

Localized Communication with Mobile Devices

University of Applied Sciences Bremen
Media Computer Science

Dennis Dunekacke
dennis_dunekacke@gmx.de

Helmut Eirund
helmut.eirund@hs-bremen.de

André Peschel
apeschel@stud.hs-bremen.de

Oliver Schnabel
oschnabel@stud.hs-bremen.de

Matthias Stock
mstock@stud.hs-bremen.de

Thorsten Teschke
thorsten.teschke@hs-bremen.de

ABSTRACT

Tagging has been applied in many projects for the purpose of locating users and providing information about locations to users. Mutual interaction between different users visiting the same location at different times, however, has been neglected. This paper presents the NewsFlush system which has been developed in student projects at University of Applied Sciences Bremen. The approach followed in NewsFlush is to foster asynchronous location-based communication by both a mobile and a web application. Emphasis is put on the visualization of dialog structures resulting from this communication.

Categories and Subject Descriptors

H.4.3 [Information Systems Applications]: Communications Applications – *Bulletin boards, Information browsers.*

General Terms

Design, Experimentation, Human Factors

Keywords

2D barcode, community, mobile devices

1. INTRODUCTION

The term “mobile tagging” describes the procedure of taking pictures of a barcode and thereby decoding it to extract the essential information hidden in the tag [1]. This can be achieved with common mobile devices, such as mobile phones, which are equipped with an additional camera.

In Asia this technology was adopted first, leading to the discovery of different fields of application. Within this area, the usage of 2D barcodes has influenced many different aspects of everyday life since the last six years [2, 3]. One example is mobile marketing: 2D barcodes are printed on advertisements inside newspapers, on

posters or on the product itself to provide the user with additional information or content about the offered product (commercial tagging). Other applications include providing further information on public information carriers such as bus stops or public buildings (public tagging) or the usage for private purposes (private tagging).

Currently there are over 70 different formats of barcodes and about 12 of them are relevant when it comes to mobile tagging [4]. The most common type of barcode that is used in these terms is the so called Data Matrix code standard [5] (see Figure 1). In order to scan these barcodes with the camera of the mobile device, additional reader software needs to be installed on the device. This software is mostly provided by the corresponding manufacturer of the device or by third-party developers. Some manufacturers already begin to ship their devices with this software pre-installed.

Beside the issue of easy access to information, this technology also enables context awareness. Since each of these 2D barcodes can be associated with a real world location, it can therefore be used to provide information about the current location of a user. Therefore, this technology has been proven to be an interesting alternative for other localization technologies like GPS. Drawbacks of GPS are its low precision that makes it inappropriate for identifying small objects and the restrictions in narrow or closed buildings [6, 7].

Most of today’s projects involving mobile tagging do not use the full potential of its technology: information can be accessed, but mutual interaction by users is mostly limited. Our approach is to foster asynchronous communication with other users while taking into account the tagged location.

In this paper we present our approach of localized communication in the NewsFlush project. The initial application scenario is the toilet wall – but technically not restricted to it. In this scenario, NewsFlush offers a “clean” alternative to communicating via graffiti. After the user identifies the location through scanning the 2D barcode attached to the toilet wall, he or she can retrieve information from the NewsFlush server and add new comments like text, pictures or videos. Thus, we get an asynchronous conversation represented as a complex tree-like dialogue structure for each tag.

Due to their limitations, displays of mobile devices are only capable of displaying individual comments, but are not able to represent the resulting dialog structures in an appropriate and user-friendly way. Therefore, users may visualize the dialogue structures attached to their frequented tags via a web service at their home PC or a public screen.

In the following sections we will demonstrate the benefits of NewsFlush, its utilization and architecture as well as future aspects.

2. THE NEWSFLUSH TAGGING SYSTEM

The NewsFlush Tagging System enhances the location-based communication with mobile devices through multimedia-enhanced interaction. Written texts, captured images or videos can be virtually attached to a current location and related to similar contributions made by other user before. Thus, NewsFlush supports complex asynchronous communications between user groups equipped with a mobile phone with camera.

