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Key Based Color and Pattern Selection in Color Qr Images for Vision Application

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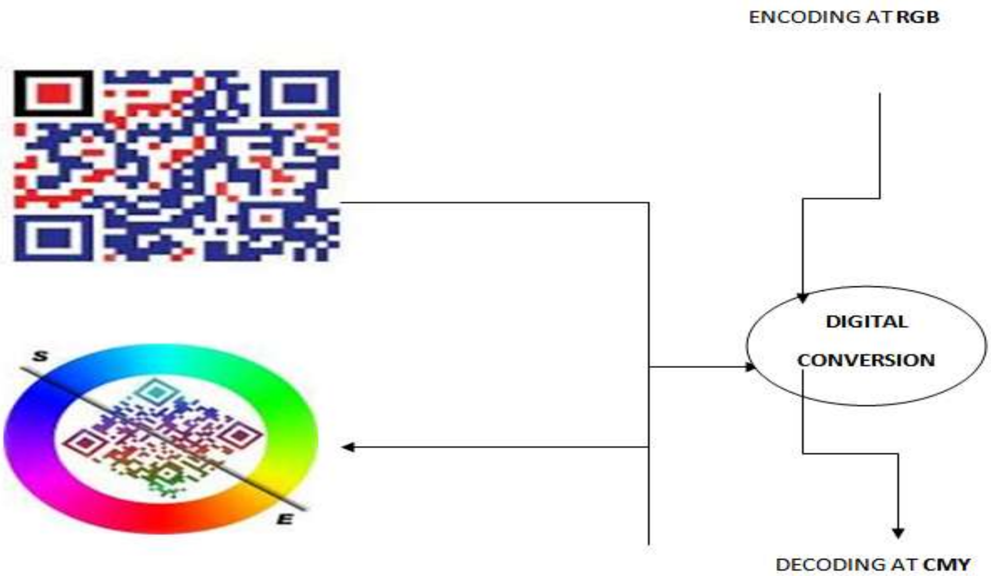
Abstract: *QR codes have gained great popularitybecause of their quick response to scanning, robustness to damage and readability from any directions. In this project, an automatic method to overcome colour tonal and illumination distortion caused in colour QR images is proposed. 16 Primary colours along with CMY print colorant channels is used to generate three unique QR codes used for colour printing and the complementary RGB channels, respectively, used for capturing colour images. Pattern key based QR generation with colour images which are compatible with standard decoding applications is applied to any colour image with full coverage area. The QR information bits are encoded into the luminance values of the image with the algorithm that utilizes half toning masks for the selection of modified pixels and nonlinear programming techniques to locally optimize luminance levels.*

I. Introduction

As the significant increase of mobile device users, more wireless information services and mobile commerce applications are needed. In the past decade, various barcodes have been used as a very effective means in many traditional e-commerce systems, supply chain management, retail sale-and-buy, as well as tracking and monitoring of products and goods. Today, many people believe digital barcodes provides an effective means for mobile commerce application systems due to the following reasons: By Using digital barcodes provides a simple and inexpensive method to present diverse commerce data in electronic commerce and m-commerce, including product id and the detailed product information, advertisements, and purchasing and payment information. As more mobile digital cameras are deployed on mobile devices, using digital barcodes is becoming an effective way to reduce the mobile inputs from mobile users. Therefore, mobile user experience can be improved and enriched. To meet the increasing needs of mobile-based barcode applications in m-commerce, more research work and technology study are needed to understand 2D-Barcodes, required supporting technologies, standards, and applications in m-commerce mobile and services.

Digital Barcodes

More design and experience reports are also needed to help engineers to create effective 2D-Barcode enabled mobile applications. Although there are a number of recent publications discussing various 2D barcodes, and related technology and algorithms.



2D BARCODES:

The concept of barcodes appeared decades ago. Traditionally, the barcodes stored data in the form of parallel lines in different widths, and they are known as 1D barcodes, and could only encode numbers [10]. About 30 years ago, the first linear barcodes were used for railway transportation and tracking of the goods in USA. Since then, barcodes have been used almost everywhere, including manufacturing, postal, transportation, government, health care, retail business, trade show, and automotive business. Barcodes, as machine-readable representation of information in a visual format, can be easily stored, transferred, processed, and validated.

