

Development of a Web-based Proximity Based Media Sharing Application

Erol Ozan, Ph.D.
East Carolina University
College of Engineering and Technology
Department of Technology Systems
Greenville, North Carolina 27858, USA
ozang@ecu.edu

ABSTRACT

This article reports the development of Vissou, which is a location based web application that enables media recording and sharing among users who are in close proximity to each other. The application facilitates the automated hand-over of the recorded media files from one user to another. There are many social networking applications and web sites that provide digital media sharing and editing functionalities. What differentiates Vissou from other similar applications is the functions and user interface that make it convenient for users to have their images taken by others without any effort on their part. The application can detect the other users who share the same location and enables media sharing only with users who are close to them. The application develops a synergistic integration of a number of open source code modules and frameworks to build complex functions. The project constitutes a light weight solution to a complex design problem.

KEYWORDS

Social networks, location-based media sharing, multimedia, social media, web application development, web development

1 INTRODUCTION

There are many social networking applications and web sites that enable digital photography and video sharing and editing. However, none of those systems offer location-based recording of media on one device by facilitating the automated hand-over of the recorded media files (e.g. photography, video, audio files) to a second party. In many social circumstances, individuals can find it convenient to have their image taken by other

people's devices without having to initiate the process themselves.

There are a number of location-based media sharing applications. For example, Piximity [1] allows users to browse the feeds that contain images from nearby locations. It is designed to help people keep up with events all around the world such as sports, concerts, and festivals. Another location based application is called Shout [2], which lets users post messages that are shared with those in their immediate vicinity or longer distances. Geofeedia [3] is another geolocation based application which provides capability to search real-time social feeds by location. It also enables users to monitor the locations providing content that they are interested in. Another application, Bivid [4] allows users to share media files and browse content uploaded by the users around them. An academic application can be found at Geopot [5], which is defined as a cloud-based geolocation data service for mobile applications.

Vissou is different from the existing location based applications in many ways. In Vissou, media sharing occurs between two users. Many other tools are based on the sharing of images with public or broader user groups. With Vissou, the user experience is based on media exchange between two users at a time. Those users are required to share the same geo-location. This is meant to prevent clutter and unwanted content. In addition, the communication between two users are limited with the exchange of photo or video files. There are numerous other tools and applications that enable the exchange of chat

messages. Vissou differentiates itself by focusing on the direct connection between users and only by the exchange of media files. One of the main contribution of this project is to reach a unique design configuration that provides utility for users in certain social settings.

2 GENERAL DESCRIPTIONS OF THE FUNCTIONS

Vissou constitutes a web service that can be accessed by Internet users by browsers using desktop or mobile computing devices. The user experience is optimized for smartphones. However, the application is functional on desktop computers as well. There is no functional difference between the experiences available for mobile and desktop users. The Vissou interface is based on responsive design practices, which ensures compatibility on various platforms including, smartphones, tablets, and desktop computers. Vissou can be used after completing a standard registration process. The following describes the limitations and rules that describe the interaction between users.

- A user can only send media file to another user as long as they are in close proximity to each other.
- The recipient of a media file can send media files to the sender no matter how far she/he is located from the sender.
- Vissou only allows the exchange of media files among users
- Users should make themselves visible in Vissou in order to see other users in their location
- Close proximity is defined as 50 m by 50 m square around a user.

A typical media recording and sharing event is described in Figure 1. The user selects a recipient among those listed on home page. They are the users who are in her immediate vicinity. To send a media file to the selected user, she clicks on the camera or video recorder icons next to the target user. Next, the smartphone interface activates the camera app, enabling her to capture an image. At this step, a user can select an existing image that is

already stored in the device instead of capturing a new image. One should note that, this stage is slightly different on a desktop or a laptop computer. In such cases, the computer displays the file system for users to select an existing media file to upload.

Once user captures an image or selects a file, the upload process starts. The file is stored in the server's file system. The URL data of the media file is stored on a database table. The file can only be accessible to the recipient. The new image appears in the media inbox of the recipient.

