Access My Campus

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Abstract. Access My Campus is a mobile phone application in development to make college campuses more accessible to students and visitors. Navigating a new college environment is a difficult task for anyone who has not fully explored it. This task is even harder for students and visitors with disabilities, such as visual impairments. Access My Campus seeks to help these students by tracking their position through Wi-Fi triangulation and providing information about classrooms, offices, and other notable landmarks within proximity. Students will also be able to plan routes and be actively guided to their destination.

Keywords: accessibility, mobile development, in-building navigation, Wi-Fi triangulation

Introduction

Providing smart physical and information access is an essential service to provide to higher-educational setting. The University of Massachusetts, Boston (UMB) and IBM have formed a Collaborative Innovation Center to create inclusive societal access through smarter policy, education and technology. IBM has a storied tradition of providing an inclusive work environment for our employees so that everyone has access to the tools and information required to be successful in their work [4]. UMB has a long standing commitment to supporting students with disabilities, and has recently introduced new advanced degree programs through their School of Global Inclusion and Social Development.
Many higher-ed institutions are located in densely populated urban environments or spread out on sprawling rural or suburban campuses. A typical campus usually involves a large and diverse population of students, faculty/staff, and visitors, which can serve as a controlled yet practical research environment for proving out smart access approaches. UMass Boston, for example, is a vibrant rapidly expanding campus with 7 buildings—and more on the way—10 parking lots and thousands of people accessing the campus every day. Traffic congestion and multiple active construction projects make streamlined navigation to/from/around campus more important than ever. However, with hundreds of vehicles, bicycles, public transport vehicles connected by a network of roads and pathways—navigating UMass Boston campus can be challenging for entire campus community. If the individual is aged or has a physical/cognitive disability the challenge is even tougher.

A Smarter Campus transportation strategy can help administrators improve the campus experience for all—students, faculty, staff, and visitors, and also comply with accessibility requirements such as Section 508 of the Americans with Disabilities Act and the UN Convention on the Rights of Persons with Disabilities. Both IBM and UMB are committed to finding innovative solutions to make our campuses accessible to everyone. Figure 1 shows a concept for a mobile application to enable faculty, staff, students, and visitors to locate accessible facilities, efficiently navigate the campus, find available parking, access real-time shuttle information, and know exactly where to go in an emergency.

Access My Campus Project

The Access My Campus application is being developed using the IBM Worklight Framework [1] to be deployable on any mobile device platform, allowing for the application to be available anyone and everyone with a smartphone. Since a smartphone is a very common accessory in this day and age, utilizing a smartphone prevents us from needing to burden our target audience with additional equipment.

Wi-Fi Triangulation

One of the pilot features of the application is the navigation feature, which uses Wi-Fi triangulation to pinpoint the location of the smartphone in the building. To do this, we incorporated code from the Rice Wireless Localization Toolkit [2]. Currently, our method is to collect location signatures every 1.5 yards, mapping small sections or nodes in each building. The application can then determine which node you are closest to. Different locations within the building are organized by category, as to whether or not they are offices, class rooms, or dining facilities. Storing Wi-Fi signature of each location in the Worklight server, along with annotations describing the location, allows us to distribute this to the application as new locations are scanned.
Accessibility

The AMC’s navigation feature is also intended to assist those with visual impairments; students or visitors who are limited in their ability to travel the campus due to their eyesight. With the assistance from the Ross Center for Disability Services[3] at the University of Massachusetts Boston (UMass Boston), we are able to work directly with a focus group to get immediate feedback to develop accessibility features in the application.

Route Planning and Location Information

Combined with the navigation feature, the AMC application will include crowdsourced route planning. Users will pick destinations they wish to travel to, such as a professor’s office, a classroom, or the rest room, and the application will provide them with a route. This route will either be calculated or sampled from routes others have taken to the same destination. Users will be organized into two groups: trusted users and general users. Trusted users would be able to submit these paths to the Worklight server to be used by all users for route planning purposes. Along with path information, trusted users would be able to annotate locations, providing pictures and textual information about them.

Work in Progress

The AMC application is far from a complete deliverable in its current state. In this paper we discussed many features which are currently in development. We are modeling the application after a previous work by IBM called Access My City [4], an application designed for New York City. In the future we hope to further develop these features to provide the applications to universities and other such educational institutions.

Our navigation feature is currently too low resolution to accurately navigate narrow hallway environments. Increase our location scanning resolution from one point per 1.5 yards (5 feet) to roughly one point per foot. There is also a matter of signal noise when scanning Wi-Fi signals. We will be pursuing noise reduction solutions.

We hope to automate the signature scanning process to allow for quickly profiling buildings for use with AMC. The current procedure is a manual scanning using a prototype of the application, which could take upwards of 8 hours of continuous scanning to profile a single floor.

Earlier in the paper, we mentioned working with the Ross Center to adapt the application to users with disabilities. Our cooperation with them in the future will be active and on-going through the development of this application. We will also be working with accessible User Interface researchers from IBM Watson to ensure the application interface meets accessibility standards.
Conclusion

Access My Campus is a mobile application designed to help users of all degrees of ability to navigate college campuses. For this purpose, it uses Wi-Fi triangulation to be easily deployable in existing college environments. Future development will perfect this navigation feature and may expand the scope of the application to larger campuses.

References

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