

# The Re: living Map - an effective experience with GPS tracking and photographs

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## ABSTRACT

This paper proposes an application, *The Re: Living Map*, which provides an effective city experience using a mobile phone, GPS tracking and photographs, and describes a new method for constructing the system, named “*gpsfred*”.

## Keywords

GPS, Tracking, Mobile Phone, Information Design

## INTRODUCTION

The proliferation of network connected, GPS-enabled mobile phones have allowed people to utilize positional information via GPS. While accessing information with mobile phones is becoming routine, the current use of GPS information so far has been limited to navigation. However, as it is possible to obtain GPS information from anywhere while connected to network, we can expect to see various other practical uses to emerge in the future. The mobile phones’ functions as a digital camera are evolving rapidly as well.

Standing on these backgrounds, we propose an application that allows users to effectively experience (relive) the city from a new perspective using photographs and the GPS tracking system named *gpsfred*. The project is based on our previous research, *The Living Map* [3].

## BACKGROUND

By linking photographs and transforming them in a similar fashion as Hayahito Tanaka's *Photo Walker* [4], we can create a virtual three-dimensional space that users are able to vicariously experience. Noriyuki Ueda's *GIS with cellular phone +WebGIS* [8] also creates a virtual city by relating photographs and GPS position data.

There are also some applications that enable communications through use of GPS information [3, 6].

One such example, *The Living Map* (Figure 1), is a previous research we have done. It is an online community tool that enables the user to exchange information about the city using a mobile phone. On this research, we used a city map as the interface for exchanging city information and creating network communities based on people’s interests.

Although these applications utilize GPS and/or photographs, no previous application has put GPS tracking at its basis to our knowledge. We propose three phases that allows us to effectively experience the city with GPS tracking and photographs: *Packaging*, *Reliving*, and *Sharing*.

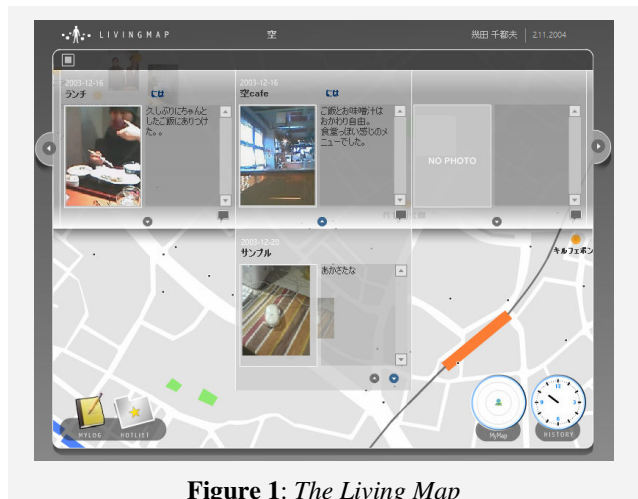


Figure 1: *The Living Map*

## EFFECTIVE EXPERIENCE WITH GPS TRACKING

We propose three phases to realize effective city experiences. In the city, users can package their own experiences through taking photographs and using the GPS tracking systems embedded in the mobile phones (*Packaging*). After returning home, they use our proposed

application, to relive their experiences (*Reliving*), and finally, to share their city experiences with others and experience those of others online (*Sharing*).

### 1. Packaging

In the *Packaging* phase, users are able to take photographs any time they like. These photographs, while sequentially discrete, reflect the users' display of strong interest (Figure 2). In contrast, information obtained through GPS tracking is sequential because it is always enabled in this phase, and it provides a common attribute for every user - position and time. For these reasons, the combination of GPS tracking and photographs allows users to package their experiences for sharing.