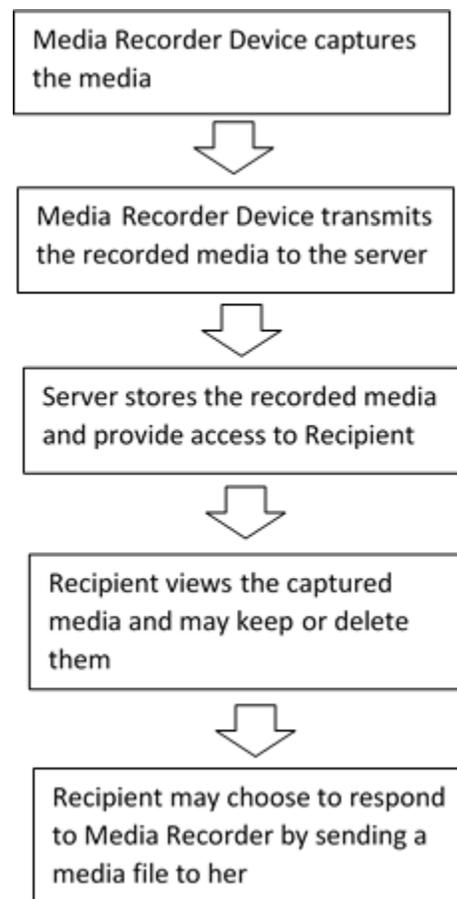


Figure 1. A typical media recording and sharing event in Vissou

One can envision a number of practical scenarios where Vissou may become useful and enhance social interaction. A number of scenarios are provided below to illustrate the use of the system and the proposed method.

2.1 User Having Their Image Captured by Others

Let us say Alice wants her photo taken by Bob. Instead of handing over her camera to Bob, she invites Bob to take her photo using the application. Bob captures Alice's photo using Vissou. The application captures the image and transmits the image file to Vissou server and makes the file only accessible by Alice. Using the application, Alice accesses the image stored on the secure server location. She may choose to download, delete, or keep the image on the server.

2.2 Reciprocal image taking:

In touristic places or social settings (restaurants, clubs, concerts, museums etc.), it is a common occurrence for people to ask strangers to take their photos by handing their camera to them. In many cases, the people who ask for recording reciprocate by taking the picture of the other party. Vissou can be used to facilitate this process.

2.3 Users start social interaction via the use of the app

Alice reviews the media files that she has received and selects the ones she likes. She connects with some of the users who took her photo by sending media files to them. Dialogues should consist of exchange of media files.

2.4 User documenting a part of her life (travel, wedding, party, sports event, concert) via the app

Alice keeps her Vissou app active during her vacation. Her video and photos are taken by other users as she visits touristic attractions and travels. By the end of her trip, she accumulates a collection of media, documenting her entire trip without spending any time in photo and video taking. She also benefits from being photographed from different angles and perspectives that can be hard to achieve by herself.

2.5 Professionals recording of events

Alice is a professional singer and gives concerts in different venues. It is hard and time consuming for her to facilitate the recording of her events. She enables and allows other participants to record her concerts. That way, Alice creates a collection of recordings of her concerts. She can review her performance. She can use the recorded media in her promotional and marketing activities.

2.6 Machine-based user capturing media via others' devices

The app can be installed on a computing system that is placed on a museum (or a similar public space) and it allows other users to take pictures and video within its vicinity. The recorded imagery can be shared on the museum's web site to promote the museum. In such scenarios, a store, a museum, a gallery, or a store can encourage to visitors to take photos and video in their establishment. The organization receives the images taken by visitors and builds a collection of media.

3 SOLUTION

The author developed a solution to build Vissou using various programming languages and frameworks, including HTML5, CSS, JavaScript, PHP and MySQL. Vissou is hosted on an Apache server. PHP 5.3.6 and MySQL 5 were installed on the server. Vissou also uses JQuery and Bootstrap frameworks to build responsive design and interactive user interface for the application. The user interface solution relies on the three main pages where most of the user interaction occur. Those three pages (home, media inbox, and profile setting) are accessible via icons on top of the screen. Figure 2 shows the three screenshots depicting those pages. Once logged in to the system, users arrive at home page, where they can make themselves visible in the system. Once a user is visible, he or she becomes an active user in the system. She can see a list of other users in the immediate vicinity. She can also be seen by others in the same location.

