

Dynamic and Static QR Coding

Zhanna Deineko¹, Svitlana Sotnik², Vyacheslav Lyashenko¹

¹Department of Media Systems and Technology, Kharkiv National University of Radio Electronics, Ukraine
e-mail: lyashenko.vyacheslav@gmail.com

²Department of Computer-Integrated Technologies, Automation and Mechatronics, Kharkiv National University of Radio Electronics, Ukraine

Abstract: *This work is overview in field of dynamic and static QR-coding. The main attention is paid to peculiarities of using dynamic and static QR codes. The paper proposes classification of QR-codes. Key code characteristics that you should pay attention to when selecting and writing code have also been identified. A comparison of dynamic and static QR-coding is given.*

Keywords—analysis; coding of information; static; dynamic; QR-code

1. INTRODUCTION

The integration of advanced technologies is expanding its boundaries every day [1]-[3].

Documentation is crucial moment. The main condition for documentation process is encoding of information.

Today it is possible to encode large amounts of information, for example, QR codes can be represented both in numerical, alphanumeric, and in binary or kanji modes [4]. In this case, various methods and approaches for such presentation of information can be used [5]-[11].

In everyday life, we encounter QR codes all time, starting with shops where code is printed on price tags of goods, and ending with tickets to theater or large big boards on street.

The popularity and wide distribution of QR codes is explained by fact that they allow you to quickly access information of interest.

The areas of such coding application are very impressive:

- in fields of consumer advertising and packaging;
- for temporary guest access to facility;
- geolocation designation;
- business card;
- for background information (e.g. about book).

In general, QR code allows you to encrypt any text, link to site, etc.

Depending on scope of application, QR codes are [12]:

- static – contain information that cannot be edited after code is created;
- dynamic – information can be updated, edited and changed type of such code after its creation.

Today, QR code is important information resource.

2. RELATED WORK

A sufficient number of works are devoted to development and implementation of QR codes.

Today, use of QR codes in almost all spheres of human life.

In [13], authors describe use of rapid response codes in healthcare.

The increased need to encode information using QR codes in service sector is presented in work [14]. The authors describe receiving feedback on guest satisfaction at destinations using QR codes. Using QR code as marketing tool to obtain information.

The value of QR codes in education is given in [15], which discusses: types of codes, levels of error correction in QR codes, main directions of using QR codes. Examples of QR codes are given in paper.

The convenience of QR codes is also expanding its areas for use on food [16]. The authors describe smart packaging using QR codes as one of most promising technologies for improving information provided to consumers.

Implementation of QR codes in production processes in [17]. We are talking about detection of QR codes on images that are received from camera. The issues of creating QR codes in C# are considered.

Analysis of factors affecting usability of QR codes is considered in [18]. Also, authors conduct review of applications for barcode reader. The paper pays attention to security of URLs.

In fact, there is not much work with emphasis on features of dynamic and static QR coding. Basically, works partially mention these characteristics. For example, in work [19], authors use four QR codes, combining them into one dynamic QR code for research. And as result, they justify feasibility of such integration of codes.

In fact, works with emphasis on features In work [20], authors explore QR code and bar code. The difference between QR code and Bar code is given. Attention is paid to availability of documents through QR code in library. Provides examples of how to generate code for use in library.

Also, QR codes to improve library services were investigated in [21]. The authors give examples of codes, describe advantages and disadvantages of QR codes. The process of creating QR code using free QR code generator is considered. The authors define static and dynamic QR code.

Dynamic QR codes are called smart in [22] because they allow managers to vary campaigns at different times of day and on different days.

The study of recognition speed of QR-code labels is considered in [23]. The authors conducted experimental studies of recognition speed of static and dynamic QR codes.

A generalized comparison of dynamic and static QR codes is presented in [24]. Also in work is basic information about versions of QR-codes. The results of testing scanning of QR code at different distances are given. The second area of research is testing of QR codes with different lighting conditions.

Thus, our work will reflect main characteristics of static and dynamic QR codes with visualization of dynamic code development using free code generator.

3. CODING FEATURES

There are many options for presenting information in form of QR codes (Fig. 1).

QR-code is effective tool for automating information processing.

Depending on its content and purpose, optimal code format is selected.

A one-dimensional QR code is read in one direction (horizontally).

A one-dimensional QR code allows you to encode small amounts of information up to 20-30 characters.

Classification of QR codes by application (Fig. 2).

One-dimensional QR codes can be of different shapes and colors (Fig. 3).

