

Charleston Tour Guide: Developing and Evaluating a GPS-Enabled Mobile Device for Touring Charleston

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Proposal Submitted to

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Introduction

Advancements in technology have changed the way we travel and plan our trips (Pan, in press). While computing devices are getting smaller, smarter, and more connected, any time and any access to any information during a trip is becoming a reality (Weiser, 1994).

Anecdotal evidence confirmed that with the ubiquitous information access and more hectic life styles, travelers plan less and less ahead of a trip and engage in more on-route and in-destination planning (Fesenmaier & Vogt, 1992; Fesenmaier, Vogt, & Stewart, 1993). For example, travelers frequently call hotels to reserve a room while in the car or check out adjacent attractions while touring a city. Ad-hoc decisions on restaurants or attractions are also a part of the fun during a trip which can create pleasant surprises.

However, travelers still could not access all the travel related information as they wish. For example, if a traveler walks around downtown Charleston and sees a restaurant on the corner of King Street and Calhoun Street, she could not check out the rating and other visitors' comments about the restaurant easily. Similarly, if she sees a beautiful house on Meeting Street, she would like to know when it was built, and its architectural and historical significance. She could not obtain this information without joining a tour group or having a mobile phone with web access. In the latter case, the information access is still awkward since she need to search on the web through her tiny cell phone screen. Additionally, Travelers to Charleston complained about the flawed traffic signs and busy traffic conditions. These types of information can also be delivered to a traveler in real-time through wireless and location-sensitive information access.

GPS (Global Positioning System) based technology could provide a solution. For example, GoCar, A GPS-guided storytelling car, has gained more and more popularity in San Francisco (GoCar, 2005). The small car navigates and shows the driver directions as well as acting as a tour guide for directing the tourists to the best sites and telling the stories that bring San Francisco to life. However, the rental fee of GoCar is relatively expensive and it might not be suitable for use in downtown Charleston area which has narrow streets. A mobile tour of Cornell campus has been developed in which a mobile phone with location information could guide the visitors of the campus to hidden treasures of Cornell University (HCI Lab, 2005).

The goal of the proposed project is to build and test a GPS-enabled handheld information device for the visitors to tour downtown Charleston. The device will provide visitors with location-sensitive texts, images, audios, and videos based on their actual physical locations. The technology could increase the visitors' satisfaction about the destination, promote more visitations to different attractions, increase sales on food, entertainments and attractions, and foster more loyal visitors. Potentially the devices could become a revenue source for the Charleston CVB and also an attraction themselves.

Theoretical Foundations

People engage in cognitive mapping as they collect, organize, store, remember and utilize information about their surrounding environment. Travelers build cognitive maps of the destinations through direct experience, roadside signs and tourist maps (Downs & Stea, 1977; Guy, Curtis, & Crotts, 1990). Research has shown that cognitive maps could substantially influence consumer's commerce or interactions with the environment, including exploring,

touring, shopping, purchasing, and patronage (Grossbart & Rammohan, 1980; Holahan & Dobrowolyn, 1978; Guy, Curtis, & Crotts, 1990). However, one of the most important tool for building cognitive maps, the physical tourist maps, are usually static, limited in the volume of information, and could be complicated to use for the first-time visitors because the unfamiliarity with the orientation and layout of the city. We hypothesize that location-based information providence could help the visitors to build cognitive maps more quickly and in more details. As a result, those visitors will be more engaged, visit more attractions, spend more on food and entertainments, achieve a higher satisfaction, and become more loyal customers.

Research Methods

This project intends to study the effects of providing location-based travel information on a mobile device to the visitor's behavior and expenses. Five prototypes of GPS-enabled PDA will be built and tested with patrons of visitor's center of Charleston. Our assumption is that with in-time and in-location information access, the travelers will have higher satisfaction toward the destination, visit more places, spend more on food and attractions, engage in more activities, and become more involved and loyal customers to Charleston area. In order to test these hypotheses, we plan to use a control group and a testing group. The testing group will utilize the mobile devices we develop; the control group will be touring downtown Charleston as usual. Twenty-five subjects for each group will be recruited from Visitor's Center of Charleston. Both groups will be asked to return to the Visitor's Center when they will receive a small incentive. Then they will be interviewed and surveyed about their satisfaction, expenses, attraction visited, and the likelihood of revisiting. The first time visitors will be asked to draw cognitive maps of the city. Their response could be collected and compared to test the hypotheses.

Electronic Charleston Tour Guide

Our approach is to develop a human interface for touring Charleston by pushing location data (maps, directions and multimedia) to mobile devices. Using GPS enabled mobile devices such as integrated GPS systems, PDA (Personal Digital Assistant) or Smart Phones for location retrieval and pop-ups about places of interests; we can deliver maps, text, images, audio and video to users with any kind of cell phone and handheld devices. In addition, the visitors could read other visitors' rating and comments on the restaurants and they can also choose to leave their own comments and ratings.