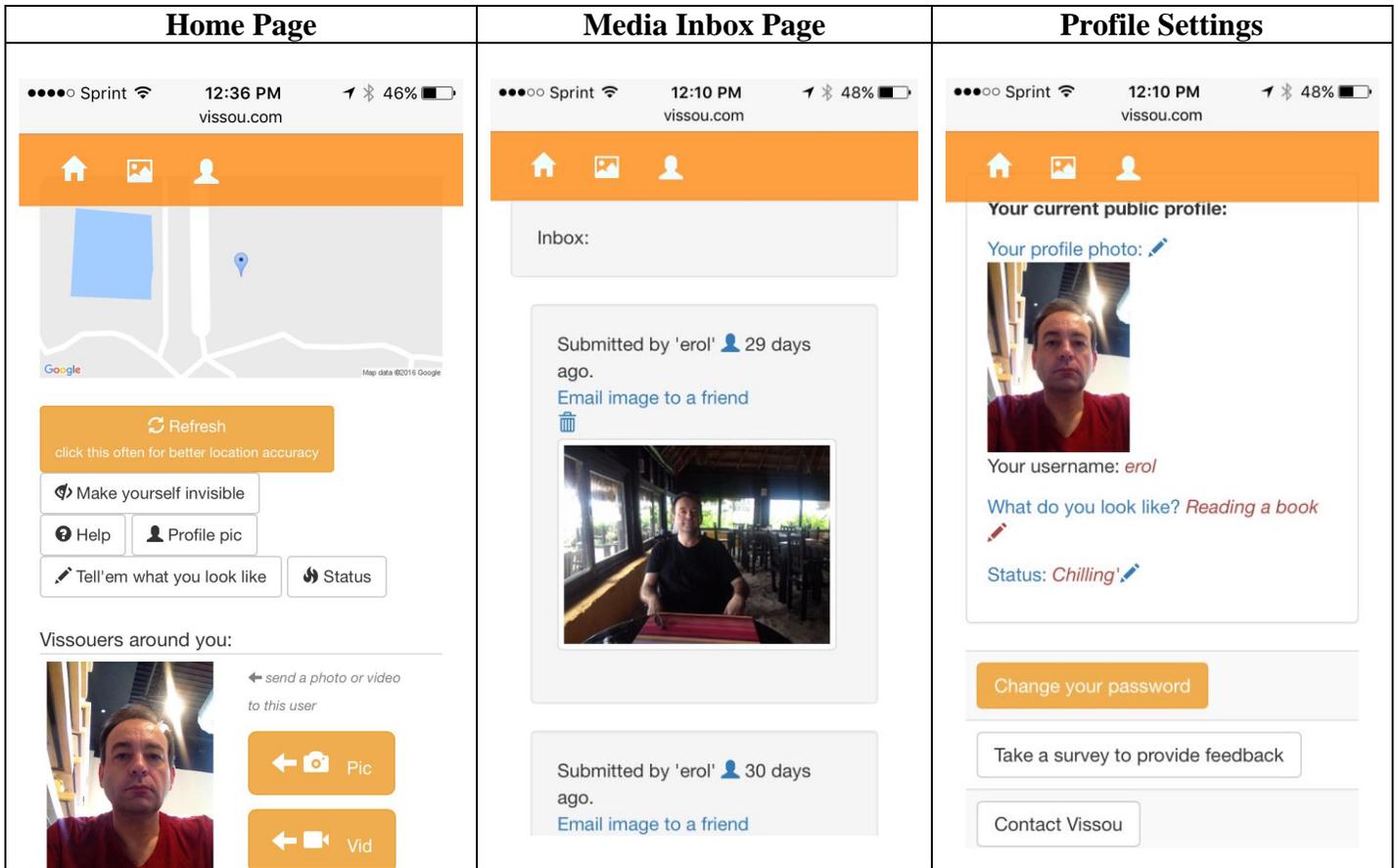


Figure 2. Screenshots of the Main Pages in Vissou

Media inbox shows the photos and videos received from other users. It allows the deletion of individual files. It also shows the age of the media files. Users can click on the sender's icon to connect with those users. Media files can be downloaded from this page. Profile setting page contains all the relevant function related with the parameters related with a user's account such as passwords, profile picture update functionality, and status updates. A complete list of functions accessible on each page is shown in Figure 3.

Vissou relies on AJAX methods to pull data from the server. Typically, it uses XMLHttpRequest object to exchange data with the server. It utilizes the open() and send() methods of the XMLHttpRequest object to send a request to the server. Those requests can be processed asynchronously, therefore, they provide an efficient way to prevent hang ups and slowdowns. AJAX lets the browser execute and process other

scripts while waiting for the server to respond to the HTTP requests. AJAX allows the application to process the data when it becomes available without blocking other ongoing tasks.