Two-dimensional QR codes are used to encode large amount of information (up to several pages of text).

Two-dimensional QR codes are read not only in "line", but also in transverse direction, for example, from right to left or from top to bottom.

You can highlight static codes:

- SMS – sending messages, that is, QR code contains phone number of code owner and pre-written text message;
- Connection – link to any website URL;
- E-mail – sending e-mails. By scanning QR code of an email, customers can automatically send email to their desired email address without having to enter it. That is, you can specify recipient's e-mail address and text of e-mail message;

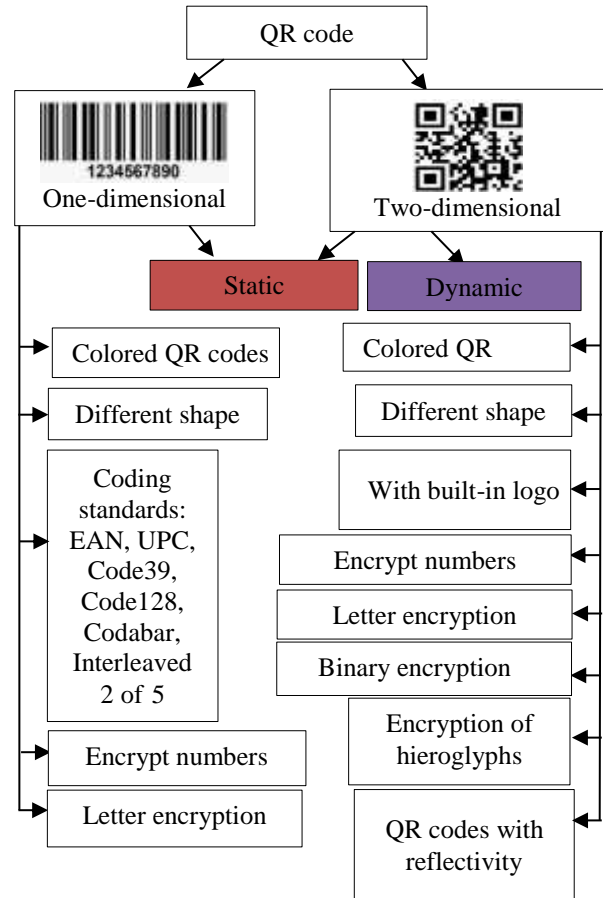


Figure 1: Classification of QR codes

- Text – contains just text;
 - Call – making calls;
 - vCard – business card. Save contact to scan your phone;
 - Whatsap – send WhatsApp messages;
 - Wi-Fi – connection to WI-FI, that is, simplifying process of entering credentials by clients. When QR code is scanned, Wi-Fi credentials are automatically stored on customer's device;
 - Bitcoin – request crypto payments;
 - PayPal – create transaction PayPal.
- You can highlight dynamic codes:
- Application – download apps for Android and iOS;
 - Web QR code contains encoded URL (link to Website);
 - vCard QR code to store information about contact in address book of phone: name, surname, address and phone number;

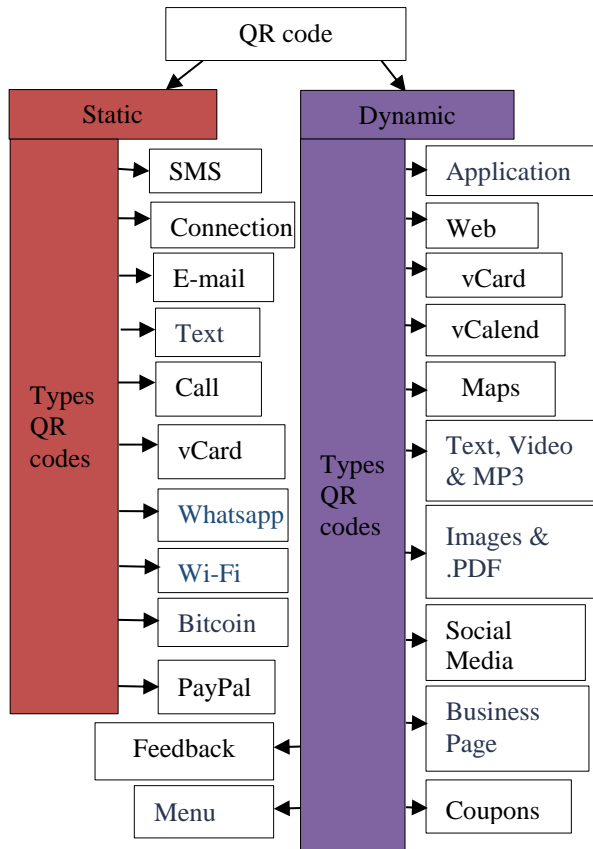


Figure 2: Classification of QR codes by application



Figure 3: One-dimensional QR codes

- vCalendar contains description of event, time and place of meeting and is used as diary of event;
- Maps contains description of exact position on world map;
- Text contains just text.
- Social Media – for all social networks;
- Business Page – business information;
- Feedback – request feedback and feedback;
- Coupons – offers of discounts and coupons;
- Menu – share digital menu.