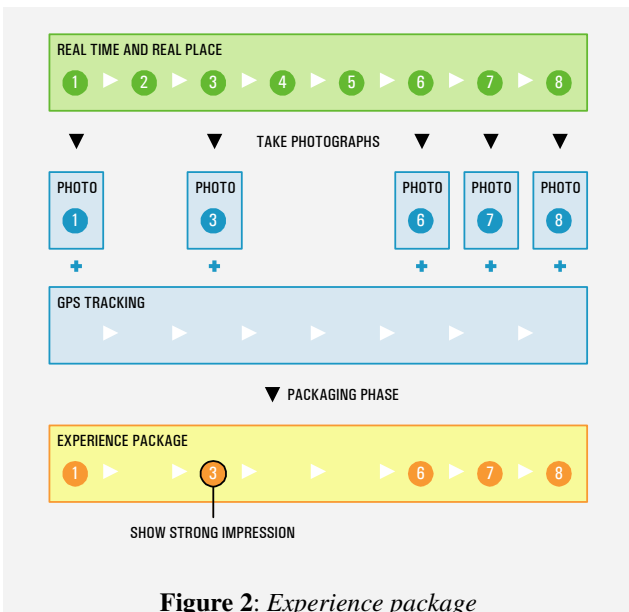


Figure 2: Experience package

### 2. Reliving

In the *Reliving* phase, *The Re: Living Map* gives users a richer city experience than a collection of still photographs can give. This is accomplished by automatically adding effects to photographs and playing them back in intervals proportional to the actual time intervals in which the original pictures were taken. The effects are calculated from the GPS tracking data. (Figure 3 and Figure 4).

This effect is created in accordance to the users' actions. For example, if the tracking data shows that the user turned right, we will see the next photograph push the previous photograph off the screen.

Playing them back in intervals proportional to real time prompts the users' memories to fill in the intervals between them. Through these effects, users are able to effectively relive their activities at the city.

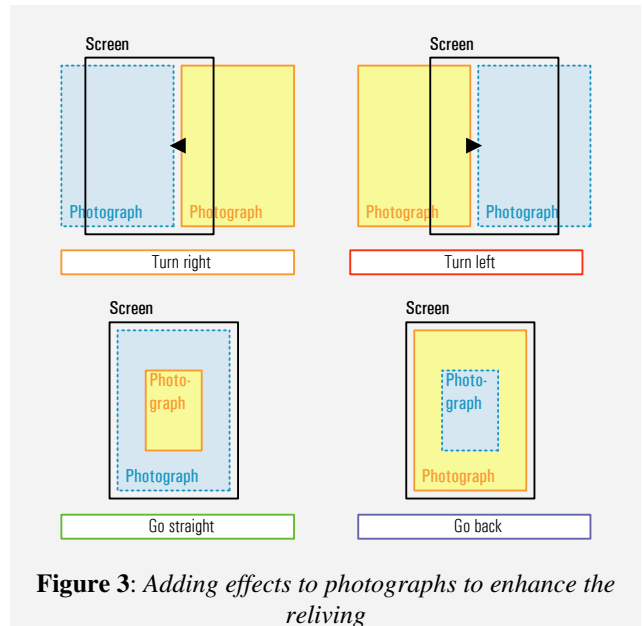


Figure 3: Adding effects to photographs to enhance the reliving

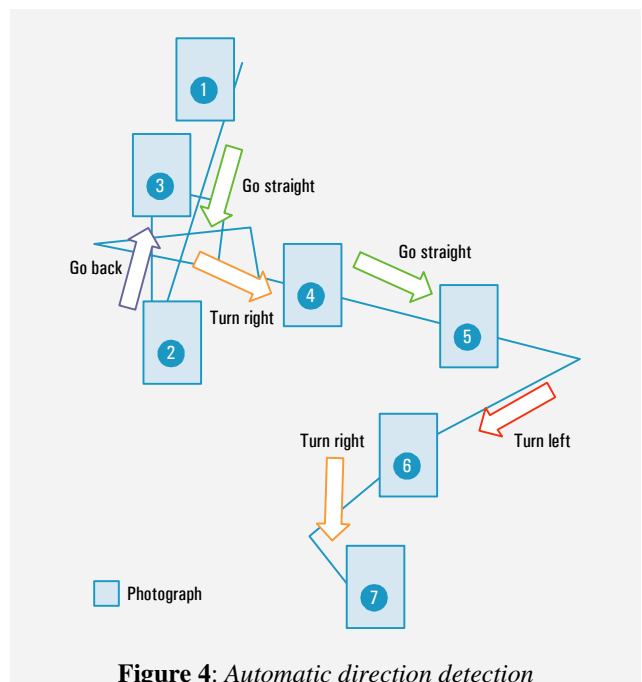


Figure 4: Automatic direction detection

### 3. Sharing

In the *Sharing* phase, we propose a method to share experiences, named "*Intersect*". With *Intersect*, the intersections of GPS tracking data between users act as starting points for the sharing of experiences. If the owner of the intersecting experience had allowed others access to them, users are able to experience them themselves using the intersections as their entryways (Figure 5).