3.1 Location Detection

Geolocation detection constitutes an important part of the solution. Vissou relies on HTML navigator.location method to determine the GPS location of users. In HTML, developers can also use getCurrentPosition() method to gain access to the users' GPS coordinates. With the geolocation API, web sites can detect users' locations. For privacy reasons, the browsers must obtain users' permission to transmit location data to server. Vissou uses Google Maps service to display the location of the user on a map. That way, users can verify their location and may choose to refresh their location by clicking a button.

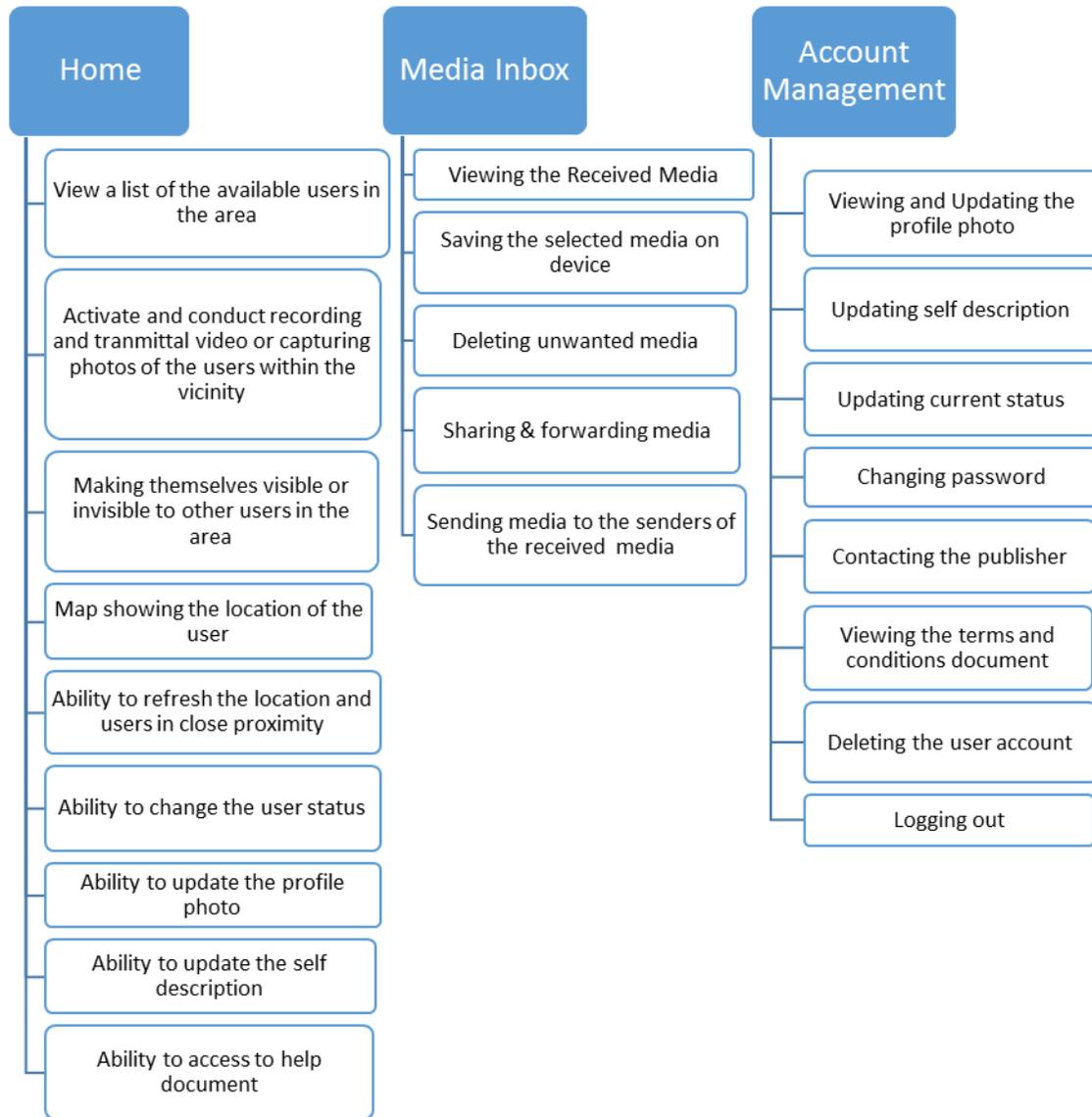


Figure 3. Main Functions Included in Vissou

There will always be location detection attempts that are not successful. Some users may choose to disable the geolocation detection on their browsers or devices. In addition, some browsers and devices do not support location detection. When the user location is not detected, Vissou displays a message (Figure 4) to warn users and give them the option of testing their location detection function.

