi-faceted approach to urban issues and review different approaches to activism in the city. Based on this, we sketch out new opportunities for design and invention in support of a range of participatory practices in the city. While urban developments and planning processes may seem to be determined by abstract forces such as markets and bureaucracy, we argue that citizen activists can—and already do—get actively and concretely engaged in shaping their cities. We conceptualize these grassroots transformations of spatial, material, and social aspects of a city as urban co-creation involving—to borrow terms from computing culture—deciphering, debugging, and hacking the city.

Conclusion

We have raised four particular challenges (sustainability, place, community, and participation) that are already addressed by different forms of civic activism that rely on digital tools. We distinguished between decoding, debugging, and hacking the city as complimentary forms of participation involving the understanding, improvement, and subversion of urban relations.

How the work informs your project

Their analysis about the effect of visualization on urban environment teaches us a lot of basic idea and understand the meaning of city visualization.

Authors

Kristian Kloeckl (MIT Senseable City Lab, Massachusetts Institute of Technology)

Title

Tool theory and the urban data medium: Data driven visual tools for urban energy

Venue (conference, booktitle, etcetera)

2015 IEEE First International Smart Cities Conference (ISC2)

Year : 2015

Number Citations:

The Aim of the paper

This paper focus on dynamic visual tools for data specifically generated by urban energy systems. In order to grasp the significance of the availability of this kind data for the development of new urban data tools, it is worthwhile to recall the pre-digital and pre-networked scenario of data collection in this domain.

Conclusion

This paper proposes a tool theory based viewpoint for the analysis and the design of dynamic visual tools based on urban system data. As persuasive digital technology networks in urban environment generate increasing amounts of data in real time, there is an increasing potential for new use scenarios analysis and the development of such new tools though are still in their infancy and this paper proposes a trifold approach based on three key tool theories to better grasp the nature of these new tools.

How the work informs your project

This paper is more tool-driven analysis, brings us a new perspective regarding the visualization of urban environment.

Authors

Francesco Calabrese
Massimo Colonna
Piero Lovisolo
Dario Parata
Carlo Ratti

Title

Real-Time Urban Monitoring Using Cell Phones: A Case Study in Rome

Venue (conference, booktitle, etcetera)

IEEE Transactions on Intelligent Transportation Systems

Year : 2011

Number Citations: 526

The Aim of the paper

This paper describes a new real-time urban monitoring system. The system uses the Localizing and Handling Network Event Systems (LocHNESs) platform developed by Telecom Italia for the real-time evaluation of urban dynamics based on the anonymous monitoring of mobile cellular networks. In addition, data are supplemented based on the instantaneous positioning of buses and taxis to provide information about urban mobility in real time, ranging from traffic conditions to the movements of pedestrians throughout the city. This system was exhibited at the Tenth International Architecture Exhibition of the Venice Biennale. It marks the unprecedented monitoring of a large urban area, which covered most of the city of Rome, in real time using a variety of sensing systems and will hopefully open the way to a new paradigm of understanding and optimizing urban dynamics.

Conclusion

The visualizations proposed in this paper are exploratory and give a qualitative understanding of how the use of mobile phone and vehicle real-time location data can be used to provide valuable services to citizens and authorities.

How the work informs your project

We learned how the use of mobile phone and vehicle real-time location data can be used to provide valuable services to citizens and authorities.

Authors

S. Shckhar, C.T. Lu, R. Liu, C. Zhou （ Cornputer Science Department, University of Minnesota ）

Title

Real-Time Urban Monitoring Using Cell Phones: A Case Study in Rome

Venue (conference, booktitle, etcetera)

The IEEE 5th International Conference on Intelligent Transportation Sy stems

Year：2002

Number Citations: 16

The Aim of the paper

We prescnt a web-based visualization package lor observing rapid suinmariza tios of major traffic trends. In the underlying dtmibase. we model the traf fic data as a multidinicnsioii:il &ita warehowe to facilitate the on-line q uery pmcessiiig uscd in tile visuaiiziitiun software. We also discuss somc rcscarcli issues in mining traffic and transportation data.

Conclusion

Internet based traffic visualization tools pro vide an easy accessible appr oach for reducing complex and redius statistical data to simple but powerfu l information that can benefit non-professional and professional users alik e.

How the work informs your project

an old paper but teach us about how researchers explore urban data visualization at that time

Authors

Sven Krasser Gregory Conti Julian Grizzard Jeff Gribschaw Henry Owent

Title

Real-Time and Forensic Network Data Analysis Using Animated and Coordinated Visualization

Venue (conference, booktitle, etcetera)

the Sixth Annual IEEE SMC Information Assurance Workshop

Year：2005

Number Citations: 27

The Aim of the paper

The primary contribution of this work is the novel use of tightly-coupled, animated, time-sequence scatter plots and parallel coordinate plots in both 2D and 3D to rapidly analyze network traffic. In addition, we explore the effective use of labeling, animation, scaling, and fading as well as interaction techniques to cope with extremely large ranges of categorical and discrete numeric data.

Conclusion

We presented a visualization tool that is capable of both real-time and forensic analysis of packet-level data that provides a more efficient way to browse and analyze data. The analyst can choose between different time scales and zoom into interesting areas of the data. In forensic mode, the system is capable of replaying large capture files containing days of traffic both forwards and backwards at multiple speeds. At any given time, the system provided the user a 20,000 - 100,000 packet sliding window on the dataset without compromising performance. Moreover, detailed packet information can be queried by clicking close to a glyph in the visualization.

How the work informs your project

an old paper but teach us about how researchers explore visualization tool that is capable of both real-time and forensic analysis of packet-level data at that time.

Authors

Erwan Le Mal´ecot Masayoshi Kohara Yoshiaki Hori Kouichi Sakurai

Title

Interactively Combining 2D and 3D Visualization for Network Traffic Monitoring

Venue (conference, booktitle, etcetera)

the 3rd international workshop on Visualization for computer security

Year：2006

Number Citations: 6

The Aim of the paper

In this paper we introduce an original visualization design which combine 3D and 2D representations of the network traffic and activity. Both representations are based on the same interactive grid representation of the network space and are linked together as they provide complementary functionalities. The 3D representation provides an overview of the communications between several network zones and the 2D representation provides a detailed view of selected parts of the 3D one. A prototype was built according to the proposed visualization design.

Conclusion

A prototype was made based on that improved design in order to test it. We used this prototype not only to display several network traffic dumps but also to visualize network traffic in real time. We were able to detect several patterns corresponding to abnormal activity with the help of the prototype. Using this kind of visualization system really simplifies the detection of such patterns in the data compared to classical textual-based techniques. The proposed visualization design has proven to be more scalable through the 3D representation of the network traffic which can be adapted to the user’s needs.

How the work informs your project

This is a very cool prototype and combining 3D and 2D representations of the network traffic and activity is a very good idea and we may well try that in the future.