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QR Code - the Business Card of Tomorrow?

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ABSTRACT

We are getting familiar with mobile devices; they begin to pervade our daily life in a way that we won't notice them anymore as something remarkable. The amazing fact that there are more registered mobile phones than inhabitants in Germany and Austria makes it easy to claim that mobile phones have already reached the state of a ubiquitous device. One often unsatisfying user experience in dealing with the mobile device addresses the entry of data. Instead of typing data key-by-key one of the most promising technologies towards mobile technologies are Barcodes. 2D Barcodes or "mobile tags" can be used to exchange information very easily and quickly. By scanning a data matrix access to additional materials can be simply provided. Such codes are able to combine and connect two different media: Print and Internet.

Graz University of Technology (TU Graz) has been started about half a year ago a master thesis and research work with the aim to gather experiences about the practicability of two-dimensional barcodes in general as well as for teaching purposes. By using QR-Codes (Quick Response-Codes) it should be pointed out how and why mobile tagging becomes valuable for the society. This paper gives an overview about the use QR Codes and discusses methods and possibilities.

It can be summarized that by using two-dimensional barcodes the print and online media will get closer and enhance our mobile lives.

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1 INTRODUCTION

Mark Weiser announced in 1991 "the most profound technologies are those that disappear. They weave themselves into the fabric of everyday life until they are indistinguishable from it." [9]. With other words, if we are getting familiar with devices, they begin to pervade our daily life in a way we do not notice them anymore as remarkable – they simple disappear [1]. Ubiquitous and pervasive computing is a dramatically growing emerging research field [5] especially if a look at mobile devices is taken.

According to different statistical data[1] in Germany and Austria there are more mobile phones than inhabitants. The Austrian Central Bureau of Statistics[2] reported in more than 90% of all private house-

[1] http://www.axelspringer.de/inhalte/pressese/inhalte/presse/unternehmen/677.html (last visited: July 2008)

holds mobile phones are available. Evaluations amongst students at Graz University of Technology pointed out that each student owns at least one mobile phone [2]. From this point of view it can be simply noticed that cell phones are already pervading our daily life, of course basically used in the intended way – for making phone calls. On the other side the rapid advancement of the mobile market turns cell phones into sophisticated personal digital assistants. Besides doing phone calls, taking pictures and videos, navigating, even surfing the WorldWideWeb becomes more and more a daily process. Smartphones like Nokias' N95 or Apples' iPhone are revolutionizing not only the whole mobile market even more mobility it selves must be rethought. It is imaginable that in the near future reading articles online via mobile Internet access is as usual as reading a newspaper today. First surveys are reporting that iPhone users' access to online news and information is increasing dramatically – 80% of all iPhone owners stated to read news via browsing[3]. Further studies pointed out that PDA and mobile phone sales would outstrip PC sales, with the majority switching to wireless networks by 2008 [3]. Without trying out to be very visionary, the mankind is going mobile – a mobile society will lead to complete new challenges looking at our daily life.

Although mobile devices become more and more sophisticated there is still one real big problem: the small interface. Of course it is very attractive to take small devices with me, but with respect to the limits the research field of Human-Computer Interaction and Usability Engineering is confronted with complete new tasks. However maybe the greatest barrier to deal with Internet is the exhausting input of URLs to mobile browser, especially the URLs are not shorted with third party applications (as for example TinyUrl[4]). With other words a fast possibility to combine the traditional print medium and the WorldWideWeb is needed to transfer phone numbers, meeting appointments but also small interactive objects or business cards to mobile devices "by one click". There are a lot of examples; they can be expanded nearly endless.

To overcome this problem in a very elegant way two-dimensional barcodes can be used, as it is very common in Japan for years. In this publication a short introduction into two-dimensional barcodes is given and further some possibilities are discussed.

2 TWO-DIMENSIONAL BARCODES

One-dimensional barcodes are widely used and can be seen on the packing of virtually any product. So this technology has been standardized since years in the field of logistic by following any package from manufacturer to the consumer. The data storage capacity of one-dimensional barcodes is very limited and so two-dimensional barcodes or so called matrix codes have been invented. Nowadays also three- and four-dimensional barcodes (matrix is changing over time and by using different colors) are already possible[5] [6]. Meanwhile there do exist more than 1000 different barcodes and about 100 of them are two-dimensional barcodes.

The idea is to install a so-called barcode reader on the mobile phone, which is able to scan two-dimensional barcodes. In this context two-dimensional barcodes are named "mobile tags" which are

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[2] http://www.statistik.at/web_de/statistiken/informationsgesellschaft/ikt-einsatz_in_haushalten/020541.html (last visited: July 2008)
[3] http://www.comscore.com/press/release.asp?press=2321 (last visited July 2008)
[4] http://tinyurl.com/ (last visited July 2008)
[5] http://ubiks.net/local/blog/jmt/archives3/004277.html (last visited July 2008)
[6] http://www.heise.de/newsticker/Barcodes-in-vier-Dimensionen--/meldung/95923/from/rss09 (last visited July 2008)

capable and powerful possibilities to transfer data from a physical object to the mobile phone. Following steps summarize the process of mobile tagging (Fig. 1):

- Capturing the image of the printed barcode with the help of a camera-equipped mobile phone using the appropriate software
- Decoding the image using the appropriate scansoftware (bar code reader)
- Reading the decoded message on the mobile device or linking a decoded URL, whatever the content looks like