The initial scenario that motivated the NewsFlush project was the replacement of bulletin boards as they appear in schools, supermarkets and many other places by a “clean” digital alternative, while still preserving their local belongings and characteristics. Soon, other scenarios from tourism or industry appeared. In a touristic setting, visitors could request detailed information about some special places, leave comments about them or even rate them. This would surely be a benefit for every visitor and creates a unique community regarding this place. NewsFlush might improve industrial processes as well. Maintenance work, e.g., could be documented exactly at the place it occurs and later on reviewed remotely by administrators. Mechanics are provided with the opportunity to leave detailed error reports without much effort and will be able to add some instructions by uploading pictures of the affected processes.

The process of using the NewsFlush system is illustrated in Figure 1. Unique identifiers are encrypted into QR codes, read by the camera of the mobile device. Each identifier is linked to a certain place and tag. Tags represent the starting point of each “journey” through the NewsFlush system. The user can follow an existing dialog, answer to entries by other users, create new discussion threads or rate entries. The chronological separation and the location-based relationship produces an exceeding exchange with branched dialogs over a longer period. This spontaneous and undirected communication is for example already present in scribbles on bulletin boards, timber fences or toilet walls. The informal, time-independent relationship between the authors, as well as their anonymous advertence may be an ideal source for developing spontaneous thoughts and statements. Published images or slogans could provoke comments or interactions of the ensuing visitors or even change their mind.

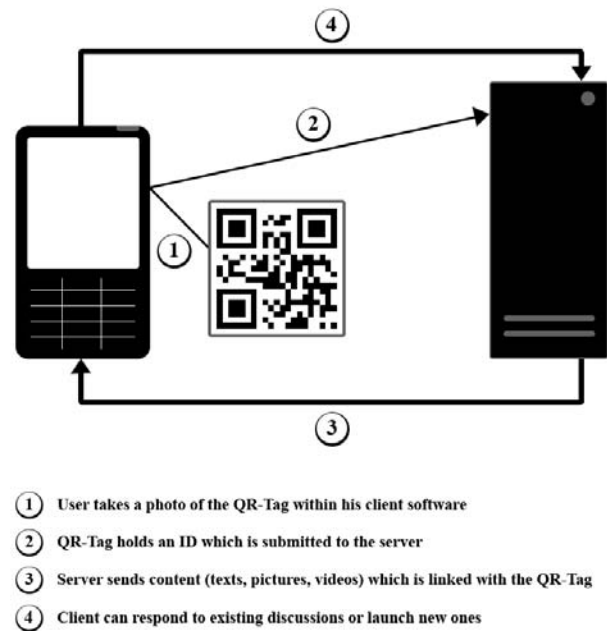


Figure 1. Flow of client-server communication.

As pointed out in the introduction, a mobile device’s screen is not appropriate for displaying potentially large dialogue structures. Therefore, NewsFlush additionally offers a web interface for viewing physically visited tags, the accessed content, and the dialog structures with special visualization tools. Figure 2 shows the realized software architecture of the NewsFlush Tagging System.

The NewsFlush Tagging System is based on Java Enterprise Edition technologies [8]. The central server holds the data on (anonymous) users, tags, dialogs, and uploaded media objects (pictures, videos, sound files). User interaction is supported through a mobile client based on Java Micro Edition (Java ME) as well as a web client based on JavaServer Pages (JSP) [9]. Moreover, J2ME Polish [10] is employed to get rid of the technical differences of various mobile phones. Access to the data stored on the server is provided via two interfaces. XML-based web services server the information exchange between web client and server. Since the use of XML is resulting in communication overhead and XML-processing on mobile devices is time- and memory-consuming, NewsFlush makes use of a proprietary, more compact protocol for communication between mobile client and server.