Static QR code – information in it is encoded without ability to make changes; dynamic – with ability to make changes.

4. DYNAMIC AND STATIC QR CODING

Let's analyze features of dynamic and static QR-coding. Static QR coding for one-time use, for personal purposes. Let's compare these codes in Table 1.

Table 1: Comparison of dynamic and static QR coding

| Name Characteristics | Static QR code | Dynamic QR code |
|--|---|---|
| URL | Contains built-in url with fixed destination. The URL is part of QR code template. Long and complex URL | Contains short URL that redirects to target site registered with that URL |
| Amount of information | Keeps minimum | Can store large volumes |
| Creation process | simple | simple |
| Ability to edit content | - | + |
| Ability to customize visual design | + | + |
| Scanning Process | Harder to scan | Easier to scan |
| Ability to protect code with password | - | + |
| Tracking Statistics | - | + |
| Connecting offline and online marketing channels | - | + |

The most important distinguishing feature is that static code cannot be edited after it is created, and dynamic code can be edited even if it is placed on printed materials.

Code generation process:

- to create static QR code, you need to generate it by selecting type of code and inserting link or text information. It is possible to customize visual design;

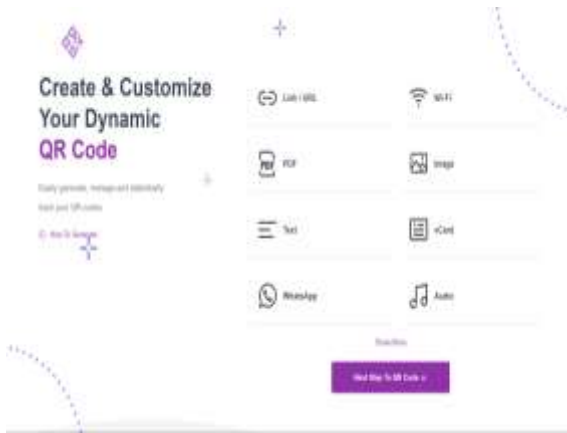
- to create dynamic QR code, you need to generate it by selecting type of code (URL, JPG, PNG, PDF, etc.) and as well

as static codes – inserting URL of social network or URL of website, etc.

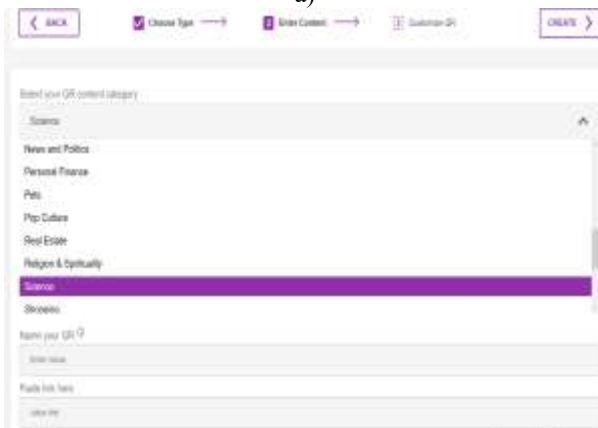
An example of creating dynamic code for free is shown in Fig. 4. In Fig. 4, and main window of Internet resource for creating code is given. Next, you need to select category of QR content (Fig. 4, b). Next, you need to name your QR code and add link. After that, QR code is configured (Fig. 4, c, d).

