

## Short Communication

# Polychromatic Quick Response (PCQR) Codes: Development and Possible Applications

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In this short communication, a description is provided of our contributions to the research, conceptual and practical development of a method for QR codes, hereby named PolyChromatic Quick Response (PCQR) codes. To the best of our knowledge, the present technique has not been presented before and “PolyChromatic Quick Response” (PCQR) is a specifically coined name for this purpose.

In our study, various possible approaches and implementations of PCQR codes have been explored. We proposed the replacing of conventional contrast usage with the utilization of color coding, resulting in a more efficient information transmission. Identifying and implementing seven printer-friendly colors, namely variations of black, white, red, blue, green, yellow, and purple (the precise color codes will be provided later), were considered an important topic.

Furthermore, we gave attention to the construction of PCQR codes with various modes and methods being considered. For instance, within the byte mode, the encoding was changed from ISO-8859-1 to UTF-8 encoding to address issues related to high-index characters. In the alphanumeric mode, contributions were made to the design of special characters for uppercase and additional functionalities. In the numeric mode, efforts were made to achieve the most efficient encoding of numerical data.

Additionally, our contribution to the so-called mask process of PCQR codes involved the application of mask patterns specific to PCQR codes, which were supported by pseudo-random generators.

Regarding the implementation of PCQR codes, a role was played in developing a scanning process, where color balancing was used to improve accuracy, and OpenCV was used to detect the corners of PCQR codes. In addition, involvement was shown in transforming the detected codes using a homographic procedure to convert them into a standard configuration, as well as in correcting minor errors in detection and transformation.

Finally, the contribution to the processing process included aspects such as estimating the position and size of the modules within the QR codes, estimating colors, and comparing estimated and actual module sizes.

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### \*Correspondence:

Wilfried Allaerts\*, Staring College  
Lochem, The Netherlands.

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