

QR CODES IMPLEMENTATION IN MUSEUM EXHIBITIONS

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ABSTRACT

In the near future accessing the internet with mobile devices will take an increasingly large scale. To accommodate to the needs of visitors, “Ion Borcea” Natural Sciences Museum Complex of Bacău was aligned with the new trend of modern technology, using an alternative to the classic guidance. Starting with the exhibition “Nature Protection” all exhibitions made by museum curators will have QR codes (Quick Response). This is a two-dimensional matrix code created in 1994 by Japanese company Denso Wave, which has a large capacity and is extremely easy to read. Through them, a real world can be connected to a location in the virtual world. With one scan, which takes less than a second, any smartphone owner can quickly get a very wide variety of information and services.

Key words: QR code, smartphone, internet, applications, museum, exhibitions.

Introduction

QR Code is a range of standards coding in form of bidimensional bars (matrix code), created in 1994 by Japanese company Denso Wave and is an abbreviation of the English “quick response”. The code was developed as an alternative to barcode and was not able to store too much information and the scan was difficult. Unlike barcode, the QR code can be scanned from any direction and from any angle, and it is fast decoding. The QR code is a registered trademark of Denso Wave, Inc. However, these codes are used throughout the world.

The easiest way to “read” a QR code is by scanning with the camera of a smartphone. The operation is performed with an application which is able to interpret the QR code. It may contain web addresses, names and addresses, phone numbers, email addresses or other information, and the phone’s browser directs the user to the URL in question. For example, many restaurants in the EU have, in addition menus QR codes. These can be scanned with the smartphone and can provide all the information you need.

The simplicity of these links from the physical world to the electronic world, known as the “hardlinks”, explains their popularity. QR codes allows companies to gain new customers. It becomes very useful when URLs are long and typing them into a browser on your mobile phone would be

impractical.

Material and method

To read a QR code you need to have at hand a mobile phone equipped with camera and internet connection and a scan application. These applications can be downloaded for free from the manufacturer’s sites, Android Market (Google Play) or Apple App Store. For Android there is a free application named QR Reader. Scan the code with the integrated camera, after which the application will “read” the information for you. If you have a smartphone or a camera phone, there is no problem: you just need a camera. Take a picture of the code and then, once home, download it to your computer and use the services of “reading” such as those offered by zxing.org online.

There are two main types of QR codes: “Micro QR” and “QR type 1 or 2”.

Micro QR Code

Micro QR Code is a smaller form of code used to encode shorter information. There are four variations, denoted M1 to M2, and the maximum capacity is 34 numbers or 21 alphanumeric characters, with three possible levels of error correction.

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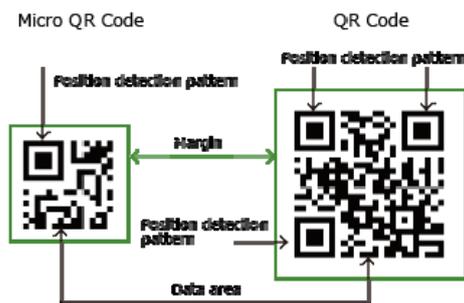


Fig. 1 – QR code explanations

Type 1 or 2 QR Code

Type 1 QR Code can store up to 1,167 numeric characters, and a type 2 QR Code can store up to 7,089 numeric characters or 4,296 alphanumeric characters.



Fig. 2 – QR code Type 1 (left) and Type 2 (right)

In addition to these types there is LogoQ, and proprietary code that can be read only in the small frame.

LogoQ

It is a color version of QR overlying a company logo over a QR code.



Fig. 3 – LogoQ composition

QR standard structure enables organizations to insert into the code necessary textual information, such as contact information, information about events, email addresses, phone numbers, geographic locations (Google Maps), SMS, text, WiFi network data setup, Internet locations. LogoQ standard allows overlapping of images, logos and special characters to make it more

appealing and easier to recognize, without loss of information, which can be easily recognized by customers.

