

# *INFOmap*

Indoor Navigation For the Visually Impaired

## Project Part I: Concept

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## 1 Abstract

INFOmap is a handheld navigation software primarily focused on helping blind patrons navigate the interior of buildings. It utilizes voice command and crowdsourcing to build a database of objects within a building. A map of the building can be downloaded off the internet and the user can then enter key items such as vending machines, restrooms, and chairs through voice and photo. Since the information is collected from a variety of users, the data will be compared to other entries to confirm the object and its location to prevent false information. As more objects are entered, the more accurate and fully navigational the area will become. While INFOmap is focused on helping the blind, it can also be used for any user unfamiliar with a building.

## 2 Project Description

INFOmap is a handheld navigator. The project is an extension of Navitar, a cell phone navigation application Kevin Grant and Alex Tam have been developing for Dr. Eelke Folmer and IBM. The application is designed to help blind patrons and users unfamiliar with specific areas navigate and find objects and destinations. Users can map anything, such as a park or building, by running the application while walking. The user will then enter items into the INFOmap database by talking into the phone and describing what is in the area. The user can also take pictures of the objects for other patrons using INFOmap to navigate. Obviously, this feature does not benefit the blind.

The main characteristic of the project is that INFOmap uses “crowdsourcing” to collect data. Crowdsourcing is the practice of outsourcing work to a group of people, usually in the general public, that is interested in the work. Anybody running INFOmap can enter objects into the database. The entries will be compared to confirm location and name accuracy for each object. The idea is to get as many entries as possible, thus making the database more accurate and filled with objects. Once INFOmap is filled with objects such as restrooms, vending machines, and chairs, a blind user or someone unfamiliar with the area can ask the phone where a certain object is. INFOmap combined with Navitar will then navigate the user to the desired objects by giving visual and audible directions. INFOmap will be using the Android platform, which is based on Java.

Blind patrons often have a hard time finding rooms in an unfamiliar building. Using INFOmap, he/she can ask the phone where room A is, and INFOmap will give audible directions to room A making traveling for the blind much easier and less stressful. INFOmap is useful for anybody; a user no longer has to roam around the building and ask other people where the

nearest restroom is. Another useful application would be to navigate through a theme park. The user can ask where a certain ride is, and INFOmap will direct him/her to the ride.

One of the biggest challenges will be to control crowdsourcing. Having unreliable sources may mean unreliable data. The problem is prominent in crowdsourcing websites such as Wikipedia. Since anyone can contribute to data entry, there can be false or mistaken information entered into the database. We will have to develop a method to compare entered data to confirm accuracy. We will also have to figure out in which manner to hold data and map out the buildings. Will the coordinates be taken where the data is entered or will user enter coordinates? If the coordinates are taken where the user is standing, will the person have to be on the object? With multiple photo entries, which photo will be chosen to use for mapping? What if the photo is unrelated, how will we detect its accuracy? How can we motivate people to enter data into the database? With no entries, crowdsourcing will not work. If the user is in a loud room, how will voice detection work? Will we need to implement manual entry? With a project this big, we are bound to run into many problems.

Beyond CS 425, INFOmap can be developed to become the largest database of directions and items. All the buildings will be connected in a full scale world-wide navigation similar to Google Maps. However, INFOmap can also navigate inside buildings and objects within the building. It can also become a social network application to find friends, lovers, or reconnect with lost family members by adding even yourselves into the database, not just objects.

Professionally, this project will expose all the team members with programming on a mobile device. Many companies are interested in crowdsourcing and mobile programming; thus it will be excellent to have on a résumé. Since this project has many social uses and has the potential to grow into a full scale application, it has the potential to become a grad thesis or even start a small company.

