BeeGather

A pedestrain navigation app., for the crowd, on the cloud.

Motivation

As we all know, the Georgia Tech campus isn't safe. Georgia Tech Police Department address this issue by providing crime alert information on the website[1]. However, people can't really understand the severity and the effected area just by a glance of look. Furthermore, people don't go to a website everytime they're passing through the campus. What we want is a mobile app that is capable of showing as a safe route to the destination. However, it is not enough to rely on just the official crime information. There is a famous application called Waze[2]. Waze is a social navigator app that allows people to send traffic feedback and integrate those crowd-sourced data into route calculation in real-time. We wanted to grab the idea and make it into this app. We will allow user to submit a crime-in-progress or safe-feeling information by a tap on the phone. It is our goal that we want to deliver a method that calculates safe routes by the input of both official data and user-provided feedback.

In order to get enough users to use the app, we need to provide some incentives for them to use our application. We propose to provide direction information for new students in town and visitors. One of the featured function is called "Where should I go?". You answer a series of designed questions and we figure out where and how should you go for help. We also designed a feature that allows people to see where are all those people like me gathering around. For example, a freshman would like to know where is people in his age would hanging around. Our goal is to use great visualization techniques to provide location information while keep the identities of community users in anonymous.

Related Works

There are many apps out there that either offer a subset of our features or provides the concept that we would like to work on. There are also some services that we would like to mention it since we will make use some of the information from those services as data sources.

- Waze: Crowd-sourced GPS navigator for smartphone
  Waze is an car navigation application that takes advantages of crowd-sourced traffic information. It works just like any regular navigation app. You specify a destination and it gives you a set of directions. The real power is hidden behind the curtain: routes are calculated in a way that takes users feedback as one of the factor. Users can report a traffic jam or car accidents just by a tap on the screen. The entire community can benifit from a simple but powerful single tap. We are taking the concept of Waze to build our pedestrain-oriented navigation app. We believe that it would make our app better by letting the user community get involved.

- Yelp: the best place rating service in the US [3]
  Yelp is a great place to read reviews for various kind of places like resturants, coffee shops, bars and even includes automotive services and beauty salons. It is also a popular service that is being actively used by students. We use Yelp for providing some Point of Interests around campus. We believe that it would be the best to work with a service that our target audience(students) is known of, rather than spin up a new database.

- Twitter: A popular micro-blogging service [4]
  Twitter is a popular micro-blogging services for people to post their status. Those posts are called "tweets" on the Twitter. A tweet is composed of a text message and sometimes contains location information. We would like to use those tweets tagged with location information as a bootstrap set for the feature that shows where people would gather around the campus.

- GaTech Police Crime Alert
  The official crime alert information provided by Georgia Tech are being used as a base information for creating the heat map. We will give this data more impact factor over than user's feedback since the data is coming from an authentic source.

Features of Proposed Work

Our main goal is to design an crowd-sourced pedestrain navigation app with various great ways to provide real-time visualization to users. Based on the idea, we determined a feature set that we are going to implement.

- Map: The foundation of everything
  The map is the core of our work. We will use the public available OpenStreetMap[5] as our base map. Many data visualization will be expected to be presented on the map, such as crime heat map, routes to destination and people density map. Simple POIs(Point of Interest) search will also be made available to the users.

- Dangerous Heat Map
  We would like to propose a formula to calculate the dangerous level of areas. In our concept, the crime heat level is decided by three main factors: dangerous type, elapsed time since event and data source. We will give an impact factor for each dangerous types(work-in-progress, road block or crimes) and different types of data source(authentic, community) and decide a decay factor for passed time. We hope to use these information to construct a smart heat map that updates over time dynamically. For long term, we would also like to explore a possible model for introducing historical statistic data as a factor too.

- Where should I go?
  This can be almost certain the most frequent asked question for new students. Despite all those information sessions, we still having trouble figuring out "Where should I go?". For example, all new graduate students with RA, TA funding needs to go through a new-hire process. The process involves many steps and many places, and thus confuses new students. We would like to design a way, for example, by asking a series of question, to help users to find what's their next step and place.

There are a few additional visualization of anonymous data that we would like to implement into the software. However, due to the possible time constraint, those are listed separately here. We still intend to implement those features.

- Where is everyone?
  Social is always a important thing for students. In addition to just providing the event information on the map, we would like to design a feature that shows places that people having a similar profile like yours(major, class level...) gathering.

- Who are they?
  Sometimes you're just wandering around in the campus and wondering "Wow. Looks like lot of people ahead, who are they and what they're doing?". We would like to explore a way to reveal such kind of infromation without giving out identities data. Privacy is always our first concern.