In our country QRomania project started with a local pilot project named Culture and Vrancea National Heritage into online environment “Google Maps-QR”. Started in January 2013 by the Potpourri Association of Focșani and the County Department for Culture and Vrancea National Heritage (who also provided the necessary information about the historical monuments that were installed plaques with QR codes), the project aims to provide greater visibility to the cultural points and patrimonial interest in Vrancea County by promoting their online environment. QR code related to a object provides access to a page with links to: page in Romanian, English and French with information about the objective and the corresponding Google maps objective page.

In May 2013, in the city of Sibiu started the project “Promotion of cultural heritage by QR Code” which proposes creating a system of tourist guidance and providing online information about cultural and touristic objectives from the city of Sibiu. Each objective in the system has a page with multilingual historical and cultural information, his location and other points of interest. Users can choose between several paths or custom theme and can send, about these, photos and impressions onto social networks.

Following a study conducted on a sample of 24,000 people, 7,200 individuals have expressed interest in using mobile phone to access such a guidance system. Indirectly, the city of Sibiu and its citizens benefit from the project through the development of tourism, since the system allows the signaling points of interest near monuments, accommodation, restaurants, bars and leisure ways.

The visitors of the National Museum of Natural History “Grigore Antipa” of Bucharest will be able to access, with effect from 1 November 2012, the information attached to parts of the permanent exhibition and using mobile phones (smartphones) in the Museo Tag project, conducted and funded by NFCExpert.ro. Through this program, the scientific information associated to the exhibits can be read using mobile phone systems through the use of QR and NFC systems (Near Field Communication). The museum aims through this project better accessibility of scientific information that, until now could only be read on the front of InfoTouch showcases and to attract teenagers and young people passionate about mobile phones and technologies in this field. Since November, information related to exhibits could be read simultaneously by multiple people, by displaying

them on your mobile phone in a very short time. Information is accessed with ease, being necessary only the approaching the phone on the label code of the exhibit. The scanned and displayed information on the phone is also a summary of the detailed explanations of the related texts of the exhibits in the permanent exhibition.

Proposed objectives

In our institution the authors attempted first implementation of QR codes in the exhibition “Nature Protection”. Specialized information in the form of text was provided by biologist Dr. Ghiurcă Daniel-Ștefan and the type 2 QR conversion format was performed by curator Eng. Tofan Florin-Cătălin

using QR Code Studio application from Tec-IT (which is free for non-commercial use). Beyond its relatively simple appearance, reliable QR code generation procedure involves a number of technical knowledge, good knowledge of existing standards, math’s and IT. Therefore, in order to generate simple codes it is recommended the use of free online generators.

Results and discussions

The information provided to the public has been carefully selected and consisted of inserting into explanatory panels of the two dioramas of the exhibition QR codes as follows:

Table 1 – QR Codes generates for four exhibits from exhibition “Nature Protection”

No.	Exhibit name	Characters No. descriptive text	QR Code
1.	The Red-breasted Goose (<i>Branta ruficollis</i>)	601	
2.	The European pond turtle (<i>Emys orbicularis</i>)	544	
3.	The Eastern Imperial Eagle (<i>Aquila heliaca</i>)	487	
4.	The Black Grouse (<i>Tetrao tetrix</i>)	323	

To generate the code has been used also the ISO / IEC 18004 Standard.

The characteristics of generated QR codes

were: maximum size 30 mm, resolution of 300 dpi. The size of modules was chosen to allow framing in the desired size. Marginal zone was set to 1 mm; the

colors chosen were black and white. We chose low and medium levels of error correction so that we can stay within the desired dimensions. The default encoding was performed according to UTF-8 Standard. Generated graphics file was saved in *.png (*Portable Network Graphics*) and the printing were done on matte paper sticker. After printing and cutting to size, the codes were tested on a smartphone and then glued on the panels in the indicated locations.

