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φ²: Exploring Physical Check-Ins for Location-Based Services

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ABSTRACT
This paper presents the φ² ('Phi-square') Scanner and φ² Barcode Generator – an exploration of physical check-ins for location-based services. The system uses 2D barcodes to retrieve and share semantic location information. Users can scan barcodes at venues that activate a location-based application with the corresponding venue page. This system overcomes problems arising when users have to select their location manually. We expect an enhanced user experience using physical artefacts in location-based services.

Author Keywords Mobile, Location-based Services, 2D Barcodes, QR-Codes, Physical Check-In

ACM Classification Keywords H.5.m [Information interfaces and presentation]: Miscellaneous

General Terms Design, Human Factors

INTRODUCTION

Upcoming Location Based Social Networks such as Foursquare or MyTown (foursquare.com, booyah.com, each >2m users) focus on sharing users' location with friends. For those services exact geographical coordinates are less interesting than sharing more meaningful, contextualized semantic location information. As an example we consider Foursquare, where users "check-in" at places to share their location with friends and receive points and virtual badges. **φ²** ('Phi-square' - 'physical check-ins for Foursquare') is a project exploring the connection between the actual 'visible' locations and their virtual representations. We are investigating this by looking at physical check-ins - incorporating the physical environment in the check-ins to an 'invisible' service - and any infrastructure needed for such connections.

Determining a location in present services

The typical way to achieve the required semantic location information is to let the user choose his location from a list of places close to the position delivered by the cell phones positioning device (GPS "Global Positioning System" or various forms of signal triangulation, e.g. WiFi and GSM).

From a user perspective this approach has two disadvantages: First, its quality fully depends on the location data, which can take time to acquire and has a lower precision indoors, where the GPS signals do not reach. Second, the number of locations presented to a user in a list grows with the density of venues, e.g. in shopping malls are multiple shops on a small space. In this case the user is faced with a long list of venues. The combination of both of these drawbacks worsens the user experience, since a quick sharing of a location cannot always be assured.

Figure 1. Barcode sticker for Mobile Life Centre placed at the entrance to let the user retrieve venue information and check-in.

Exploring different ways of "physical check-ins"

Within the φ²-project we are exploring different ways to enhance the user experience by using physical artefacts to achieve a "physical check-in" – an action of a user that automatically selects the right venue and checks the user in to share his location. We are using different techniques such as 2D barcodes, Bluetooth and RFID smart cards and the RFID reading rabbit Nabaztag (nabaztag.com) and analyse the user perception of the different approaches. We here describe the barcode approach – using 2D barcodes, in this case QR (quick response) codes (qrcode.com/index-e.html).

The φ² Scanner and the φ² Barcode Generator together form a system that allows users to scan barcodes with their mobile phones to share their location on Foursquare (see Figure 1). The visibility of a barcode at the venue creates a similar awareness of the service as the existing Foursquare stickers that have been provided for businesses, reminding the users to check-in [1].

THE Φ² SCANNER

The φ² Scanner is an application for mobile phones running the platform Android 1.6 or higher. The application allows users to retrieve venue information and check-in at the location-based social network Foursquare by scanning a 2D barcode that contains a link to the corresponding venue page. When starting the application, the user views the live

[1] Cramer's work was carried out during the tenure of an ERCIM "Alain Bensoussan" Fellowship Programme

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video taken from the phones camera with a rectangle and a short description of how to scan the code. As soon as the user places the barcode in the rectangle, the barcode is recognized and the view changes to the Foursquare application, which is opened directly with the venue page of the actual location. The user can now check-in to that venue and share his location with friends.

Implementation

The mobile application is written in Java using the Android SDK on API Level 4. The capability of scanning barcodes is provided by the *Zxing* barcode reader application (code.google.com/p/zxing), which can be accessed via Android's mechanism for launching activities, aka *Intents*. After scanning a barcode, the content of the barcode is returned to the φ² Scanner, which checks the validity of the link. If the barcode contains a valid link, the ID is used to open the corresponding venue page in the Foursquare application by using its intents.

THE Φ² BARCODE GENERATOR

Since this application needs an infrastructure in terms of barcodes at venues, we published the φ² Barcode Generator on our project website (phi2.mobilelifecentre.org). This barcode generator allows end-users to generate this infrastructure by printing barcode stickers for their venues. Users can enter a name of a venue and its address. If multiple venues are found, the user can select a venue from a list; otherwise the barcode is directly generated and displayed. Another option is to generate the barcode sticker directly by entering the venue ID from the Foursquare database.

Required information in the barcode

The representation of the venue information is done by encoding the URL of a venue page on Foursquare as a QR code (e.g. http://foursquare.com/venue/364422 encoded in a QR code represents the Mobile Life Centre). This representation was chosen to allow people who do not have Foursquare installed or are unfamiliar with this service to read out the information in the barcode. This specific approach is bound to the Foursquare place database. Instead future barcodes could link to an independent database merging the place databases of multiple services.

Implementation

The barcode generator is written in PHP using external web services: the Google Geocoding API for determining geo coordinates of the entered place and the Foursquare API to receive the venue ID of Foursquare. The generated link to the venue page on Foursquare is encoded as a QR barcode, using the QR-Code API from QR Server (qrserver.com).

USAGE

The φ² Scanner was downloaded 1.609 times from the Android market within the first month after publishing. In the same time there have been approximately 600 barcode stickers generated by our web service. At the moment there are 982 active installations of the application. This shows that there is an initial interest from users to try the application. However, it is not clear how many installations are in active use, and further work is needed to find out how this kind of services can gain traction in the long run.

RELATED WORK

Rohs and Gfeller are using 2D barcodes to bridge the gap between the physical and virtual world [2]. They mention different interaction scenarios but don't take location-based services into account. Multiple projects approach the use of barcodes to receive location information: Pradhan mapped 1D barcodes to URLs to get location information in the CoolTown project of HP Labs [3]. Google sent out QR barcodes to businesses in the US, which contain links to the corresponding Google pages of those businesses [4]. Hutter et al. developed a framework for using visual tags (BeeTaggs) in mobile applications to retrieve information from multiple location-based services [5]. However, we have found no approaches that focus on the user experience of sharing a location within location-based social networks when using physical artefacts or using tagging technique, like 2D barcodes, to 'check-in'.

CONCLUSIONS

We have introduced the φ² Scanner and φ² Barcode Generator. The φ² Scanner enables Foursquare users to check-in to venues by scanning 2D barcodes. To allow end-users to create the necessary infrastructure themselves, we also built the φ² Barcode Generator – a tool that lets users print barcode stickers for their venues. As future work we needed to analyze the user perceptions of this tool: we have to compare it with other techniques as well as with the conventional manual check-in process, while also taking the drawbacks of 2D barcodes into account. We believe that the use of physical check-ins and visible connections of physical venues with their virtual counterparts in location-based services will have a positive impact on the user experience. However, more importantly from a research perspective, we are interested in how perceptions of location-based services and sharing one's location with others are affected by the check-in process and the way location information is represented.

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