drawnTogether – a collaborative approach to virtual graffiti

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1. ABSTRACT

In this work, we propose and implement a new application enabling ubiquitous creation of virtual graffiti, intended to support location awareness and interaction amongst mobile peoples despite their lack of temporal co-location. In particular, we developed a mobile application using the GPS and compass within the iPhone 3G S to allow participants to create sketches attached to real world geographic locations and others to view them and contribute at a later time. We intend to show user interaction rates among participants increasing when they can contribute to something permanently, even in the digital sense.

2. CONTRIBUTION AND BENEFITS STATEMENT

> Describes a system enabling ubiquitous creation of virtual graffiti, intended to support location awareness and interaction amongst mobile people despite their lack of temporal co-location.

3. PRIOR WORK ANALYSIS

Zurita et al. [5] presents MCSketcher, a mobile collaborative sketching system, using handheld devices in an ad-hoc network. People can draw sketches with collaborators in the same page in the system. They can take a picture and use it in the background of the drawing. The system supports gesture recognition for basic navigation gestures, and selecting and resizing items. Collaborative work is only available in an ad-hoc network. In other words, friends or collaborator can only work together in close distance. Our application connects to a server to store what users draw and to retrieve what they drew in the past using cellular networks. One can collaborate with not only friends, but also any people.

Kim and Dey [2] presents displaying augmented reality based car navigation information on windshield. Augmented reality helps elder people can concentrate to drive a car and easily follow directions from a navigation system. Augmented reality is one of ways to display various information in a view. Likewise, overlapping sketches can help for users to know what has happened in a certain location, even though augmented reality is not exactly applied to our application. In addition, our application provides users with some filters such as name of a drawer, time and so on, so that they can select what they want to view.

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Bastéa-Forte and Yen [1] presents a collaborative sketching tool. Each user has a Tablet PC to draw some sketches and to view shared sketches. Each users drawling is synchronized, so that users can view the same drawling. The collaborative sketching tool helps each users contribution is equalized although it reduces total number of sketches. Our application enables users to collaborate drawing no matter what their relationship is.

The authors in [4] are trying to combine various context-aware applications. They want to retrieve data from different sources and services, thus design a general purpose client software that can be used to access a variety of context-aware services. In their paper, they proposed an architecture of their system model. They use messenger protocols. If a service has new information, it sends a short notification message via the servers to the client. The client can then decide whether it wants to retrieve the full data. Therefore, the client can directly connect to the service. A discovery service is used to find services which are relevant for a client in its current context. It uses the messenger protocol to inform the client software about new services. In our project, we will find sketches relevant for a client based on its current context information - both GPS data and twitter friends.

The authors in [3] tested a few hardware and software technologies in real-time collaborative system, basically raised two fundamental principles - collaboration and persistence. The two principles refer to the ability to communicate ideas with other interested parties in real-time and the ability to store the results of those interactions for long-term reference, respectively. The softwares include NetMeeting, OneNote, DyKnow. Their work is mainly to help students share class materiel and simultaneously edit presentation text or sketch.

4. REVISED PROPOSAL

We are going to develop a collaborative artistic application for the iPhone 3GS. This application allows users raw sketches on their iPhone and upload the sketch as well as their global position and orientation at that moment, to a server. The sketch can be anything the user wants to draw. It can be the view he/she is seeing, or the idea he/she is thinking about, or his mood and his feeling. The purpose of this application is to help users collaborate and communicate better with others in the same network, or let actors be more aware of what happened around based on context information and more involved in social activities. The context information contains both temporal and spatial information. Each sketch will be timestamped at the point it is uploaded to the server.

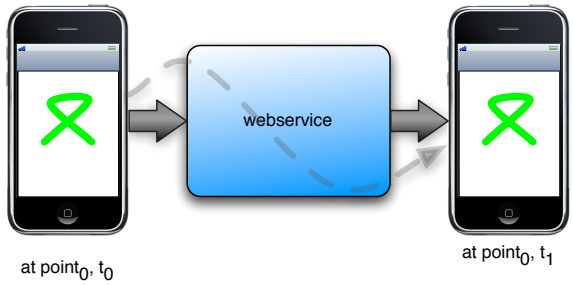

Figure 1: A simplified diagram showing client communications

The spatial data has:

1. the current position the user locates, indicated by x (latitude), y (longitude) and z (altitude) available via GPS in the device.
2. the current orientation the user faces available via the magnetic compass within the device.

