MeetDroid a Smartphone's Augmented Reality Social Network

Igor Nelson Garrido da Cruz
Faculdade de Ciências e Tecnologia
Universidade de Coimbra
Coimbra, Portugal
igorcruz@student.dei.uc.pt

EXECUTIVE SUMMARY

Augmented Reality is the name given to the technique which overlaps computer-mediated information on an image of the real world using the Smartphone's camera. This technology creates a better user interface which allows an intuitive way to show information to the user and consequentially creates a more real world context aware application.

On the other hand a Social Network allows users to communicate expressing their feelings knowing what is going on at a given time and even sometimes creating new friends.

By creating a Social Network that uses Augmented Reality, we can have a better insight of the user's position using the GPS sensors and consequentially allow users to communicate using a more user-friendly interface.

Keywords

Augmented Reality, Ubiquitous computing, Social Network, Context Aware Software, Smartphone Applications, Geolocational Software

1. MOTIVATION AND GOALS

"Augmented Reality interfaces enhance user's perception of and interaction with the real world"-[3]. The information added in the virtual layer cannot be seen by the user with his natural senses, so we create a layer capable of interpret information and embed it with a representation of the real world. In this case the camera of the mobile phone.

Social Networks sometimes provide a lot of information of multiple categories uploaded by the users. This data needs to be mined if we want to achieve some concrete information about a given theme. Some of the bigger Social Networks already monitor user's position at the moment. However this information is not treated decently and sometimes is even ignored by other users. However we can join Social Networks and Augmented Reality and achieve the best of both worlds, a Social Network in which users are aware of their physical world surroundings and can check the location of their friends, and what they are doing.

So we aim to create a Social Network that uses this model of interaction with the user and can create a better sense of being embedded with the real world creating something more similar to what exists in the Nature.

2. APPROACH / METHODOLOGY

After some research on the Internet about augmented reality engines for mobile devices I found out that there are two main types of approach on this subject, they are:

Marker based[1] - approach that recognizes images in the camera of the mobile device through techniques of image analysis and recognition and draws objects on top of the original image with the correct position and rotation.

Geolocation based[2] – The application knows the position and direction of the users on the planet Earth using GPS or other positioning system and calculates what we can see based on this geolocation.

For the realization of this project is necessary that the augmented reality engine has knowledge of the user's position and what is around him.

3. REQUIREMENT ANALYSIS

In this chapter I present the functional requirements for the project concept to be implemented successfully. These requirements were building considering other applications that exist in the real market and considering improvements and diversification of their functionalities.

[Required] - Implementing an Augmented Reality Layer able to show contents provided by the application

It will be important to build a layer capable of represent all the information of the application and which can show users and their messages in front of the on Smartphone camera image. The layer should simulate user's vision, that is, it should have a behavior in which the "virtual" information overlays the camera in a geo-locational context aware way.

[Required] - Treatment of Augmented Reality Content related with the application

Another basic function of the application is the capacity of managing all the information related with the Social Network. Creating and maintaining user accounts and implementation of the ability to send messages to be displayed in the layer of Augmented Reality are among the requirements in this section.

Adding Client-Side Features

At a later stage of the project it will be of value add a few options that can enhance the experience user. Among them we highlight the functionality of adding users to a list and show whether or not to show friend's posts in the layer. It would also be great to take measures to reduce consumption battery.

Supplementary Improvements

Additional improvements on the user interface such as limiting the number of posts visible in screen. Possibility of adding sounds. It will also be important to implement mechanisms deniability, at this point it will be interesting to implement one invisible mode that allows the user to see the contents of the application without having to reveal their position.

4. DEVELOPMENT

4.1 Libraries and Software Used

In order to implement the requirements presented above I used Android Augmented Reality Framework to manage the augmented reality and the location of each user.

For the communication between the client and the server I used one socket per client in the server side and the transmission of information is implemented using JSON objects or JSON arrays as a way of allow a simple intuitive high-level system and interoperability between systems for future development.

4.2 Java Server

The server was developed in java, it is hosted in meetdroid.dei.uc.pt and should be run using "java –jar su.jar &" in order to allow the application to run in background.

The server is responsible for managing all the messages and user accounts. Also the amount of information retrieved when the client changes the radius is done in the server side. So it has a list of users and a hash map of friends. These lists are stored in the files *md_users.mdb* and *md_friends.mdb* respectively, being loaded each time the server starts.

The messages are volatile and created each time the server is running and a user makes a post being removed one hour after the insertion. This removal is possible, because when a message is created the server instances a new object that establishes the message to be deleted to a given time of removal. In background a thread is running every 10 seconds and verifying if the actual system time is already bigger than the time of removal of a given message.

About the interface used as a solution to the problem the implementation is very simple, the server receives a JSON message parses this message and executes the command which corresponds to the request made by the client and responds with a JSON format string. This implementation allows a simple approach and the possibility of interoperability with others application and/or servers.

