

# A Wizard for School Opening Events

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## *Abstract*

There are about 20.2 million students attending American colleges and universities in fall 2015 and we expected the number will increase annually. To facilitate the decision making for the students and families, the school normally considers to offer opening events. However, there are a few issues at opening events: (1) campus tour is a human resource intensive task; (2) event scheduling and location switch are difficult for prospective students and families; (3) the mutual communication channel is not easy to access. In this paper, we identify a few research questions and propose a system to address these questions. The *WOW (Wentworth Opening Wizard)* is an innovative integrated system, which not only provides mid-scale navigation on campus by using NFC and Wi-Fi techniques, but it also allows the students and families to schedule interested events with navigation support when using it.

**Keywords - School Opening Week, Campus-wide Navigation, NFC, Wi-Fi.**

## I. INTRODUCTION

According to the National Center for Education Statistics (NCES), there are about 20.2 million students attending American colleges and universities in fall 2015 and the number has increased 4.9 million since fall 2000 [1]. To facilitate the decision making, the colleges and universities normally offer a few opening events to help prospective students and families understand the school, including the school's vision, resources, courses, financial support, the characteristics of the departments, campus settings, etc. However, the communication was mainly single direction from the school to the students and their family. Even worse, the schools normally have limited budgets and resources to support all prospective students, such as campus tours, and the students have difficulties to explore all interested events on unfamiliar campus. There are many challenges in current settings of opening events, but we would like to think of them as opportunities to apply new technologies to solve parts of them.

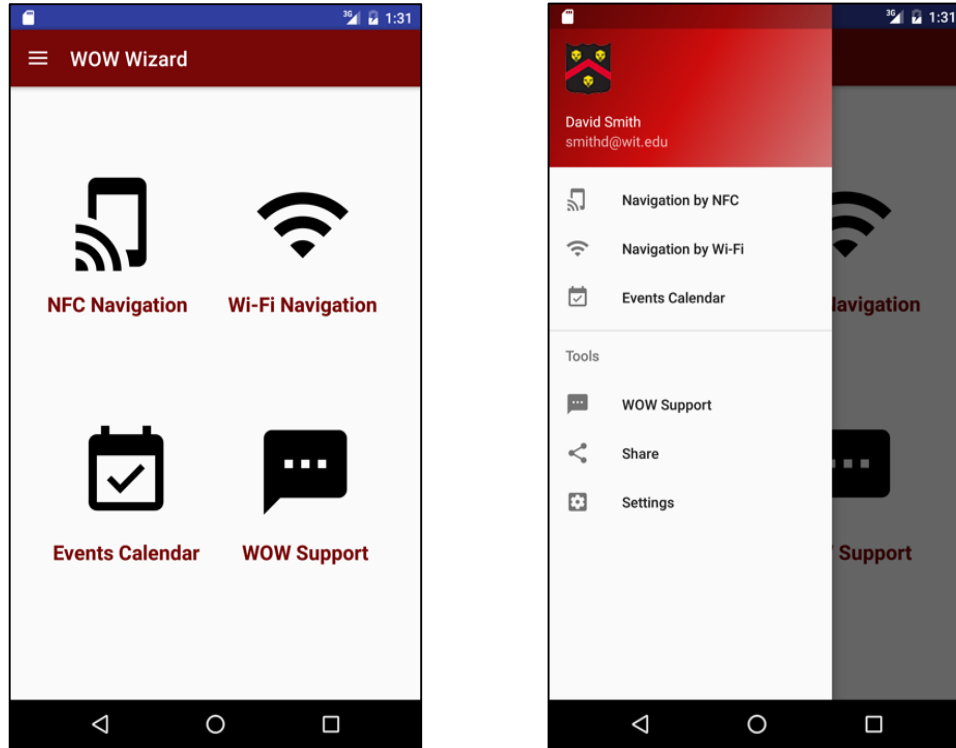
Firstly, a campus tour is one of the most time-consuming event, but it is an important factor for the students and families to choose a school. Although Global Positioning System (GPS) navigation system has become popular and convenient in outdoor environment, it is not easy to provide such a service easily at an indoor environment, such as rooms in a building or a connection between buildings.

Secondly, there are many interesting events happening at the opening day and the students are easy to miss some of them without noticing it. Although a school brochure can provide a detailed event schedule, the students and families can feel annoyed and lost, especially they need to switch locations for different events. Scheduling selected events and understanding what's happening on campus has become a challenge.

Thirdly, it is difficult for the schools to service all prospective students, and the students and families also encounter a difficulty to ask questions and get an instant feedback to facilitate decision making. Even though the schools want to provide follow up support, traditional sign up sheet approach can't provide data analysis.

In this paper, we propose to have an integrated platform, *WOW (Wentworth Opening Wizard)*, to address above issues. As shown in Figure 1, the *WOW* is an Android 6.0 mobile application developed by using Android Studio 2.1 and it provides mid-scale, campus-wide navigation service by using NFC (Near Field Communication) and Wi-Fi technologies.

