

Design and Implementation of a University Navigation Maps Using Mobile Application

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Abstract: - The smart phones we carry with us are becoming ubiquitous with everyday life and the sensing capabilities of these devices allow us to provide context-aware services. In our paper, we explain the development of *University navigation*, a context-aware mobile application that delivers personalized campus maps for universities. The application utilizes university students' details to provide information and services that are relevant and important to them. It helps students to give the direction within the campus and become familiar with their university environment quickly. This study was to evaluate the acceptability and usefulness of the campus map, as well as the impact on a users map reading efficiency by utilizing the personal and environmental information. The result indicates the integration of personal and environmental information on digital maps can improve its usefulness and navigation efficiency.

Keywords: Mobile application, campus map, context-aware, university, student profile.

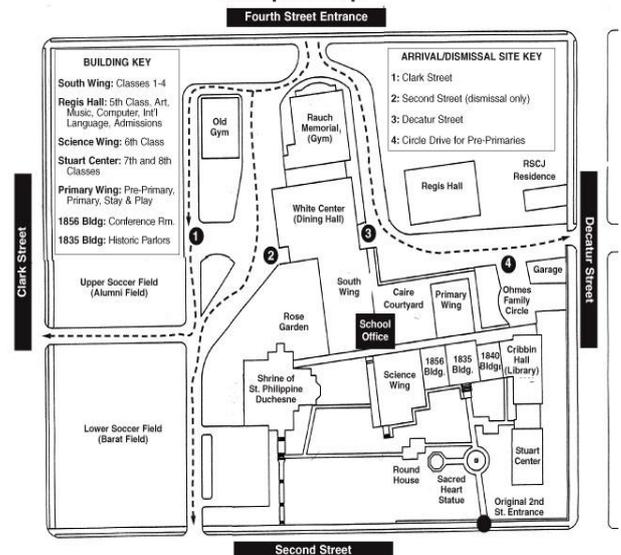
I. INTRODUCTION

The vision of ubiquitous computing is generally about having computing presence, embedded in our environment, always available and always with us. Currently, many mobile devices and smart phones are embedded with a rich set of sensors, such as accelerometer, GPS, digital compass, etc. The sensing capabilities on these devices provide the potential to enhance applications with useful services based on a users' context. Hence context-awareness has become a key factor for creating mobile applications. This paper focuses on an exploration to extend the range of context usage with a user's personal and environmental contexts. Our test application is university campus maps. Within the study, we also investigate the relative usefulness to a user of combining these contexts together for location navigation.

II. DESIGN

The application serves as a digital campus map, providing information on university buildings, food courts and students navigate through the university campus.

Campus Map



Standard VS Personalized Map

Here, we created two versions of university navigation to compare: 1) *Standard Map* and 2) *Personalized Map*.

Standard Map provides a digital map with all the campus buildings on their mobile devices. It also shows a user's current location on the map as they navigate around the campus.

Personalized Map has an additional feature on top of the Standard Map. It filters the buildings on the map utilizing a student's profile information, such as their faculty (e.g. business, education, etc.), students and buildings (e.g. library, laboratories, etc).

III. SENSING POTENTIALS

The sensing capabilities on mobile phones have the potential to monitor user's activities, profile information and preferences. This information can be captured using physical sensors (GPS, microphone, or compass) or virtual sensors (calendars, social network profile) and be utilized to support context-aware systems. For this study, time, location and user's profile and preferences were used to personalize maps. By integrating information such as Wi-Fi access points, social network check-ins

captured by other mobile sensors it has the potential of gathering more valuable information towards to user's context. However, we have yet explored the possibility of these mobile sensors. There are still challenges with these sensor technologies that have yet been addressed. For example, we've discovered the raw data captured by GPS on the mobile is not always accurate, especially when tall buildings are nearby or they're indoors. It also cannot represent which floor user is on when they are indoor. There are also other issues with battery consumption of sensing and limited processing power on mobile devices.

IV. BACKGROUND WORK

Geographic information system

The main use of geographic information systems is resource management, development planning and scientific research.

Location tracking of mobile devices

The need for positioning of mobile devices becomes more and more important

GPS-based Positioning Wi-Fi-based Positioning Received Signal Strength Indication (RSSI)

Augmented reality

Augmented Reality (AR) is a type of virtual reality where a live view of a real-world environment is displayed on a device like a Smartphone with a layer of additional data attached to it

V. IMPLEMENTATION

Application Usage

The application has helped them settling into the university. However, the GPS location sometimes was inaccurately represented while they were navigating around the campus. This issue occurred especially when users were inside a building, or lost their Wi-Fi connection when using their iPod touches.

Map Usage

All the participants who used the Personalized Map reported that having color-marked buildings were useful. All the users' of the Personalized Map also reported that removing Irrelevant buildings were useful. Only one who used the Standard Map believed removing the irrelevant buildings from the map was not required.

Filter Usage

All the participants who used the Standard Map indicated Buildings was the most useful information on the map for them. All the participants who used Personalized Map

indicated the option of showing their faculty building was the most useful on the map and most of them also found other filtering options useful, such as essential services, searching the places, etc.

VI. CONCLUSION AND FUTURE WORK

This study describes how context-awareness has an impact on the usefulness of a campus map mobile application that utilizes personal and environmental contexts, and reports on the results from a university orientation case study. Results show that integrating personal and environmental contexts on digital maps can improve map usefulness and navigation efficiency. Future work will look into expanding the application with personalized campus tours, adding extra sensor data such as Wi-Fi hotspots or Bluetooth connectivity, as well as testing the application in indoor environments. We will also experiment the application in different types of locations, such as hospitals and shopping malls.

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