The *Intersect* method provides users a new type of experience, attainable only through the sharing of individual experiences via digital means.

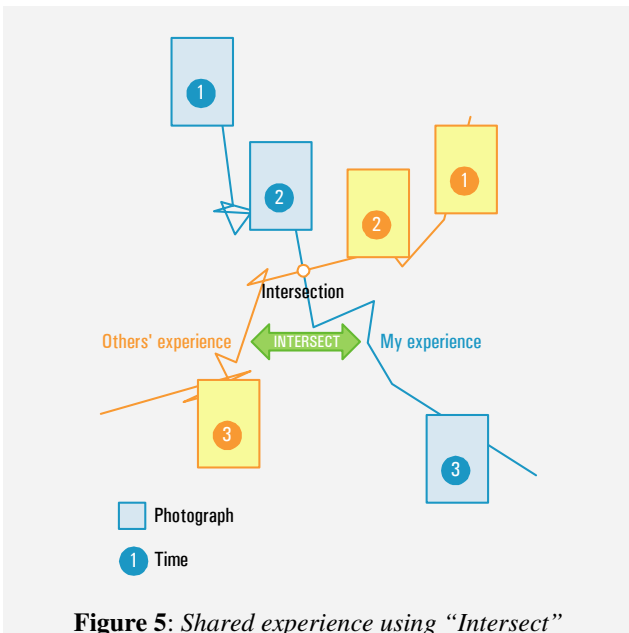


Figure 5: Shared experience using “Intersect”

With *The Re: living Map*, we propose an online application implementing these three phases with GPS tracking and photographs to give users a (re)living of their city experiences.

### APPLICATION

On this section, we propose an application, *The Re: living Map*, which provides effective city experiences on the aforementioned three phases. This application is implemented with *gpsfred*, an application framework we designed.

We will first give an overview of *The Re: Living Map*, and then go into the details of each of the features.

### Overview

*The Re: living Map* consists of two interfaces, one for the mobile phone and one for the personal computer (Figure 6 and 7). The interface for the mobile phone provides users an interface mainly to package their own experiences. The interface for the personal computer provides an interface to relive and share their experiences.

### Package experience on the mobile phone

The interface for the mobile phone has two functions; GPS tracking and taking photographs (Figure 6). Users may

switch the GPS tracking on or off and take photographs anytime they wish. The photographs and GPS tracking data, which constitute the users' experiences, are stored in the users' database via the internet.

