TWO – DIMENSIONAL CODES ON MOBILE DEVICES AND THE DEVELOPMENT OF THE PLATFORM

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Abstract: In the last times, the mobile terminals have experienced an accelerated technological development. This evolution has provided numerous advances in presentation and interactivity in general and it has given rise to the generation of numerous applications for it. Following this line; this article shows how to incorporate on mobile terminals a simple interaction with the environment across the technological successor of the bar codes: the two-dimensional codes. We will use three basic elements -camera quality, growth in data traffic and increased bandwidth in mobile phones- to create a platform that provides to the user an easy and useful way of obtaining information multimedia that improves his relation with the environment. We will look for a complete and global development of the system, that is, the generation of the two-dimensional code; his interaction with the platform and final obtaining of the information in the terminal.

1 INTRODUCTION

Throughout its history, mobile phones have been used for more tasks than serving as a voice communication device Thanks to the quickly advance of mobile technology, we can add new applications that solve or improve access to information or communication. One of these contributions is the exhibited in this article and it is related with the two-dimensional codes. These codes allow to store more data and more efficiently than traditional bar codes. This new technology, two-dimensional codes, properly applied, can save the existing limitations, and give the user an easy way to interact with the environment and multimedia information to enrich their relationship with it. This technique should take advantage of two stimuli easily verifiable which are the following two:

- Best multimedia and data communication (in particular, the diffusion of mobile terminals with built-in camera is growing)
- The forecast for the next years point out that, while the global voice traffic will increase linearly, the data traffic will do it exponentially.

That is the reason why it is necessary a work of I + D + i; in order to design a platform to deploy services based on two-dimensional codes and that

is also scalable and configurable

2 STATE OF THE ART

2.1 Barcodes and Two-dimensional Codes

The bar code (IEEE, 2008) is a code based on the representation by a set of parallel vertical lines of different widths and spacing which together contain certain information. Currently, the bar code is massively deployed globally. There are several papers studying barcode readers using the camera device in mobile phones (Ohbuchi; Hanaizumi; Hock, 2004), (Tasos Falas, Hossein Kashani, 2007), (Yue Liu; Bo Yang; Yu Yang, 2007). The problem arises when you want to store a certain amount of information. In short, traditional bar codes are very limited in the amount of information which can be stored and this give rise to another, more appropriate, codes to the current market. That's when the idea of two-dimensional codes arises.

Two-dimensional codes (TEC NEWSLETTER, 2008) are matrices formed by the combination of dots of certain colours allowing a subsequent scan by a reader in a very quick and efficient way. There are a lot of types of two-dimensional codes such as

QR codes (Quick Response Barcode), Datamatrix, MaxiCode, Aztec code, PDF417, RSS or 49 codes.

Figure 1: General structure of a DataMatrix code.

3 OBJECTIVES AND TOOLS USED

The complete development of the system is reached, from the generation of the two-dimensional code up to the final obtaining of the information in the mobile terminal. Definitively, it will be necessary implement the following aspects:

- Application for two-dimensional code generation.
- Architecture and platform for the diffusion of the application for the recognition of the generated graph.
- Platform architecture and on-demand video distribution.
- System for receiving and sending MMS with images requested by the mobile terminal.

For an overview and anticipate the tools used, in the following image shows the general pattern:
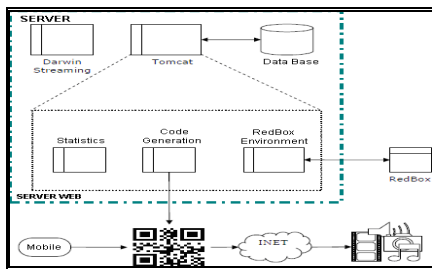
Figure 2: Basic scheme of the platform.

As can be seen, a number of tools (Darwin Streaming Server, Tomcat, MySQL, RedBox, etc.) software and hardware will be required which are shown here.

3.1 Multi-platform Messaging: RedBox

The operation of RedBox (RedBox-Vodafone, 2008) is very simple. Basically consists of making a bridge between the mobile and the applications that are programmed to send and receive SMS, MMS, etc. All SMS sent by a mobile terminal to reach the platform, are forwarded to a particular website.

From these web applications, the user may be capable of sending SMS, MMS or request the location of a particular mobile terminal which has previously been discharged from the service LBS.

3.2 Videos on Demand

The concept of VOD or Video On Demand (VoD) consist in the possibility of, through a specific interface, to view a video hosted on a server through the technique known as "streaming". The transmission protocol used for distributing video over the Internet (TCP / IP) is RTSP (H. Shulzrinne, R. Lanphier, 2007). For this project has been chosen the so-called Darwin Streaming Server.

4 DEVELOPMENT PLATFORM

The system implemented must meet the following objectives:

- Generate two-dimensional codes with three different formats: URL, plain text and SMS.
- A mobile terminal may, by the send of an SMS, to receive the application made to read two-dimensional codes.

4.1 Server

The central element of the platform is the server, which will be equipped with the Ubuntu operating system 6. It's necessary to install other tools, yet explained. It is; therefore; essential requirement to install:

- **MySQL:** To collect data from mobile terminals.
- **DarwinStreaming Server:** Copying the files properly in the folder, will be possible to access each of the videos by clicking the following way: rtsp: / / SERVER_IP: 554/NAME_FILE
- **Tomcat:** Installation of this web server will contain all three web applications made for this platform (generation of two-dimensional code, the compilation of statistics and management of RedBox).