## Team 01

**Kevin Grant** has a good understanding of proper programming practices, and a very strong background in networking and communication skills. He has previously worked on large structured projects under the advisement of Eelke Folmer and is currently continuing his research under him. In this specific project, Kevin will be an assisting Alex Tam in the specific programming that he needs, but will primarily be acting as project manager, keeping the team on track and making all of the necessary meetings and networkings necessary to finish and complete a finished product.

**Angela Proffitt** has been programming since High School at an academy in Las Vegas. She is graduating in the spring of 2010 with a Bachelors of Science in Computer Science and a minor in Mathematics and Interactive Gaming. She is most versatile in C++ with an interest in

human interaction and gaming. As the newest member of the project, she will be involved in designing and programming.

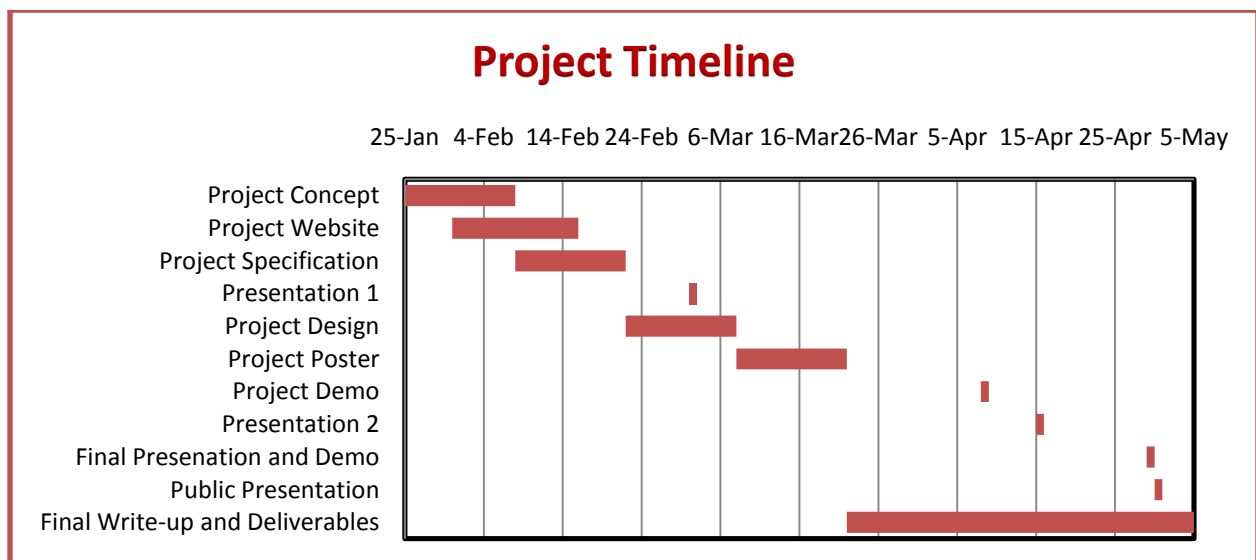
**Alex Tam** is currently an undergrad in Computer Science achieving a Bachelor of Science degree. He is very detail-oriented and super efficient. Has an eye for aesthetics. Experienced programming in C++, Java, JavaScript, PHP, and ASP. Interested in designing user interfaces to be more useful and intuitive. Will be involved in programming, web development, and aesthetic design.

### Team Advisor

**Elke Folmer** is an assistant professor in the Department of Computer Science and Engineering at the University of Nevada, Reno. Received his Masters of Science in Computer Science and a Ph.D. in Software Engineering from the University of Groningen, the Netherlands. Research is motivated by the emergence of video games and software interaction for users with disabilities.