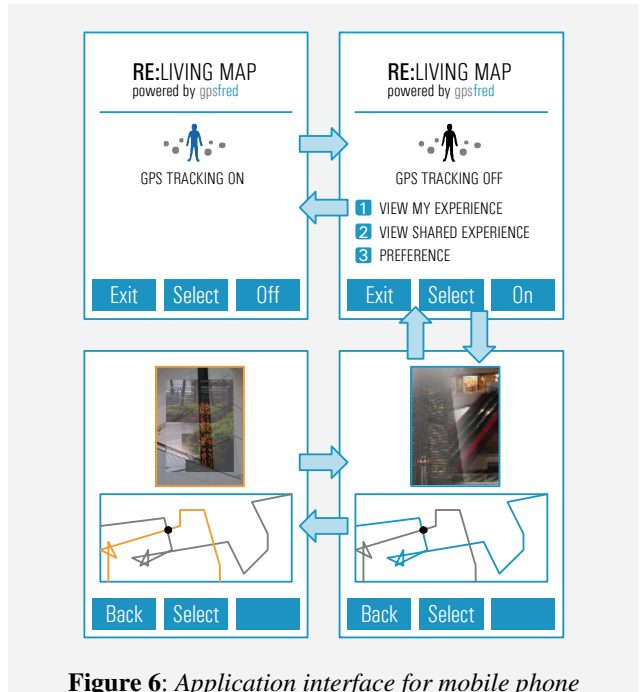


Figure 6: Application interface for mobile phone

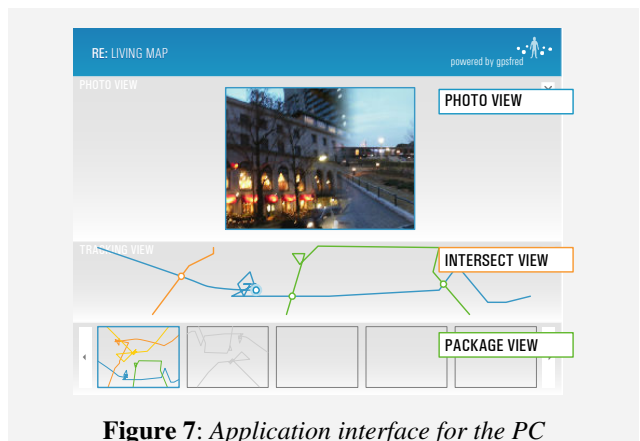


Figure 7: Application interface for the PC

### Relive experiences on the personal computer

The interface for the personal computer has three views; The *Photo View*, the *Intersect View* and the *Package View* (Figure 7).

In the bottom view, the *Package View*, users can select their own experiences that have been stored from the mobile phone. In the middle view, *Intersect View*, users are able to select a path from the experience selected in the

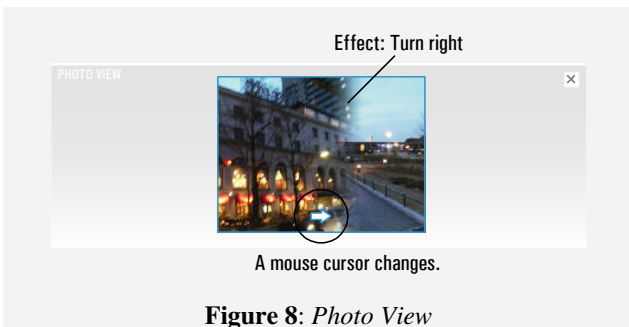
bottom view. Finally, the top view, *Photo View*, shows photographs with effects in accordance with the users' activities that are automatically calculated from the selected path.

**Photo view**

Figure 8 shows the *Photo View*. This view usually plays back photographs enhanced with effects in time intervals in proportion to real time.

Users are also able to experience the paths using a mouse. In this view, a mouse cursor tells users where they have been or went by changing shape. Users will come to see the cursor as representations of themselves, and the photo effects tell them the positional relationship of the photographs.

Combined, these effects prompt the users' memories to fill in the blanks between the photographs and effectively relive their experiences of the city.



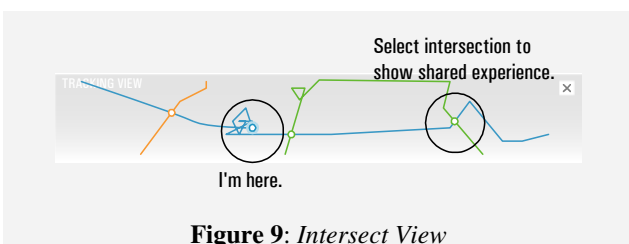
**Figure 8:** *Photo View*

**Intersect view and intersect method**

Users are able to select a tracking path on which to show in *Photo View*. Also, users are able to choose whether the selected path should accept Intersects from others users.

Should the user allow it, the application sends the information about the selected path to the application server which is shared by all users. The server checks other paths and broadcasts the detected intersections, related path and photograph information as a shared experience.

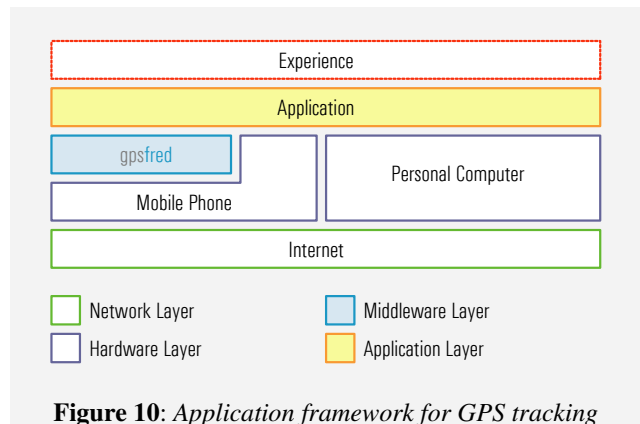
If the path has intersections and a user selects an intersection on the view, photographs from both experiences are presented in the *Photo View* (Figure 9).