The orientation is important because view would be affected given different orientation.
Just like common social networks, users have his/her own networks in our system. i.e., one may only interested in his/her friends' sketches or sketches based on their tagged metadata. It is expected that the amount of created sketches could quickly overload our small interface. For this reason, we are initially allowing sketches to be filtered based on tags and their creator, as seen in Figure 2. Further work will focus on ways to display this potentially large dataset in a way optimized for small devices.
The specific activities users will conduct using our system include:

1. Hold iphone in hand, stay at any location GPS can track.
2. On the iphone screen, make some sketch as seen in Figure 4
3. For sketch, users can paint in a limited number of colors and have that creation tagged as seen in Figure 2
4. As the sketch is created, it will be uploaded to the server at small increments (every n seconds)
5. Users can retrieve entries based on a simple query interface. Thus conditions involve: social relations, tag, time, and present location.
6. Users can view which sketches are near them via a map interface, as seen in Figure 3

Here is an initial description of the components we will need to prototype for the system (hardware and software)

1. Client interface
   - iPhone 3GS
   - Sketch application
2. Web service

Figure 2: A mockup of the proposed settings interface

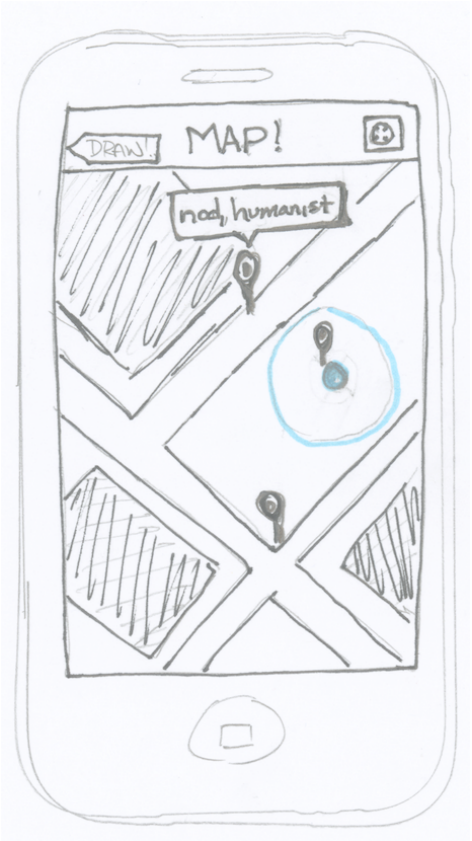

Figure 3: A mockup of the proposed map interface

Figure 4: A mockup of the proposed drawing interface

- Operating system: Linux
- Web server: Lighttpd
- Web application: custom service build using Django framework
- Database: MySQL
- Code management tool during development: git

5. EVALUATION PLAN

All people who own an iphone may be interested in this system, especially young people in university. If interviews and tests need to be conducted during the course of the project, we prefer do a small group of field study. We first introduce our system and make them aware how useful and funny our system is. After users have much experience with the application, we will get their feedback about this system based on interviews. We may input some random sketches into our server repository before users are able to view submitted drawings.

5.1 Hypotheses

The sketch application on iphone 3GS should be manipulated conveniently and effectively. On the screen of iphone 3GS, users can make sketch freely with four colors. The most significant part of this application is that collaboration among users should happen in real time, even with large number of people drawing for the same object at the same time.

5.2 Paper Mockup Evaluation

Before we write the application, we will conduct an interview with 5-10 people for the mock interactive interface on paper. We will observe what they will draw on the paper. Of course, the available area on the paper is the same size as the screen of iphone 3GS. T his part will be done before Nov. 24.

5.3 Field Study

After the first version of our application is done (after Dec.1 and before Dec. 5), we will perform "hands on interviews" with 5-10 people who have iphone 3GS. Basically, we will obverse how people are using it and ask them their opinions about our system.

5.3.1 Observe users

We will help users to install the application, but when the installation is finished, we will not teach them how to use the application, just observe how users will manipulate in their iphone 3GS screen in each step. During this process, of course, users will ask questions about what would happen when touching the interactive screen or in order to show what the user want the screen to be, what kind of operation should be done? Based on those questions, we will know what part should be revised in the application. Also, we will see if the sketch will be updated automatically in real-time among other users' iphone screen.

