Auto(mobile): Mobile Visual Interfaces for the Road

Frederik Wiehr
Saarland University

Vidya Setlur
Nokia Research Center

Alark Joshi
Boise State University

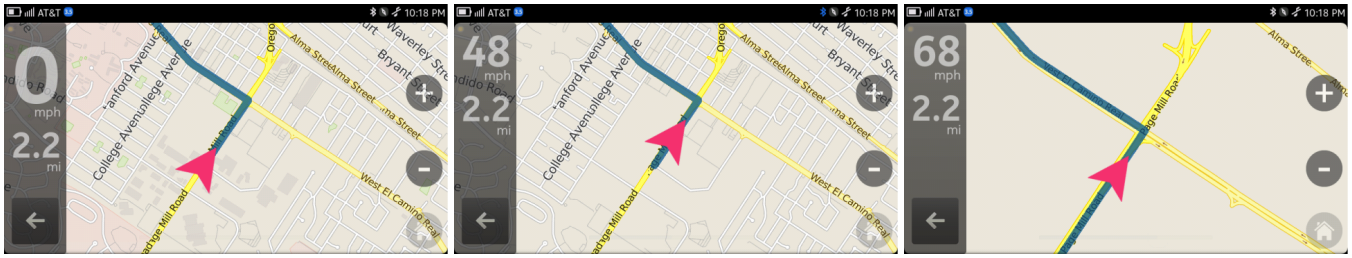

Figure 1: *Comparison of route maps for varying speeds. As the speed increases (left to right), the amount of detail displayed to the user is reduced.*

Abstract

The increased prevalence of mobile touch screen interfaces in cars provides for new challenges in terms of optimizing safety, usability and affective response. While touch screens have certain usability benefits, the interfaces present significant visual attention demands from the driver. Suppose that you are traveling to an unfamiliar destination in your city to visit a friend. You know that she lives close to a popular landmark (mall, tourist attraction) and have visited that landmark several times. If you get directions from your GPS to visit your friend, it will most likely provide a shortest or fastest route, none of which will take into account the fact that you have visited the popular landmark several times. Additionally, the amount of navigational details that you would need to get to the popular landmark would be far fewer than the assistance you would need when you are driving in an unfamiliar region. By using context from the phone and car, more informed visual navigation applications can be created for a better user experience.

1 Background

Techniques in cartography have been an inspiration for several research papers. Rendering route maps effectively and succinctly has been a widely researched topic [Tversky et al. 2006] . Kray *et al.* describe a method of presenting route instructions on a mobile device depending on various situational factors such as limited resources and varying quality of positional information [Kray et al. 2003]. Reilly and Inkpen describe a map morphing technique for relating maps with significant spatial and schematic differences [Reilly et al. 2006]. While their approach focuses on web pages on the mobile phone we provide the user with relevant information by minimizing visual clutter in a map through semantic zooming.Patel *et al.* [Patel et al. 2006] developed a system that suggests alternative directions using pre-defined familiar landmarks/routes. We propose leveraging context both from the mobile device and the car for delivering more relevant map navigation for the user on-the-go.

2 Phone + Car Context

With a rapid development of ubiquitous computing technology, context about the user's environment is made available via mobile phones. Sensors on these phones, such as, the GPS, camera, gyroscope and bluetooth provide varied granularity for perceiving location, task, and the proximate environment. Analogously, the On-Board Diagnostics (OBD-II) interface is a standard supported by all modern vehicles for accessing data regarding the vehicle's operation. This standard supports numbers sensors including vehicle speed, engine load, fuel, and tire pressure.

We leverage the dual advantage of phone and automobile to come up with a system called 'DriveSense' for providing a better navigational experience for users on the go. DriveSense, a context-sensitive visualization system that automatically varies the visualization being displayed to the user based on the speed of the vehicle as well as the familiarity of the region that the user is driving in (Figure 1). Details and labels are accordingly varied based on the cognitive load that the user may be experiencing at that point.

3 Future Directions

In this extended abstract, we present novel visualization techniques for context-based navigation of route maps in an automobile. By leveraging mobile context and OBD-II data, mobile devices can transform themselves into automotive application platforms, facilitating new ways of thinking about visual interfaces. Here, we present a comprehensive view of the current state-of-the-art, hoping that this would encourage further exploration in the auto(mobile) world of map navigation.

References

KRAY, C., ELTING, C., LAAKSO, K., AND COORS, V. 2003. Presenting route instructions on mobile devices. In *IUI '03: Proceedings of the 8th international conference on Intelligent user interfaces*, ACM, New York, NY, USA, 117–124.

PATEL, K., CHEN, M., SMITH, I., AND LANDAY, J. 2006. Personalizing routes. In *Proceedings of the 19th annual ACM symposium on User interface software and technology*, ACM, 187–190.

REILLY, D., RODGERS, M., ARGUE, R., NUNES, M., AND INKPEN, K. 2006. Marked-up maps: combining paper maps and electronic information resources. *Personal Ubiquitous Comput. 10*, 4, 215–226.

TVERSKY, B., AGRAWALA, M., HEISER, J., LEE, P., HANRAHAN, P., PHAN, D., STOLTE, C., AND DANIEL, M. 2006. Cognitive design principles for automated generation of visualizations. *Applied spatial cognition: from research to cognitive technology*, 53–75.