**Figure 9:** *Intersect View*

**GPS TRACKING FRAMEWORK DESIGN**

Although there are many applications which utilize GPS, no previous application to our knowledge has put GPS tracking at its basis. On this section, we describe a new application framework for GPS tracking.



**Figure 10:** *Application framework for GPS tracking*

The framework has 4 layers; the network layer, the hardware layer, the middleware layer, and the application layer. These layers make the experience of the users more effective. The most important components are *gpsfred* on the middleware layer, and the application on the application layer (Figure 10).

**Features of *gpsfred***

*gpsfred* we have implemented a middleware which makes it easy to implement GPS tracking with mobile phones and applications using it. Developers who plan to use *gpsfred* to implement applications are able to extend any functionality of *gpsfred* to suit them to their needs through plug-ins. Figure 11 shows the 5 features of *gpsfred*.

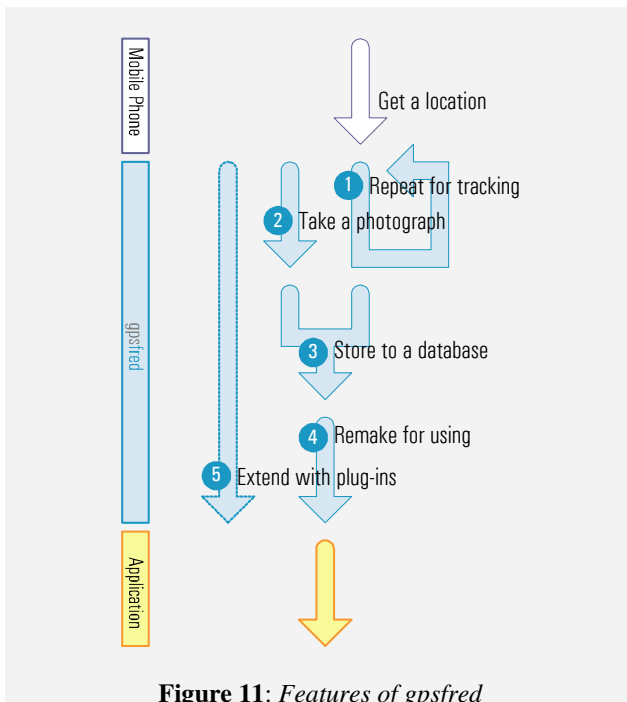


Figure 11: Features of gpsfred

#### Generate tracking data - 1

The first step is repeatedly detecting the current position, generating the tracking data. Developers are able to change the repetition intervals by 1/100 second units.

#### Join photographs and tracking data - 2

A photograph taken while the GPS tracking is running is associated with the tracking data and stored. It adds chronological information to photographs, allowing developers to handle them in that order.

#### Store into a database - 3

All data are stored into a database accessed via a network. For that reason, developers are able to flexibly handle both the tracking data and the photographs.

#### Reuse tracking data and photographs - 4

gpsfred provides tracking photograph data in an XML format. Developers are then able to perform operations such as converting the axis of the tracking data, normalizing them, resizing the photographs to fit, and so on.

#### Support Plug-in - 5

Plug-ins are supported in every level of *gpsfred*. Developers are able to extend any functionality of *gpsfred*. Some methods *gpsfred* provides by default are implemented in the form of plug-ins, in fact.

#### FUTURE WORK

On this research, the primary issue for the future is the operation and evaluation of the application. Currently, several problems exist before large-scale testing can be attempted. One such problem is the phone bills generated from usage of the program. Solutions such as fixed-rate communication services are on the horizon, however.

#### Framework and application

The current GPS tracking method *gpsfred* has a problem in where position detection takes at least approximately 15 seconds. We have recognized it as an implementation problem, and will modify it to avoid the problem.

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