Conclusions

Throughout the procedure was taken into account the 10 golden rules of QR codes generating:

1) At the end, any QR code readability should be tested on multiple and different readers, both hardware and software.

2) Creating a QR code involves both science and art and so experimenting with various styles and colors is a premise of success.

3) Using the short sites on the Internet is a primary requirement, allowing both the change of location of the Internet access at anytime, but also reducing the volume of information stored, the size of the code and its readability.

4) Choosing a chromatic contrast between the foreground and background ensure correct reading of the code. Usually foreground is always darker than the background (some readers fail to read

properly if the settings are reversed).

5) QR codes allows customizing modules form component, even if the code itself is a square.

6) Size matters - square side which contains the code must be at least 2 cm to be read by most readers. *A good rule tells us that the size of the QR code side is the 10th part of the distance to be scanned.*

7) Redundancy is a good thing – the higher the redundancy, the greater the resilience of the QR code o interference. However, higher redundancy also makes a QR code more dense and hence a harder to read, so we prefer an average coefficient of error correction.

8) The LogoQ system can overlay a preferred image to the QR code to attract attention, but in this case must be choose the highest level of protection from errors and the selected image should not exceed 30% of the total area of the code. Since some parts of the QR code do not admit overlap, it always requires careful testing of the QR code result. We didn't use this type of system in our exhibition.

9) Choosing a large enough margin around the QR code offers good visibility, provides a quick orientation and a good scan of it.

10) The information provided to the public must always worth the effort. Nobody likes an attractive QR code that provides uninteresting or unpleasant experience.



Fig. 4 – QR code exhibition stand

Rezumat

În viitorul apropiat, accesarea internetului de pe dispozitivele mobile va lua o tot mai mare amploare. Pentru a se adapta nevoilor vizitatorilor, Complexul Muzeal de Științele Naturii "Ion Borcea" din Bacău s-a aliniat cu noua tendință impusă de tehnologia modernă, utilizând o alternativă la ghidajul clasic. Începând cu expoziția "Ocrotirea

Naturii", toate expozițiile realizate de muzeografi vor putea avea cod QR (Quick Response). Acesta este un cod bidimensional tip matrice creat în 1994 de compania japoneză Denso Wave, cu o capacitate de stocare mare și extrem de ușor de citit. Prin intermediul lor, un loc din lumea reală poate fi conectat cu o locație din lumea virtuală. Cu o simplă scanare, ce durează mai puțin de o secundă, orice posesor de smartphone va putea obține rapid o foarte

mare varietate de informații și servicii.

References

1. <http://www.qrcode.com/en/>
2. <http://goo.gl/>
3. <http://qrworld.wordpress.com/2011/08/09/the-quiet-zone/>
4. http://www.emobil.ro/articole/ce_sunt_codurile_qr_si_ce_aplicatie_iti_trebuie_pentru_telefonul_tau.html
5. http://ro.wikipedia.org/wiki/Cod_QR
6. ISO / IEC 18004
7. <http://www.wall-street.ro/articol/New-Media/115854/vor-prinde-codurile-qr-si-in-romania-exemple-reusite-dintr-o-piata-inca-needucata.html>
8. <http://metropotam.ro/La-zi/Antipa-primul-muzeu-din-Romania-care-beneficiaza-de-tehnologia-QR-code-urilor-art6054687731/>
9. <http://vranceamedia.ro/inaugurarea-primei-placute-cu-cod-qr-in-proiectul-pilot-cultura-si-patrimoniul-national-vrancea-in-mediul-online-google-maps-qr/>
10. <http://cronicadefalticeni.com/2013/11/02/obiective-culturale-si-turistice-din-zona-falticeni-semnalizate-prin-qr-code/>
11. <http://blidaru.net/inaugurarea-primului-qr-code-folosit-in-scop-cultural-si-turistic-in-vrancea-galerie-foto/>
12. <http://www.radiocultura.ro/2013/07/cinci-muzee-din-tara-au-lansat-un.html>