syn(c)ity

VIZUALIZING THE POTENTIAL OF A PREDICTIVE IN-CAR RECOMMENDATION SYSTEM

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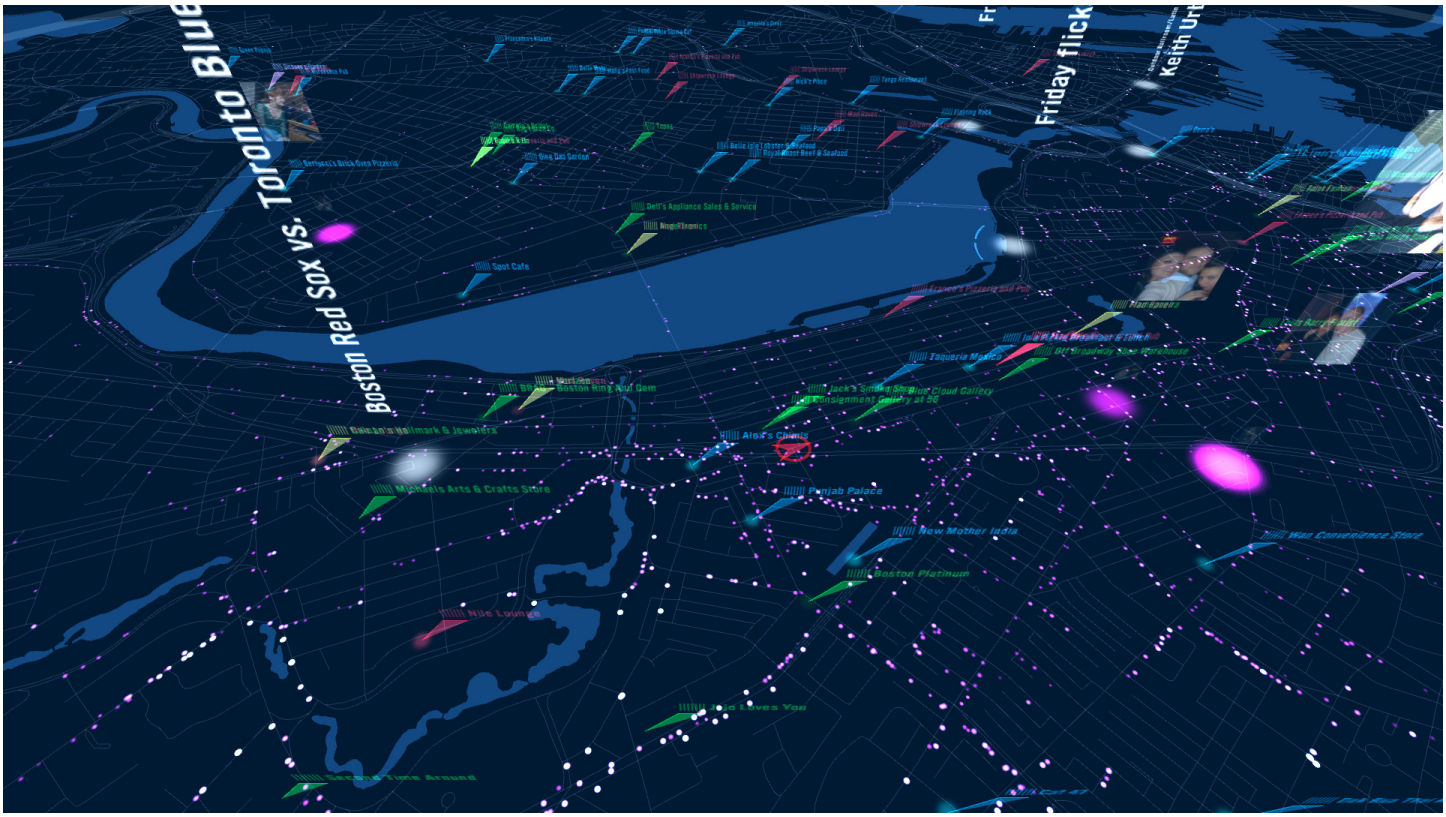

ABSTRACT

The syn(c)ity video illustrates the potential of a predictive, in-car recommendation system based on the real-time profiling data on the city and the driver. Key to the system are novel methods of filtering relevant data to provide to any given driver in any given time and place.