System Architecture
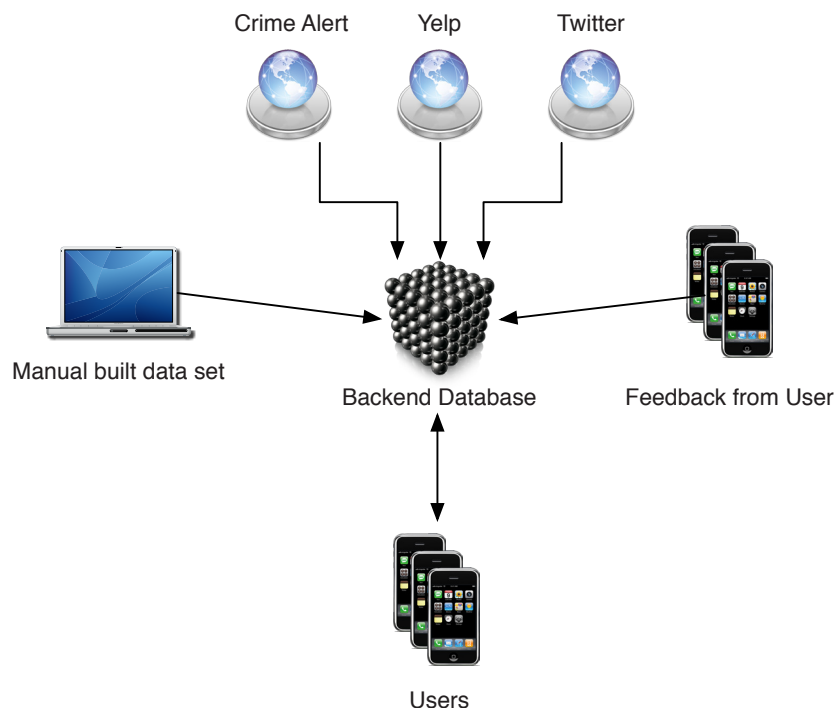
Our system architecture composed of several components. It is all centered around the backend service. The backend database collects data from various third-party data sources, such as crime alert database, yelp and twitter. We mixed it with a few manual generated data and feedback from communities. We will strip the identities from data and transfer it to users. We intend to focus on iOS and/or Android client first. However, for the purpose of demo, we may build a prototype of backend as well.

- Backend
  We would use Ruby to write our backend service and build a datbase using PostgreSQL for storing all information collected from the users. These information is stored without the identities, so even if we have a data leakage, no personal privacy history could be gathered from the system.

- Data Sources
  We use the data from three kind of sources: third-party data, manual built data set and community feedback. We will integrate those data and provide user with a useful visualization.

- Users
  We expect user to access our services using a smartphone. We plan to roll out the iOS app and Android app as a start. The client app will make the query and the server will mixed up all the data we have and return only necessary data for clients to display visualizations. The raw data is never being transmitted over the intenet .

Foreseen Risks

1. Accuracy of Dangerous Heat Calculation
   This is one of the most ambitious target in the project. We both are neither an expert in the relating fields. We will survey papers from realted fields and try to deliver a close approximation. However, if we can't figure it out in time. We plan to use a simplified model for presenting the idea.

2. Unable to deliver all features in time
   We have a lot of features that we want to make it into the app. Time isn't just so merciful from time to time. This is why we devide the features into two parts. We would focus on the demo-able features first and improve the accruacy of the system.

3. Insufficient user-generated feedback
   We understand that large portion fo users are not willing to share their information. We are still investigating this issue. For example, providing some incentives to the users and make contribution to community a mutual benefit. We may also try to adapt the level/achievement model from games to make user more self-motivated. However, there is some initial and dynamic third-party data set are being used in the system. The user-generated content is used to make the system better, not to just make system work.

Deliverable

- Source code of Software

- Submission to AppStore / Google Play

- Presentation / Demostration materials

- Final Report

Future Work

- Extend the idea of dangerous level
  For example, we could adapt this model for calculating "fun level" of a given area. We can use the same idea for more kinds of information.

- Expand Service Area
  We would start to do it for the Georgia Tech campus. If the idea is proven to be work, we may try to introduce more service area into the system.

Work Distribution

The work distribution is roughly 50%/50%. The detailed information is listed below:

Items	Members
3rd-party API module	Chien-An Zero Cho, Jung-Hau Chen
Backend & Dataase	Chien-An Zero Cho
Android App	Jung-Hau Chen
iOS App	Chien-An Zero Cho

Workplan

	24-Sep	1-Oct	8-Oct	15-Oct	22-Oct	29-Oct	5-Nov	12-Nov	19-Nov	26-Nov	3-Dec
Feature Analysis and Design	■	■									
Technology researches: iOS, Android and Web services		■	■								
Implement 3rd-party API modules			■	■							
Build an initial set of database				■	■						
Implementation: Map(incl. Heatmap)				■	■	■					
Implementation: Search					■	■	■				
Implementation: Where should I go?						■	■	■			
Implementation: UI improvement								■	■		
Preserved time slot for low-priority features									■	■	
Project presentation and Demo preparation										■	■

References

[1] Crime Alert from GaTech Police - Maintained database of recent crime events

Viewed at http://police.gatech.edu/crimeinfo/crimealerts/

[2] Waze

Viewed at http://www.waze.com/

[3] Yelp

Viewed at http://www.yelp.com/developers/documentation/v2/search_api

[4] Twitter

Viewed at http://dev.twitter.com/

[5] OpenStreetMap

VIewed at http://www.openstreetmap.org