To create individual design of customize QR code, you need to specify:

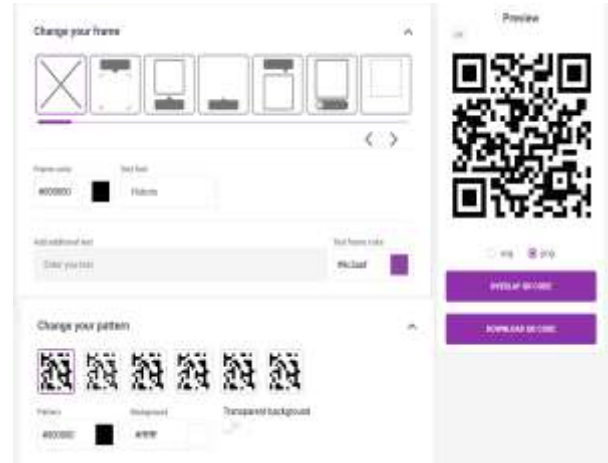
1. Change frame. QR code with frames is important function when creating QR code. Here you can add call to action to your QR. Framed QR code will let target audience know what content they will find in code. It is important to note that QR code created using framed QR code generator increased number of scans by 80 %. You can select the font type and border color (Fig. 4, c).



a)



b)



c)



d)

Figure 4: Customize QR (frame selection)

2. Change your pattern (Fig. 4, c): type, color and background. It is important that foreground color of QR code is darker than background color.

Bright colors in QR code can be main difference between code, however, they can worsen its readability [2].

3. Set corners style: internal and external – set view of search part (Fig. 5, a).

4. Add Logo (Fig. 5, b) in order to personalize QR code.

The process of scanning dynamic QR codes is easier, since code image contains fewer details, therefore, static QR code is scanned longer than dynamic one.

Tracking statistics – in order to know how many people and from which devices scanned code. This is more convenient dynamic code.

Main characteristics of static QR codes:

- small amount of information;
- URL is part of QR code template;

- no user registration is required to access control panel;
 - static QR codes do not expire because they do not change.
- So, key features of static codes:
- convenient for creating landing page (for yourself) or disposable;
 - content is embedded directly;
 - unlimited number of scans, since there are no tracking statistics;
 - registration is not required;
 - cannot be changed or updated after creation and "promulgation";
 - can store non-editable information.

- you can change content after creation;
- tracking capabilities via AI or GPS, which allows you to analyze performance of dynamic code (number of scans performed, location, device used, operating system and time in real time).

A static QR code cannot be converted to dynamic one, as static QR codes cannot be edited or updated after creation.

5. CONCLUSION

In analysis course, features of dynamic and static QR codes use were determined. A comparison of dynamic and static QR coding is given and it is determined that dynamic QR codes are more flexible compared to static ones, since it is possible to change concept or content of QR code even after their creation.

The paper proposes classification of QR-codes.

As result of analysis, main characteristics of QR codes were determined.

The choice between dynamic and static QR coding depends on marketing plans and usage goals.

A detailed process of creating dynamic QR code in form of separate drawings is presented, which allows you to better understand material presented.

6. REFERENCES

- [1] Sotnik S., & et al.. (2022). Key Directions for Development of Modern Expert Systems. *International Journal of Engineering and Information Systems (IJEAIS)*, 6(5), 4-10.
- [2] Sotnik S., & Lyashenko V. (2022). Prospects for Introduction of Robotics in Service. *International Journal of Academic Engineering Research (IJAER)*, 6(5), 4-9.
- [3] Sotnik S., & et al.. (2021). Nano Devices and Microsystem Technologies: Brief Overview. *International Journal of Engineering and Information Systems (IJEAIS)*, 5(11), 74-82.
- [4] Deineko Zh., & et al.. (2022). Confidentiality of Information when Using QR-Coding. *International Journal of Academic Information Systems Research (IJAISR)*, 6(9), 10-15.
- [5] Mustafa, S. K., & et al.. (2020). Using wavelet analysis to assess the impact of COVID-19 on changes in the price of basic energy resources. *International Journal of Emerging Trends in Engineering Research*, 8(7), 2907-2912.
- [6] Al-Sherrawi, M. H., & et al.. (2018). Corrosion as a source of destruction in construction. *International Journal of Civil Engineering and Technology*, 9(5), 306-314.
- [7] Куштим, В. В., & Ляшенко, В. В. (2007). Динаміка розвитку банківського сегмента міжнародного фінансового ринку. *Фінанси України*, (12), 96-105.
- [8] Matarneh, R., & et al.. (2017). Building robot voice control training methodology using artificial neural net. *International Journal of Civil Engineering and Technology*, 8(10), 523-532.
- [9] Rabotiahov, A., & et al.. (2018). Bionic image segmentation of cytology samples method. In 2018 14th International Conference on Advanced Trends in Radioelectronics, Telecommunications and Computer Engineering (TCSET) (pp. 665-670). IEEE.