Prospective visitors touring Charleston could borrow a GPS-enabled device to learn about things such as the rating of the restaurant, the specialties of a restaurant, the last minute deal from the nice-looking hotel 50 feet north. While all of this information could be made available from the World Wide Web, accessing information through a computer at home is devoid of the contextual information that brings the information to life. Making this information simultaneously available and organized by the physical surroundings of Charleston adds dimensionality and brings the information back into context.

More importantly, the attractions, restaurants, and hotels could deliver real-time and frequently updated and customized information to the travelers while they are touring Charleston area. While a traveler is walking down Meeting Street toward east, an audio message could offer an introduction to the hotel of Charleston Place right in front of the

visitor and a special deal offered that day. The location-based information providence opened many opportunities for real-time marketing for tourism organizations.

Recently, GPS-enabled games are gaining popularity. Geocaching is the most popular GPS game in which visitors with GPS devices need to locate certain artifacts hidden by previous visitors through location information. More social GPS enable games includes Torpedo Bay, in which players move the streets hunting for enemy subs, e.g. other players, as well as other targets and bonus items. These gaming experiences in physical space will add another dimension to tourist experience in Charleston. These Geo-games will be the next step of the project besides tourist information.

In addition, the GPS device could colleted all the information about visitors' physical locations across their entire trips. This provides the tourism researchers a great resource to study visitors' behavior and it is also a feedback and quality control device for tourism organizations to learn about their performance. Furthermore, once the Charleston Tour Guide becomes readily available and user-friendly, the technology itself could become an attraction for Charleston.

GPS Technologies

GPS is a worldwide radio-navigation system formed from a constellation of 24 satellites and their ground stations. GPS uses these satellites as reference points to calculate positions accurate to a matter of meters. Advanced forms of GPS could make measurements to better than a centimeter. GPS receivers have been miniaturized to just a few integrated circuits and so are becoming very economical. And that makes the technology accessible to virtually everyone. These days GPS is finding its way into cars, boats, planes, construction equipment, movie making gear, farm machinery, even laptop computers. Soon GPS will become almost as basic as the telephone.

There are four types of GPS-enabled technologies relevant to this project: software with GPS Locator for using in computers; standalone GPS device used in automobiles; GPS Card used in handheld device; and GPS-enabled smart phones. The major producers of GPS systems are TomTom, Garmin, and Magellan. We plan to choose TomTom system as the platform since it is based on the Linux kernel which is open-source and can be easily adapted and built upon. TomTom provides two types of GPS-enabled navigation: complete in-car system; a PDA solution which a GPS card could allow the PDA into a wireless navigation tool. TomTom Inc. also provides a developers' tool to help future expansion of functionalities and add-ons on the device and software. We plan to use PDA based navigation at the first step since the In-Car system is inconvenient when walking around while carrying it. Future developments could extend the information providence to stand-alone GPS devices and Smart Phones.

Significance of the Project

As stated earlier, the technology could increase the visitors' satisfaction about the destination, promote more visitations to different attractions, increase sales on food, entertainments and attractions, and foster more loyal visitors. Potentially the devices could become a revenue source for the Charleston CVB and also an attraction themselves. More importantly, the success of the mobile device in Charleston area could lead to the development of a more

general tool for South Carolina as well as the United States. Hopefully a lucrative enterprise could spring off from the initial stage of the project.

Communication of the Results

The development of the evaluation of Charleston Tour Guide will be reported at the annual conference of TTRA (Travel and Tourism Research Association), CHI (Computer Human Interaction), and IFFIT (International Federation of Information Technology and Tourism). The research results will be reported to Journal of Travel Research and Tourism Management, the top two premier journals in tourism field.

Budget

Hardware: Two PDAs and two GPS cards: $\$700 \times 2 + \$200 \times 2 = \$1800$
Software: TomTom go developer Kit: \$200
Programming tools: \$200
Labor: Programming and Testing: $\$20 \times 120 \text{ hours} = \2400
Evaluation and Research: $\$40 \times 40 = \1600
Total budget: \$6200

We estimate that a rental fee of \$20 per day would be acceptable to the visitors while they are visiting the Visitor's Center of Charleston. With 5 handheld devices, the cost could be recovered within three months.

The Team

Dr. Pan has a Ph.D. in Tourism Management from University of Illinois at Urbana-Champaign and two-year post-hoc experience in the Human-Computer Laboratory at Cornell University. Dr. Crofts developed Hospitality Performance Index system, an Internet-based weekly performance benchmarking tool for accommodations, which is the first of its kind in the world.

Timeline

The project will start at the spring semester of 2006. The first version of prototypes is expected to finish in April, 2006. After several round of testing, the final 4 handheld devices will be available at Visitor's Center in May. The research and evaluation will be conducted from May to August in 2006.

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