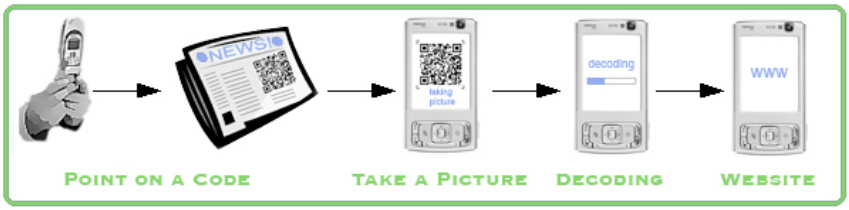

Fig. 1 Graphical illustration of "mobile tagging"[7]

The number of two-dimensional barcodes that can be used for mobile tagging is about twelve[8]. According to Kato & Tan [6] nine criteria are outlined that should be fulfilled by a standardized two-dimensional barcode. Nowadays several two-dimensional barcodes are in use. The most famous are QR-Code, DataMatrix, Shotcode and Beetag. There are different reasons for using different codes, from readability to proprietary.

At Graz University of Technology a master thesis [8] about the usage potential of QR-Codes (Quick Response Code) has been started. The decision to investigate QR-Codes [7] bases on several aspects:

- QR-Code, which is developed by the Japanese cooperation Denso Wave,[9] is a de facto standard for Japanese telecommunication providers.
- Google is dealing with QR-Codes since 2007[10]
- Microsoft launches Windows Live Barcode Beta[11]
- Popular Web 2.0 Applications are using QR-Code, like YouTube[12], Flickr[13] and Google-Maps[14]
- Nokia[15] as well as Apple is supporting QR-Codes and DataMatrix by preinstalled software on mobile phones

3 HOW QR-CODES CAN BE USED FOR BUSINESS

They're various possibilities to use QR-Codes for different approaches [4]. Most used business areas of QR-Codes in German-speaking countries are marketing and advertisement[16] as well as the primary

[7] http://en.wikipedia.org/wiki/Mobile_tagging (last visited July 2008)
[8] http://mobile-tagging.blogspot.com/2007/06/windows-surface-und-die-zukunft-der-2d_05.html (last visited July 2008)
[9] http://www.denso-wave.com/qrcode/index-e.html (last visited July 2008)
[10] http://www.google.com/adwords/printads/barcodes.html (last visited July 2008)
[11] http://www.barcodemobile.com/microsoft-launches-windows-live-barcode-beta/ (last visited July 2008)
[12] http://videomeetsfunction.com/ (last visited July 2008)
[13] http://www.joshrussell.com/2008/06/23/flickr-qr-codes/ (last visited July 2008)
[14] http://2d-code.co.uk/google-maps-qr-code/ (last visited July 2008)
[15] http://mobilecodes.nokia.com/learn.htm (last visited July 2008)
[16] http://www.kaywa.com/ (last visited July 2008)

area logistics. For example the Swiss Federal Railways provides its train timetable[17] with the help of QR-Codes; a first multilingual QR-Code books series is available since some months[18].

At Graz University of Technology a master thesis [8] has been started to research about further possibilities to use QR-Codes[19]. Following interesting outcomes can be listed:

- Business card: QR Codes can be easily used for business cards. By simply storing all contact data in a .vcf file and putting it online, a hyperlink is created and coded via QR-Code. Afterwards with any mobile device the image can be decoded. By selecting the hyperlink all data is saved to the local address book. If the mobile device is synchronized with a Personal Computer or Laptop the contact is automatically stored in the usual address book. Only one scan and one click is necessary instead of collecting printed business cards.

Fig. 2 QR-Code used as Business Card

Fig. 2 shows a first prototype of a branded QR-Code carrying a URL. This URL will lead you to my business card with all contact data you need.

- Appointment: A further interesting task is to use QR-Codes to transmit appointments from a printed medium (for example posters, placards or similar) directly to the calendar application of the mobile device. In the same way as described above the meeting can be filled in via a web-form and a QR-Code is created. The image can be placed on any document (Fig. 3).

Fig. 3 QR-Code used for appointments

- Up-to-date with your lectures: In the area of m-Learning there are also some emerging fields. For example it is easy possible to transfer an RSS-Feed of the appropriate lecture via QR-code to the mobile device to receive updates with new entries. Furthermore YouTube videos can be easily watched via mobile devices. Provide the link to a YouTube video as a

[17] http://mobile.kaywa.com/p841.html (last visited July 2008)
[18] http://mobile.kaywa.com/qr-code-data-matrix/bidibooks-the-first-multilingual-qr-code-books-series-in-europe.html (last visited July 2008)
[19] http://qr.tugraz.at (last visited July 2008)

QR-Code for watching it on the go (Fig. 4). It is imaginable that in future lecture notes are combined with QR-Codes to link to extended online material, like videos and interactive objects.

Fig. 4 QR-Code linked to YouTube Video

4 CONCLUSION

The combination between the traditional print media and the online world can be processed much quicker by the use of two-dimensional barcodes. This publication introduced the field of barcodes and pointed out some practical examples. Which kind of code will be established finally is not crucial at all. Furthermore mobile phones are turning more and more into personal digital assistants with much more functionalities than phoning quick transfer of data will be necessity of future. Due to the fact that Internet access via mobile devices will increasing considerably in future, the link between print media and WorldWideWeb will be the next big step towards the digitalization of human society.

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