### Project Timeline

February 08, 2010:	Project Concept due
February 16, 2010:	Project Website due
February 22, 2010:	Project Specification due
March 02, 2010:	Presentation 1
March 08, 2010:	Project Design due
March 22, 2010:	Project Poster due
April 08, 2010:	Project Demo
April 15, 2010:	Presentation 2
April 29, 2010:	Final Presentation and Demo
April 30, 2010:	Public Presentation
May 05, 2010:	Deliverables due



### **3 Market Potential**

INFOmap has the potential to have many uses. Whenever anyone is in an unfamiliar environment, INFOmap can help the user find a path to any destination. The beauty of the software is its use of crowdsourcing. Many GPS navigation companies have been relying on crowdsourcing to get the latest traffic reports, trendy stores, and popular events. In regards to Google's new project on crowdsourcing for Google Maps, Doug Caverly explains, "Who knows your town better: you or Google?"[1] By having users who use the building everyday enter data for INFOmap, it makes for a more accurate and useful navigation application.

While INFOmap started as a project aimed toward guiding blind patrons through a building, it can be used for anybody unfamiliar with the area. For example, INFOmap can map out the buildings at the University of Nevada, Reno so that incoming students unfamiliar with the campus can find their classes with ease. Another application would be to navigate an airport. The large airports such as Los Angeles International Airport are very confusing for many people who have never been there before. Using INFOmap, the user can ask where the nearest bathroom or where the gate for his/her departing plane is.

While INFOmap may be only practical for the average person, a blind patron can find this kind of navigator for inside a building extremely useful. The American Foundation for the Blind has been looking for a solution to find specific rooms [3]. While a guide dog can help a blind patron through a building, the dog does not know how to take the person to a specific room. The patron can ask INFOmap where the specific room is, and it will announce audible directions to where he/she wants to go to.

#### **Open Source Significance**

INFOmap will be free and available to the public to encourage more people to utilize the crowdsourcing data entry. Businesses can be navigated using INFOmap to help its customers navigate through the buildings. For example, casinos, theme parks, malls, etc would find this application useful. However, the source code will not be available for the public to modify.

There are already hundreds of different types of GPS navigation and crowdsourced maps made for the streets (or big area such as the entire city), there aren't many navigators for a small area with important areas such as bathrooms and rooms. INFOmap is innovative because it navigates small areas and maps out the area in detail. It will be using a crowdsourcing technique to collect data rather than relying on a team to collect data.

#### **Advertising and Marketing Strategy**

The original demographic for this project is the visually-impaired. Our marketing strategy would be to show how much less of a burden it would be for the visually-impaired to find objects in a room instead of having to find a sighted person to show the blind person around or using a cane to guess what is in the room on the initial visit of a location. We would have a commercial very similar to late-night infomercials showing a comparison of using a cane and having someone guide the user versus just asking the phone directly where objects are.

## 4 Project Related Resources

- [1] Caverly, Doug. "Google Maps Makes Use Of Crowdsourcing." 2007. WebProNews. 2009 <<http://www.webpronews.com/topnews/2007/08/03/google-maps-makes-use-of-crowdsourcing>>.
- [2] Harrington, Nathan. "Map places, people, and relationships inside a building with open source software." 2007. IBM. 2009 <<http://www.ibm.com/developerworks/library/os-gimpmap/>>.
- [3] "Navigating a Building for the First Time?" 2008. American Foundation for the Blind. 2009 <[http://www.afb.org/message\\_board\\_replies2.asp?TopicID=4064&FolderID=3](http://www.afb.org/message_board_replies2.asp?TopicID=4064&FolderID=3)>.
- [4] "The Mind of a Building in the Palm of your Hand." 2009. Micello. 2009 <<http://www.micello.com/>>.
- [5] "Real-time maps and traffic information based on the wisdom of the crowd." 2009. Waze. 2009 <<http://www.waze.com/>>.

## 5 Connection with CS 425 Project

The current project for CS426 is a continuation of the project from CS425. We will be building on top of the existing application which is just the user interface at the moment. We will add the ability to add and remove the room items to and from the database, respectively. We will also add the ability to get a more precise location of room items on the map. If there is enough time we will also have a three dimensional representation of the room drawn on the screen instead of the current two dimensional bird's eye view.