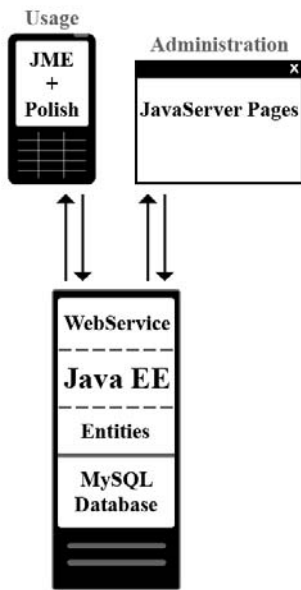


Figure 2. NewsFlush software architecture.

3. VISUALIZATION

While the mobile client visualizes conversations in a well-known hierarchical way like many internet forums do, we designed new approaches for a visualization of tree structures. By now we provide three different visualization approaches to represent dialog structures via a web interface (see Figure 3a-c). The collected texts and multimedia content, including their relationships and details like age, user-rated quality and impressions are extracted through a standardized XML interface.

The mass of data attached to a tag is presented in an attractive and user-friendly way in the desired format to create a new experience. The existing tree structure should vanish from the presentations as far as possible, yet without losing information content and preserving visually identifiable relations. Therefore, the created visualization should be simply recognized by everyone, not only computer scientists, who are familiar with tree structures.

As a matter of fact, different application scenarios of the NewsFlush system demand for different kinds of visual representations.

Animated interactive visualization (cf. Figure 3a): the user-friendly interaction concept offers a great possibility to browse through a huge amount of data like in machine park maintenance or big communities (e.g. Twitter, YouTube). Optimized sorting and glowing points stick up the most interesting areas. The animated navigation helps to stay on top of things.

Static visualization (cf. Figure 3b): “classic” wall-like presentation, where relevance of contributions is illustrated by size and thickness, age by opacity, just to name a few.

Pre-rendered Video (cf. Figure 3c): dynamic alternative to the static visualization which shows relations between contributions

by camera motions. A virtual camera flies along the unique threads, zooms out at their end-points and moves back to follow other branches of the dialog structure.

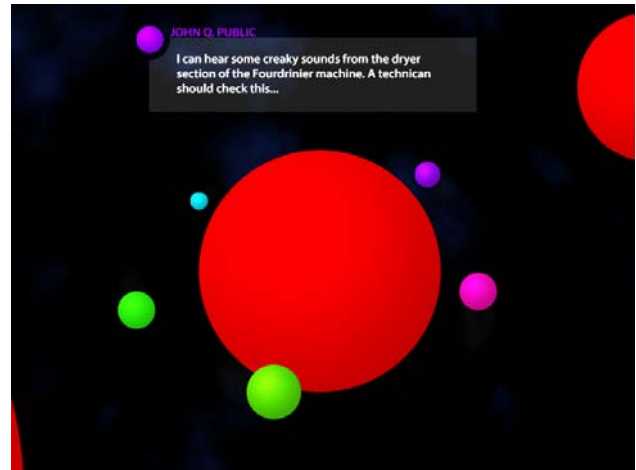


Figure 3a. Interactive 3D-visualization



Figure 3b. Static visualization in terms of a toilet wall.



Figure 3c. Pre-rendered video (here: a fade of two screens).

We expect, e.g., the representation of a “toilet wall dialog” to be a static picture. Attachments at a touristic POI may be visualized as a video clip with restricted length and a more “serious” application like machine park maintenance ask for an interactive access to the stored notes at the tagged machines.

Due to its open interface the visualization system is capable of presenting similar content structures outside the NewsFlush tagging universe. Those content structures are generated for example from Twitter, YouTube or various internet forums and can be accessed for visualization purposes by public application programming interfaces (APIs).

4. CONCLUSION AND FUTURE WORK

Currently, our system for tagging, annotating multimedia content, retrieving and representing the resulting dialog structures has been implemented, stabilized and tested and is ready for use. The current focus of our work is put on refining different kinds of visualization techniques that offer a much more accessible and intuitive navigation through the content for the user. We are still discussing the question which visualization is most appropriate for different user groups and application scenarios.

The next logical step is a qualitative analysis of other visualization methods not covered by our approach and statistical evaluation of user acceptance. In fall 2009 we will test the system with different visualizations in the toilets of the University of Applied Sciences Bremen.

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