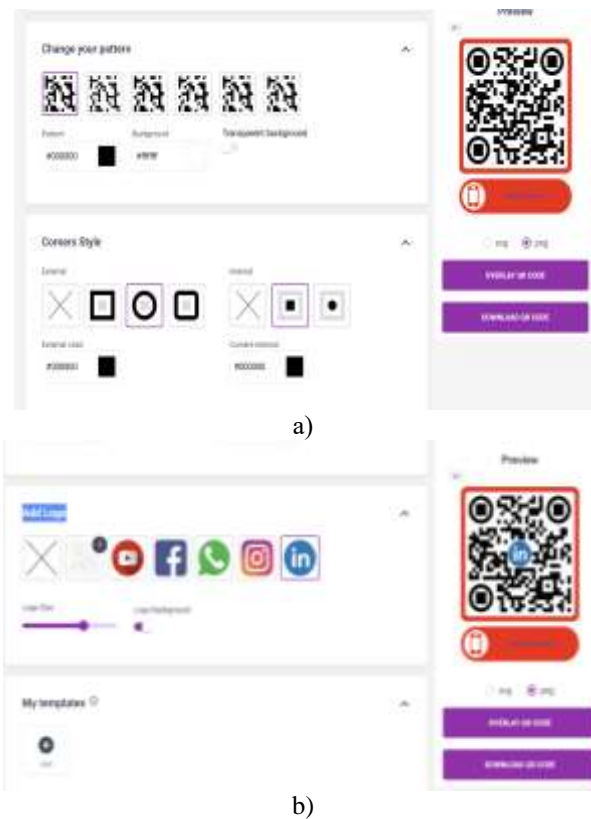


Figure 5: Customize QR (template change)

Main characteristics of dynamic QR codes:

- large amount of information;
- content is embedded in short URL;
- user registration is required to access control panel;
- password protection of code;
- dynamic QR codes expire as they can be updated.

Key features of dynamic codes:

- convenient for business and marketing;

- [10] Chetverykov, G., & et al.. (2019). Wavelets as a Tool for Data Mining Technology. Інформація, комунікація, суспільство, 249-250.
- [11] Matarneh, R., & et al.. (2018). Highlights methodology of time characteristics optimization for plastic products production. International Journal of Engineering and Technology (UAE), 7(1), 165-173.
- [12] Deineko Zh., & et al.. (2022). Usage and Application Prospects QR Codes. International Journal of Engineering and Information Systems (IJEAIS), 6(7), 40-48.
- [13] Karia, C. T., & et al.. (2019). Uses of quick response codes in healthcare education: a scoping review. BMC Medical Education, 19(1), 1-14.
- [14] Vuksanović, N., & et al.. (2020). QR codes as a tool for receiving feedback about guests' satisfaction at destinations. Journal of Place Management and Development, 14(1), 19-31.
- [15] Deineko Zh., & et al.. (2022). QR Code as an Element of Educational Activity. International Journal of Academic Information Systems Research (IJAISR), 6(4), 26-31.
- [16] Rotsios, K., & et al.. (2022). Evaluating the use of QR codes on food products. Sustainability, 14(8), 4437.
- [17] Khamidullin, M. R., & et al.. (2019). The Introduction of QR-Codes in Production Processes. Journal of Environmental Treatment Techniques, 7(Special Issue), 1108-1111.
- [18] Wahsheh, H. A. M. (2019). Secure and usable QR codes.
- [19] Haisheng, L., Huafeng, H., & Fan, X. (2021). QR Code Style Transfer Method Based on Conditional Instance Regularization. In International Symposium on Visual Computing (pp. 15-26). Springer, Cham.
- [20] Perumal, R. (2019). Usage of QR Codes in JC College of Law Library: A Study. Library Philosophy and Practice, 1-5.
- [21] Singha, S. C., & Verma, M. K. (2019). Integration of AIDC technology in mobile via QR code for enhancing the library services: a case study of don bosco college central library, Arunachal Pradesh. Indian Journal of Information Sources and Services, 9(2), 44-48.
- [22] Bolzan, R., & et al.. (2022). QR Codes: A Case of its Level of Adoption in Portugal. Journal of Tourism, Sustainability and Well-being, 10(3), 189-200.
- [23] Xinyu, T., & et al.. (2020). A Research on the Impact Factors of Recognition Rate of QR Code Label Based on RSM. Industrial Engineering Journal, 23(6), 146.
- [24] Merdana, O. (2020). QR-Barcode Application for Barrier Gate Opener based on Android. IJCONSIST JOURNALS, 2(1), 31-35.