4.2 Applications

Applications developed can be divided into two main groups: Generation of two-dimensional codes and RedBox management and statistics.

4.2.1 Code Generation

The first application developed will be responsible

for generating two-dimensional codes (namely, QR and Datamatrix) by completely dynamic way and with a user-friendly graphical interface.

Figure 3: Interface two-dimensional code generator.

The following figures show the two-dimensional symbols (QR and DataMatrix) associated with a web address with the URL: www.google.es. This is the result of this application code generation:

Figure 4: QR Code (left), DataMatrix (right).

4.2.2 RedBox Management

RedBox manages the incoming requests from users and the SMS or MMS from the application to a particular mobile phone. The previous set of actions can be divided into three main blocks:

- Block I: This block is responsible for receiving information from RedBox. Depending on what comes, take a particular decision making any module block II to act.
- Block II. This block will act accordingly, depending on the orders laid down by the block I: Send an SMS, send an MMS or store some information in the database.
- Block III. Block assigned to receive notifications and subsequent writing them in the database.

5 RESULTS

5.1 Multimedia Results

Let's start with the request to download a two-dimensional code reader. To obtain an application will be necessary to send an SMS from our mobile to phone number of RedBox (600124XXX) with content "focuses lectorc2d." Automatically; RedBox redirect to the application developed and it will pick up the petition that the user is asking. Thus, the method adopted is to send an SMS with the URL I-

Nigma Reader. So, the user can access the URL of the reader and can download the specific application for his mobile model. The following illustration shows this procedure:

Figure 5: Process for obtaining a code reader.

With a simple click you can proceed with the installation and the terminal will be ready to read QR codes previously generated.

To view a web page through a QR code in the first place we will start the application. Next, we will focus on the QR code generated and automatically interpret what type of content is. Simply; with a click on the "Connect" will enter the requested website. In the following illustrations we can see the process of viewing web through a QR code:

Figure 6: Viewing a web through a QR code.

The next step is to verify that the RedBox system for displaying images works correctly. Through a QR code, which is interpreted like a sending of a SMS with a specific keyword and after the developed application will send to the mobile terminal, an image based on the words entered in the content of SMS.

Figure 7: Image display process RedBox.

It will be necessary hope that RedBox acts adequately sending to the developed application, the request that has been requested by the user. This application will realize how the user are trying to download a map image and then it will send an MMS to RedBox to carry out the sending this image to the mobile terminal.

Finally, we check the video display on the terminal through video streaming. To do so, the user should access a URL very characteristic since the protocol to be used will not be "http" but "rtsp". The terminal N95, used for the development of the project, will interpret that it is a question of a transfer for streaming and will automatically open his streaming video player to start viewing the video.

Figure 8: Video visualization process.

5.2 Statistical Results

This section is responsible for displaying different statistics generated by the system RedBox. A series of tables are created where the information stored in the database appears.

In the first table will display data as total requests, demands complete, incomplete or erroneous. In the second table the requested requests are stored supplying data; as data of the request, the type, the origin and the message. In the third table (table 1), a list of all requests sent to the platform and the type of message requesting will be shown.

Table 1: Mobile table requests.

6 FUTURE WORK

You can study the integration of these codes in various scenarios that generate added value.

An application of QR codes is the possibility of incorporating them along a cultural visit, for example, in a museum next to a sculpture or a painting, where, to take a picture the code in question, will facilitate the reproduction an audio (streaming).

Also, in the poster for a concert you can include a QR code to provide access to buy the ticket through a secure payment platform (via web). Then it will be provided a link to an image with a QR, which is your e-ticket. Only have to access this link to download it.

7 CONCLUSIONS

The mobile terminals are increasingly smaller sizes to provide user mobility. But as a disadvantage, appears to have to enter web addresses in the browser using a keyboard too small. This article has been shown how the use of QR codes facilitates this work. QR codes are based on open standards, allowing us to use in any environment without restrictions. This makes the QR useful for mobile payment platforms and applications through mobile-oriented web pages. This opens a wide range of development opportunities in the mobile environment. It requires a joint effort of all actors involved in technology development and public administration to facilitate standardization and technology integration. Also, the advantages QR codes have been joined the use of the Platform RedBox Vodafone. The integration of the two makes it even easier access to mobile Internet.

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REFERENCES

IEEE. Barcode, 2008; /lessons/crackingthecode.pdf

E. Ohbuchi; H. Hanaizumi; L. AH Hock, Barcode Readers using the Camera Device in Mobile Phones; *International Conference on Ciberworls*; 2004. IEEE.

Tasos Falas, Hossein Kashani, Two-Dimensional Bar-Code Decoding with Camera-Equipped Mobile Phones, *Fifth IEEE Int. Conference on Pervasive Computing and Communications Workshops*, 2007.

Yue Liu; Bo Yang; Yu Yang; Bar Code Recognition in Complex Scenes By Camera Phones; *Fourth Int. Conference on Natural Computation*; 2008.

BOLETÍN INFORMATIVO TEC (TIC). Códigos Bidimensionales, 2008; www.tec-mex.com.mx

OPEN MOBILE INTERNET ALLIANCE (OMIA). OMIA Mobile 2-D Bar Code Standard. 2007; www.meworks.net/

VODAFONE. Red Box, 2008; :/vodafone.es/empresas/ servicios/mensajeria/redbox/

H. Shulzrinne, R. Lanphier. RTSP, 2007; www.javvin. com/protocol/rfc2326.pdf