In addition, the system also provides event tracking and support for mutual communication between the school staffs and the students. In the following of the paper, we will introduce the current status of the development and discuss the future direction of this project.

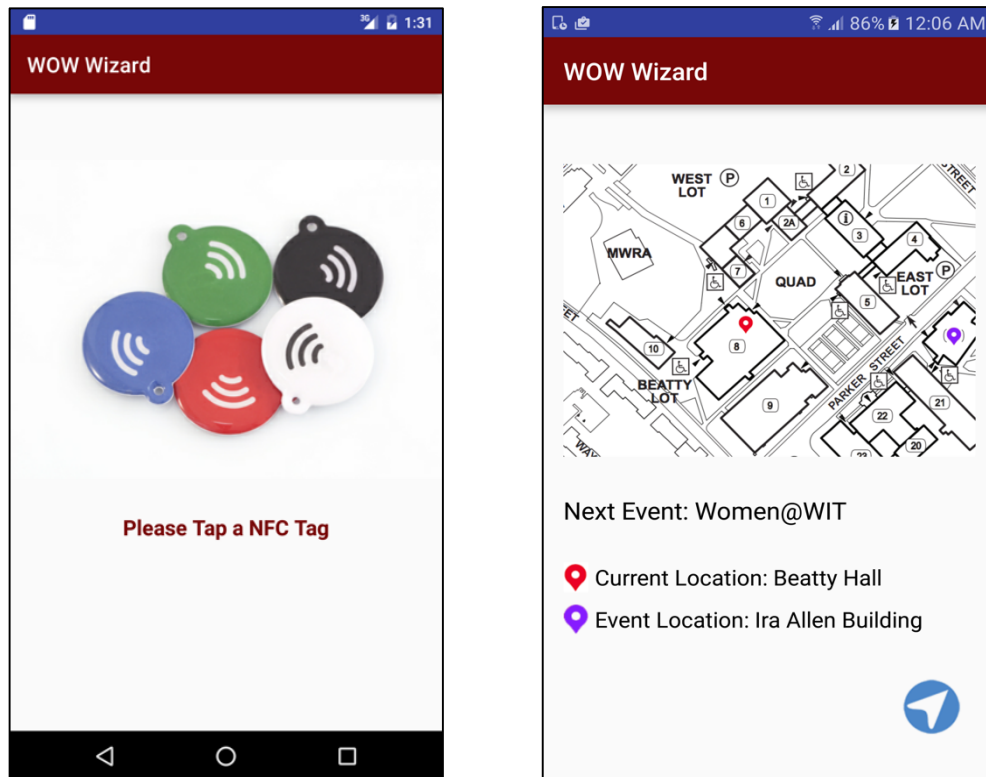


**Figure 1: The *WOW* mobile application. (Left) Main dashboard page; (Right) A navigation drawer provides an easy-to-access options.**

## II. NFC NAVIGATION

Although a traditional GPS-based navigation system has shown a successful usage in some fields, such as driving and outdoor navigation, it doesn't help prospective students and families or someone unfamiliar with the area to explore the campus and get to their desired destination. Based on the observations, we found that there is a need to have a more reliable way to access directions, especially when GPS systems are inaccurate or inaccessible. NFC is a new short-range wireless connectivity standard that uses magnetic field induction to enable communication between electronic devices in a close proximity [2]. This technology is currently used for many different services, such as Google Wallet, Apple Pay, and Nintendo Amiibo.

NFC tags allow the users to accurately determine their location on campus by touching their NFC phone or tablet to an NFC tag, which is normally preprogrammed. This action will then enter the locations data into the application. The location data can then be used to provide directions, reminders, and location specific information (such as building names, room numbers, hours of operation, etc.). Our previous work has demonstrated that it is feasible to use NFC tag to provide mid-scale navigation [3]. We extend our work to the WOW system and provide campus-wide navigation. As shown in Figure 2, by tapping NFC tags placed all around the campus, the users can get the current location in details. If that user registered some opening event through the Event Calendar feature, a path information to the desired destination from current location can be provided.



**Figure 2: WOW NFC Navigation. (Left) A screen for tapping on NFC tag to know current location. (Right) A search result on the map to support indoor navigation.**