5.3.2 Interview

After users finish playing with our application, we will ask some questions as the part of interview. Here is an initial list of structured-interview questions:

- Is this idea interesting? Are you having fun with the new iphone 3GS application?
- Are the sketch setting options enough for you to draw? If not, what else should be considered?
- How you like the user interface? Any improvement needed?
- If you are the designer, what other affordances do you like to add into our application?
- Will you recommend this application to your friends and play with them together?
- Is there any problem for this application? Any suggested solutions?

6. DEVELOPMENT PLAN

The scope of this project and the tight deadlines means that team communication and productivity is of the utmost importance.

6.1 Application Environment and Development Tools

6.1.1 Mobile Client

Since the prototype is intended for the iPhone OS, there are few options for development environments. The path of least resistance (and greatest productivity) is for the application to be written in Objective C, and built using Apple's iPhone SDK toolchain integrated into the Xcode IDE. It is

possible to develop iPhone applications outside of Xcode, using other text editors and foregoing the builtin debugging integration that Xcode offers, but to compile and link, one is still required to use the provided tools by Apple. For this reason, our team will focus on the Xcode environment and the full stack that it has to offer. In particular, we will be using the following:

- development workstations will run OSX
- Xcode
- iPhone 3G S
- iPhone Simulator

6.1.2 Web Service

In order for the applications on the client devices to share content, a centralized web service is required. There are many options within this realm, however, for ease of development since time is short on this prototype, this web service will be built using the following:

- Python scripting language
- Django Web Framework
- Lighttpd HTTP Server
- MySQL Database
- JSON for data transport

This stack of tools has been widely utilized in numerous installations and in particular, the Python language has proven itself to be quite powerful, yet easy to learn.

6.1.3 Version Control & Source Code Management

In order to facilitate sharing our work, we have created a repository at GitHub[1]. This allows us to use Git, a distributed version control system, for all of our created content. Our source code, scripts, and even our papers (written in LaTeX) will be stored in this shared repository. This allows us, as a distributed team working in disparate locations, to share all content and stay up-to-date with others contributions.
Git also provides issue tracking that we have begun using in an effort to track progress and discussion on multiple concurrent items.

6.2 Development Milestones

- 17 Nov – Storyboards and Lo-fi Prototypes
- 19 Nov – Webservice completed and API locked for data transfer
- 23 Nov – pre-Alpha "Sketchable" interface working on Sim with fabricated geo data
- 24 Nov – Initial User Feedback incorporated into final designs
- 26 Nov – Early "Alpha" version of the mobile client ready
- 1 Dec – Prototype due

[1]http://github.com

6.3 Application Architecture

The heart of the mobile application will be the integration of a live video feed from the device's camera overlaid by user contributed sketches for the current location of the device. The application will rely on Apple's CoreLocation service to provide the location and orientation information in order to retrieve user content from the web service. We will run an NSTimer that will create NSInvocationOperations at regular intervals to submit any user created content in the background during viewing and to retrieve any new content for the user's current geographic area.
We intend to incorporate a simple user identity component using Twitter. This will allow us to attach a user to a sketch without having to manage the identity infrastructure. By having identity information attached to each contribution, we will also have the ability to allow users to filter based upon the user.
There will be a tagging component, although it will be limited in this initial prototype. The user will be able to create a set of tags that will be applied to sketches created after tag assignment.
Finally, a map view will be provided which will indicate to the user sketches near to them, to allow for "sketch tours" or other artistic discoveries.

7. SCENARIOS

We can apply our application to various scenarios. In this section, we show two of them.

7.1 Scenario 1: collaborative drawing

Alice and Bob are students at Texas A&M University and are friends. Alice wanted to draw the MSC building before it is remodeled, so she went near to the building and sketched it using our application. She did not finish the drawing because of a class. While she is going to a classroom, she sends a SMS message to Bob. The message is "Could you finish the sketch for the MSC building in location X?" Fortunately, he is passing in front of the building and starts to add some sketch into the figure, which Alice drew. Sometimes later, he finishes to draw the building and sends a SMS message to her. The message is "I'm done!" After the class is finished, she goes to the location in which she drew the building. She can view what they drew and is satisfied about what they did.

7.2 scenario 2: recalling a old building

Now the MSC building is under construction. George is a new student at TAMU. He hears about the old MSC building from senior friends, but he does not know what exactly it looked like and what happened near to the MSC building in the past. His senior friend tells him to use our application to view the scenes because some students drew the building and scenes near the building in the past, leaving some comments. He can view stored scenes and filter them by a drawer, time and so on. Even though the building is under construction, new students including George can recall it.

8. REFERENCES

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