Despite all the improvements in GPS sensors and location detection, there is still room for improving the accuracy of location readings. There is an increasing interest in improving the

accuracy of web based location detection services. Many applications rely on GPS and cell based location tracking in cellular networks. Alternative detection techniques are being explored by researchers. For example, in one of such studies [6], the scientists developed a prototype establishing “a simple path and location tracking system within an organization based on its available infrastructure Wi-Fi network”. Their system uses signal strength and the logs of previously used access points to approximate the location in a designated area.

3.2 File Upload Process

Vissou's file upload module is based on jQuery-File-Upload, a widget developed by Sebastian Tschan [7]. jQuery-File-Upload facilitates file selection, progress bars, validation and preview of the images, audio and video. The solution is based on jQuery. The upload process can be resumed if it is interrupted. JQuery-File-Upload can be integrated and used with a wide variety of server-side platforms and configurations, including PHP. It can also work with standard HTML forms. The author has made a number of modification in jQuery-File-Upload to make it compatible and communicate with the front and back end functions of Vissou. jQuery-File-Upload is available under MIT license at [7]. The file types that Vissou accepts are limited to the following; mov, avi, mp4, jpeg, png, and gif. Maximum file size is set to 5 MB. Before storing the images, the captured digital photos are resized so that the image height is limited to 800 pixels and the maximum width is set to 1200 pixels. The media files are uploaded in small chunks to ensure a reliable upload process.

3.3 File Storage Strategy

The media files are stored in the file system. Storage based on the file system provides faster access than data base based storage. The files are assigned random file names, which ensures the security of the files. The files can only be viewed by the users who are authorized to view them. JQuery-File-Upload widget's UploadHandler.php file contains the php code that handles the file upload process. The author has made a number of modifications in the file to make it compatible with Vissou. The modifications allow Vissou to use its own file naming scheming to generate secret file names for media files. The author also inserted code to facilitate the database operations for the storage of the new media files' URL locations in the file system. A secret file name is generated by the use of the following PHP code, which relies on the built-in random number generators of PHP.

```
$name = "media" . mt_rand(). mt_rand().  
mt_rand();
```

It has to be noted that the above php code does not modify the file extension. It determines the file name that excludes the file extension portion. The users are allowed to share the secret URL of the photos and video files. If they choose to do so, the media files can be accessed by anybody who has the secret URL address of the individual files.

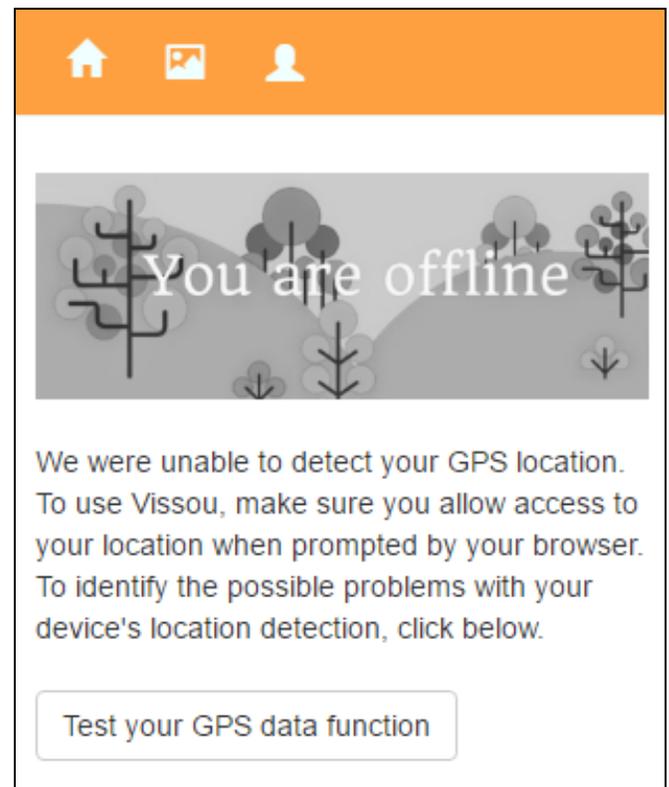


Figure 4. Geolocation malfunction warning screen

The following PHP code adds a row to the table that holds the data for each media file that is stored. Each row contains the username of the user who sent the file, the user name of the recipient of the media file, the URL of the media file, GPS coordinates of the media in terms of latitude and longitude.

```
$timestamp = mktime();  
$sql="INSERT INTO $tbl_name  
(mediataker,mediatarget,mediaurl,gpslat,  
gpslong,time) VALUES  
( '$mediataker', '$mediatarget', '$mediaurl  
, '$gpslat', '$gpslong', '$timestamp' )";
```