### III. WI-FI NAVIGATION

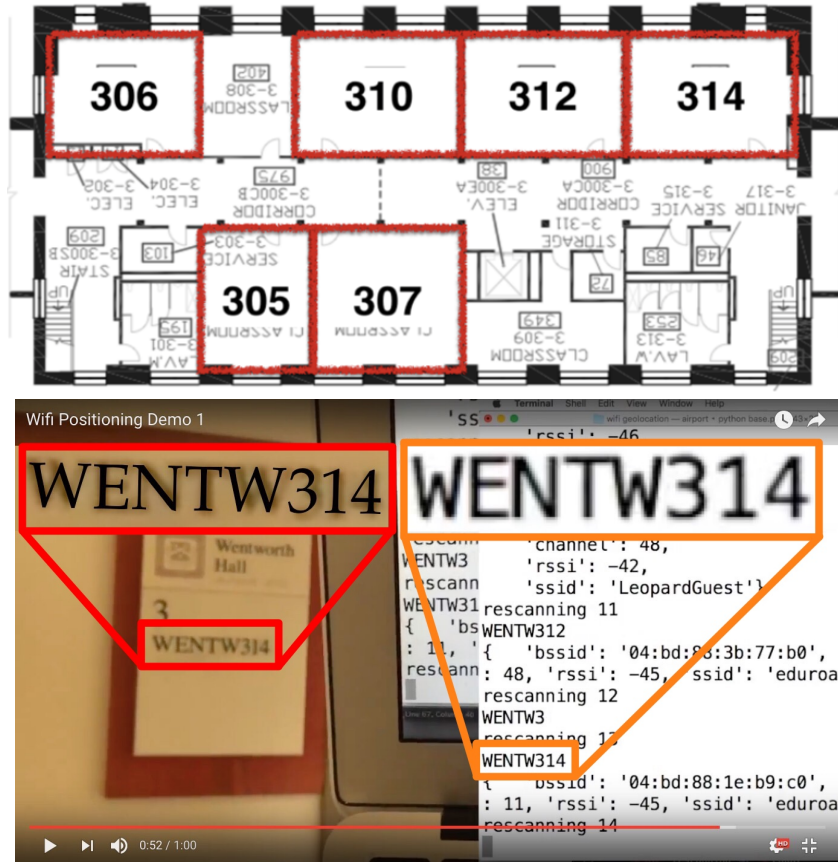
Although NFC tags are relatively cheap and have very flexible placement options, NFC navigation system still requires initial deployment cost and efforts [3]. However, Wi-Fi access points (AP) are already available on most campuses and every smartphone or tablet has Wi-Fi access [4]. By using existing Wi-Fi signal strengths, the system can provide a dynamic location and direction information.

Wi-Fi APs on a campus also have unique media access control (MAC) addresses, which allows devices to differentiate between the routers, especially since some campuses may have a number of routers in close proximity to one another. Our Wi-Fi navigation module collects the signal strengths from these APs in order to determine a user's location. As shown in Figure 3, we verified our idea on the third floor of Wentworth hall at the Wentworth Institute of Technology in Boston. Each room has a Wi-Fi AP and we collected a few received signal strength indicator (RSSI) inside and outside of a room. After mapping those RSSIs to the room numbers and Wi-Fi MAC addresses, the *WOW* Wi-Fi navigation can provide an accurate location information. Figure 3 shows the output of current Wi-Fi navigation module.

### IV. CONCLUSION AND FUTURE WORK

The school opening events have provided an opportunity for the students and families to know the school. However, existing opening events system has many challenges and these challenges offer an opportunity to find solutions with state-of-the-art technologies.

In this paper, we have identified three issues at opening events: (1) campus tour is a time consuming and human resource intensive task; (2) event scheduling and location switch are difficult for prospective students and families; and (3) the communication channel was mainly single direction from the school to the students and families, and the school can not collect and analyze data to support future opening events.



**Figure 3: WOW Wi-Fi Navigation. (Top) A floor plan of a building that has multiple classrooms (Bottom) a screenshot of detecting location with the Wi-Fi navigation module.**

Based on these observations, we designed and implemented a new Android mobile application, *WOW* (Wentworth Opening Wizard), to address the issues above. The *WOW* system uses state-of-the-art techniques, NFC and Wi-Fi indoor positioning, to provide mid-scale navigation, which is helpful for some school opening events, such as campus tour, location switches for an event, etc. In addition, it also provides event scheduling for the students to plan events in advance. Figure 1, 2 and 3 have shown the status of current development.

Although the current development has demonstrated a promising direction for school opening events, we are considering to explore following research directions to enhance the service.

#### **A. Back-end data analysis server**

While the *WOW* system provides services to the students, the students and families can also provide their public information comments (text or voice) to help the school prepare for the next year. We are considering to setup a server by using Node.js to provide data analysis with statistic open-source software. Based on the analysis, the school can have an idea of the geographic information, students' academic background and preferred events or activities for the opening events.

#### **B. Speech-based routing support**

The *WOW* NFC and Wi-Fi navigation services can only provide text-based navigation at current stage. To provide a better usage, we are working on creating a GPS-like speech navigation feature that can guide the prospective students and families naturally. Integrated with Events Calendar feature, we believe the system can provide a CLICK and GO scenario.

### *C. User study with prospective students and families*

We are working with the school administrative office to include 2016 opening events into the WOW system. As long as we have the details of all planned opening events, we will start to invite users to test the features, including NFC navigation, Wi-Fi navigation, events scheduling, etc. The post-interviews are also considered to get qualitative feedbacks to improve current system.

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