INTRODUCTION

Current navigation systems are destination-focused. They are capable of pointing out the shortest route to a location while also integrating traffic information and identifying points-of-interest. These systems can effectively assist drivers to a fixed desired destination.
There has been considerable work towards advancing these systems to extract useful information about the driver's surroundings as well as predict future destinations. [2][5]. None of those approaches, however, have considered a crucial parameter for determining individual mobility choices: the intentions behind a driver's behavior and personal preferences.
The syn(c)ity video illustrates the potential of a predictive, in-car recommendation system based on the real-time profiling of both, the city as well as the driver. It connects analysis of the driver's behavior and personal preferences with geographical data from the current location to successfully identify the set of activities relevant to the driver's intentions. Each place in the city is then characterized in terms of land use, points of interest (POI), social events and distance. In this way, the prediction of the driver's intention as well as his personal preferences are used as filters to select the personally relevant real-time information to be conveyed to him on the dashboard while driving. This video is not intended as a user interface for in-car recommendation systems but showcases potential scenarios of the system. The translation of its capability into user interface

and interaction elements will be addressed subsequently.

DATASET

A description of the datasets used for the video is presented below.

Mobile phones locations
The dataset consists of anonymous location estimations collected by Airsage (www.airsage.com) for close to one million cellphone users of one telecom operator in eastern Massachusetts, USA and generated each time a device connects to the cellular network, including:

- when a call is placed or received;
- when a short message is sent or received;
- when a user us connected to the internet

(e.g. to browse the web, or through emails programs that periodically check the mail server). To guarantee anonymity, each user is identified with an encrypted unique identification number (ID). Moreover, the ID is reset every day in order to avoid the possibility of tracking people over a long period of time. The database for each user contains a measure of their geographic location in latitude/longitude, for each time they connect to the cell network. Since, the location measurements collected for every user are often noisy and inconsistently sampled, we processed the raw data to extract a set of meaningful places and trips between those places applying the methodology described in [1]. This aggregated information is used to model, evaluate and analyze the location, movement and flow of people in the city and therefore to model both the city activities and the collective behavior.

Point of interest (POI)
POIs have been extracted from Yelp (www.yelp.com/) for all Boston metropolitan area and grouped in 22 categories. Looking at the most visited areas; Food-related POIs cover almost 50% of the preferences, followed by shopping and nightlife. Other categories have less impact.

Social events
We analyzed the Boston Globe (http://calendar.boston.com/) event website and selected events from a variety of categories, namely Performance Arts, Sports events, Family events, Music and Outdoor Cinema, corresponding to a total of 7 events in the day considered in the video.

Photos
Photos have been extracted from Flickr (www.flickr.com/). Flickr service allows to share and organize photos also have the option to add geographical attributes. Each time a photo is anchored to a physical location, Flickr assigns longitude and latitude values together with an accuracy attribute derived from the zoom level of the map in use to position the photos. We took advantage of a social function in Flickr that invites users to voluntarily share photos with theirs interests or their friends and family. To include the Flicker dataset into our analysis the driver should provide to the system his personal account and password to allow including his friends photos otherwise the system will provide generic photos' related to the predicted destinations.

VISUALIZATION

In the video, different typologies of information are associated with different visual elements that form a structured overall grammar.
After introducing the various real data sources that were used to generate the visualization, emphasize is put on three distinct filtering approaches related to the driver. Considering the massive amounts of real-time data potentially available to a driver and considering the imperative of reducing distraction from the driver's attention on traffic, filtering techniques that can extrapolate the few but very relevant data for a given driver in a given time and space are increasingly critical. The filtering modalities presented are thus:

Filter by distance: Data is mainly filtered by proximity to the vehicle position. The user can set the desired distance radius and additional filtering semantics can be added.

Filter by personal interests: Data from social network profiles as well as travel predictions as described above are used to infer relevant data

and informations to be conveyed to the driver.

Filter by user query: Given the city and driver profiling of the system, a user's query does not need to focus on indicating a place directly. The place is a result of the query in this case and subsequently additional real-time information is conveyed to the driver in function of reaching his overall goal expressed in the search query.

CONCLUSION

The syn(c)ity illustrates potential scenarios of a new category of in-car recommendation systems. Key to this system is the original filtering of real-time information to be conveyed to the driver based on destination prediction algorithms, and the integration of personal profiles as well as time and location based information about urban dynamics. Future work will focus on how to integrate such a system's capabilities into a car's dashboard while safeguarding a driver's attention on road traffic.

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