Ladislav Karrach
Elena Pivarčiová

LOCATION AND RECOGNITION OF DATA MATRIX AND QR CODES IN IMAGES

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Authors:
Ladislav KARRACH, Ing. PhD.
Elena PIVARČIOVÁ, Prof. PhD.

Department of Manufacturing and Automation Technology
Faculty of Technology
Technical University in Zvolen
Zvolen, Slovakia

Reviewers:
Pavol BOŽEK, Dr.h.c. Prof. Ing. CSc.
Institute of Production Technologies
Faculty of Materials Science and Technology
Slovak University of Technology
Bratislava, Slovakia

Ivan KURIC, prof. Dr. Ing.
Department of Automation and Production Systems
Faculty of Mechanical Engineering
University of Žilina
Žilina, Slovakia

Dagmar JANÁČOVÁ, Prof. Ing. CSc.
Department of Process Control
Faculty of Applied Informatics
Tomas Bata University in Zlin
Zlin, Czech Republic

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Location and Recognition of Data Matrix and QR Codes in Images

Ladislav Karrach[1] (0000-0002-5982-6806), Elena Pivarčiová[1*] (0000-0002-6676-8245)

[1] Department of Manufacturing and Automation Technology, Faculty of Technology, Technical University in Zvolen, Masarykova 24, 960 01 Zvolen, Slovakia
[*] Corresponding author's email: pivarciova@tuzvo.sk

Abstract

Data Matrix and QR codes are two of the most popular types of two-dimensional (2D) matrix bar codes, which are the descendants of well-known 1D bar codes. However, compared to 1D bar codes, they offer many benefits. They enable us to store much more information in the same area, omnidirectional readability, readability even with partial code corruption, error correction, etc.

2D codes began to be used in the automotive industry but quickly spread to other areas. They are used by many industry organizations as an appropriate industry standard, are often used in production, distribution, storage, and sales processes in product labeling, and are also used in monitoring and analysis of production processes in car production.

The monograph deals with the recognition of Data Matrix and QR codes in images. It presents the current state of knowledge in the field and presents the principles of image processing that can be used to address the topic. The work summarizes the results of the scientific and research work of the authors and proposes their own original algorithms for the recognition of 2D codes in real-scene images. Our goal was to design an affordable solution that enables the processing of scanned 2D codes in real-time. Emphasis is placed on the possibilities of use in industrial practice.

We have proposed algorithms which localize single or multiple Data Matrix and QR Codes in an image and decode information, which is stored in them. Image processing techniques like edge detection, adaptive thresholding, connected component labeling, image moments, and local features under sliding window are utilized to identify objects of interest or areas in an image, which can be 2D codes or their parts. We also deal with partially damaged and perspective distorted 2D codes. The recognition rate of the presented algorithms was tested on publicly available test data sets of images with Data Matrix and QR codes. Test data sets are freely available online, so other authors can compare their results with ours. Algorithms are

computationally efficient, work well for low-resolution images, and are also suited to real-time processing.

The monograph is intended mainly for programmers and developers of business applications, researchers, teachers, doctoral students and students at technical universities, as well as for the scientific community and professionals with an interest in the topic.

This monograph was developed within the project KEGA 006STU-4/2021: "Progressive form of interdisciplinary education and support for the development of vocational subjects in the university environment".

Keywords: 2D matrix code, Data Matrix Code, QR Code, Finder Pattern, Timing Pattern.

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