As functionalities implemented in server side it allows a user to login, register, make requests within a given radius, post messages, get a list of friends for a given user, add a user as friend and get the profile information's of a given user.

From these functionalities described above is important to detach the capacity of make requests within a given radius as a way of explaining the interaction.

```
{
        "command": "request",
        "username": "example",
        "password": "example",
        "latitude": "39.931261",
        "longitude": 75.051267",
        "altitude": "10",
        "radius": "50",
}
```

This information is parsed and the distance between the user's position and the posts stored in memory is calculated. If this distance is lower than the radius given by the client, that post is returned.

An example response would be an array of objects:

[{"title":"test","username":sender,"altitude":1.0,"longitude":-75.051267,"latitude":39.931261}]

4.3 Android Client

In the client side were created diverse activities to interact with the user. AndroidFacebookConnectActivity.java is responsible for interacting with the server, working as login/register portal. This activity stores information as the server ip which is used in multiple places of the client. Data as the username, password, and other volatile variables are store using the Data.java class to be accessible at any class.

When a user makes login with Facebook the application will try to login using the FacebookID as username and password, however if this credentials do not exist a user is created with that information and his Facebook display name and the login is made automatically.

There are some other classes that don't directly belong to the framework used and are very important to the execution of the client:

Demo

This class extends the AugmentedReality and is designed to be the starting point of everything in the application. It is responsible for calling the MeetDroidDataSource and get information from the server. It is also responsible for drawing buttons and options in the user interface. The markerTouced method is responsible for knowing if a user has clicked in a marker and call the Showperson class in order to show details of a given user.

AugmentedReality

This class extends the SensorsActivity and is designed tie the AugmentedView and zoom bar together. In other words it helps appends the zoom bar to the AugmentedView.
It works as a visual container for the camera, buttons and zoom bar.

The zoom bar is responsible for controlling the radius that is sent to server in order to calculate which posts we will show to a given user.

The post button starts the post Activity, allowing the user to input text and share it with the world.

Finally the option of showing only messages from friends allows hiding messages from users that don't know each other, making usage of the friends list which is stored in Data class.

AugmentedView

This class extends the View class and is designed draw the zoom bar, radar circle, and markers on the View.

Post

The class Post is responsible for processing user's inputs and sends them to the server creating a new post at the use's position.

Register

The class register allows the user to register in the server and start using the application. It needs username, password, email and gender. The name is used for posterior appearance in the posts.

Show Person

This class works as a social profile of the user showing his username and name, and making possible for a user to add another to his friend's list.

Figure 1 – Application Interface

5. DEPLOYMENT

After being developed, the application was tested by about 10 users for a period of one week. In general, the user's opinions were good, they said the idea was really good and about the technical implementation their opinion was that the application performs well his function.

There was some criticism about how users were signed in when they entered the application. In order to overcome this adversity I created the possibility to login with Facebook which forced me to change many aspects of how communications with the server were made and some major structural aspects of the application.

There were also critics about the accuracy of GPS, for which I cannot do anything. However, it will be better explained in section conclusions.

6. CONCLUSIONS

Through the realization of project it was possible to consolidate knowledge about the functioning of GPS system and Augmented Reality, it also gave me a better insight of the utilization of mobile networks such as 3G and Wi-Fi.

In practical terms the application works well when you have good GPS signal which only happens in outdoors. When we are inside buildings or in places of GPS signal shadowing the application operation is not good since it cannot have a location with the desired precision, or sometimes no signal at all.

On the other hand when in outdoors and with good GPS signal the application has accuracy on the order of 20-30 meters and is able to give us a pretty good insight on the user's location.

To achieve this precision, we have to run the application some time after starting the GPS receiver so that the Smartphone is already receiving an accurate location.

7. ACKNOWLEDGMENTS

During the development of this project the opinions and clarifications of some aspects were a great support provided by Dr. Carlos Bento of University of Coimbra. I also would like to detach the information given by Justin Wetherell when asked about some details about the implementation of Android Augmented Reality Framework.

8. REFERENCES

[1] Siltanen, Sanni – "Theory and applications of marker-based Augmented reality"- http://www.vtt.fi/inf/pdf/science/2012/S3.pdf

[2] Suita Tom, "Low Cost Precision INS/GPS Aided Geolocation For Real-Time Augmented Reality"

[3] Azuma, Ronald T. – "A Survey of Augmented Reality"

[4] IBM, Business Consulting Services – "Augmented reality: More than meets the eye" - http://www.07.ibm.com/services/pdf/etr_augmented.pdf

[5] Augmented Reality and Enhanced Television - http://www.cablelabs.com/advancedadvertising/innovationbriefs/Innovation%20Brief%20-%20Augmented%20Reality.pdf

[6] Justin Wetherell - android-augment-reality-framework - https://code.google.com/p/android-augment-reality-framework/