3.4 Database Design

Vissou employs five tables to conduct and manage various activities and tasks. Those tables consist of the following; members, userdesc, media, survey, and contact. The first two tables contain information about the current members. Those tables store the user name, hashed passwords along with other relevant details such as users' current GPS locations, their activity statuses, and their last login times. Vissou stores the URL data of the stored images and video files into a table, titled media. Whenever a new video or photo is captured, a new row is created in the table. The username of the member who takes the image, the username of the recipient, and the time of the file transmittal are captured. Vissou uses a separate table to capture users' feedback about their experience with the application. The table stores their response to various questions in the survey. The time of the survey completion is also retained. Another table is dedicated to store the messages sent by the users. These are the messages sent by the users to Vissou. Instead of using an email address for communication, Vissou employs a database action to capture users' messages.

4 PERFORMANCE EVALUATIONS AND OBSERVATIONS

Vissou was tested with various devices and platforms. Overall, the evaluations and tests indicate a satisfactory user experience on most commonly used devices and platforms. Effective testing of web applications is a challenging task as illustrated by [8]. The test results indicate that Vissou is compatible with most of the recent operating systems and device platforms.

There were some issues with older devices. For example, with iPhones 4S or older versions, frequent browser crashes were observed. The crashes were frequently recorded during the file upload process. However, this problem occurs with other web sites that employ complex HTML functions. On Chrome browsers, the location detection requires secure contexts such as HTTPS. Figure 5 summarizes the browser compatibility of Vissou's location detection function. It has also

been noted that geolocation function fails to work with the native browsers of some of the older smartphones. In such devices, the use of Firefox has solved the problem.

Vissou's file upload module is based on jQuery-File-Upload. The compatibility of jQuery-File-Upload is shown in Figures 6 and 7.

Browser	Chrome	IE	Firefox	Safari	Opera
Geolocation Enabled for the indicated versions or higher	5.0 requires the SSL connection)	9.0	3.5	5.0	16.0

Figure 5. Geolocation detection compatibility of Vissou

Mobile Browser	Chrome	Native Browser	Safari	Opera Mobile
File Upload Compatibility	on IOS 6+ on Android 4.0+	on Android 2.3+	on IOS 6+	12.0+

Figure 6. File upload functional compatibility on mobile platforms [7]

Desktop Browser	Chrome	IE	Firefox	Safari	Opera
File Upload Compatibility	All	6.0	3.0	4.0	11.0

Figure 7. File upload compatibility of Vissou on desktop computers [7]

Security is another area of concern for the design of all types of media sharing applications. The issues surrounding secure use of social networks have been investigated in many studies including [9]. Most standard security design precautions and operational best practices are applicable to Vissou's design concept. For example, it is recommended that Vissou should be hosted on a secure context that supports a SSL (Secure Sockets Layer) based connection. Vissou allows users to make themselves invisible to the other users. The users become invisible after an hour of inactivity. This prevents the unwanted dissemination of the user's GPS location in the system. In addition, a user cannot send a media file to another user unless they are in same location or they have previously exchanged files. Like most other similar applications, Vissou is vulnerable to geolocation spoofing. Currently, there is no feasible method that mitigates the risks involving this particular vulnerability. However, Vissou's range is short (typically maximum 25 meters between two users), therefore it is possible for users to check their physical surroundings visually to see the other users. Visual reaffirmation of the users is deemed feasible given the short distance between the users.

5 CONCLUSIONS

This paper presents a light weight solution to a complex web application design problem. The proposed solution and the design process that are explained in this article can be applied to many other similar design problems. This project demonstrates the effectiveness of the synergistic use of open source code, software frameworks, and modern web application development techniques in creating location based interactive applications. The location detection capabilities of today's smartphones provide considerable potential to develop novel design applications. This paper outlines and illustrates the major technical elements of such undertakings. The web application described in this paper constitutes an original alternative to the existing location based applications in the market. Readers are invited to try Vissou [10].

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