Linear Barcode:

A linear barcode refers a way of encoding numbers and letters in a sequence of varying width bars and spaces so that it can be read, retrieved, processed, and validated using a computer. Using barcodes provides a simple and inexpensive method of encoding text information that is easily read using electronic readers.

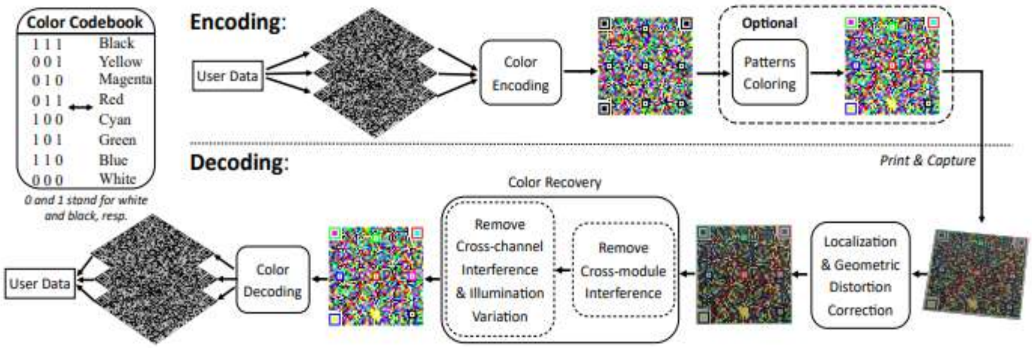
Barcode Symbology:

The barcode symbology refers to the protocol that defines a standard for arranging the bars and spaces that comprise a particular type of barcode, such as UPC-A and EAN. It defines the technical details of a particular barcode type, including the width of bars, character set, method of encoding, checksum specifications, etc. Since the earlier forms of linear barcodes were not capable of encoding letters, 2-D barcodes were invented to meet the needs of encoding alphanumeric data, including letters, numbers, and punctuation marks.

At the end of 1980s, two dimensional (2D) barcodes appeared. With a much larger data capacity, 2D barcodes become popularly used in different areas. PDF417, Micro PDF417, and Data Matrix are typical examples. In general, there are two types of 2D barcodes: a) stacked 2D barcodes, such as Code 49 and PDF417, and b) Matrix 2D barcodes, such as Data Matrix and QR Code. Some examples of common 2D barcodes are listed below. Compared with 1D barcodes which hold vary limited information data, 2D barcodes has a much larger capacity to hold more information data. As shown in table 2, a QR code can holds up to 7,089 digits, 4296 letters, and 2953 binary data. Selecting and using 2D barcodes must consider the following factors:

a) the application usage,
b) standard,
c) implementation,
d) the data you need to encode in barcodes, and
d) how you wish to print the barcode.

Signal-Rich-Art Code Image Generation:



The proposed method includes two main phases of works as illustrated in Fig. 3: 1) signal-rich-art code image generation; and 2) message extraction. In the first phase, given a target image IT and a message M, a signal-rich-art code image IC is created by four major steps:

Step 1.1 — transform message M into a bit stream B of codes;

Step 1.2 — transform every three bits of B into four bits and represent them by a binary pattern block, resulting in a pattern image IP;

Step 1.3 — modulate each pattern block Ti of IP by two representative values calculated from the Y-channel values of the corresponding block Bi of target image IT, yielding a modulated pattern image IP';

Step 1.4 — replace the Y-channel of target image IT with IP' to get a signal-rich-art code image IC as the output. In the second phase, given a camera-captured version IC' of a paper or display copy of the signal-rich-art code image IC, a message M', which is supposed to be identical to M, is extracted from IC' by four major steps:

Step 2.1 — localize the region IC" of the original part of the signal-rich-art code image IC in IC';

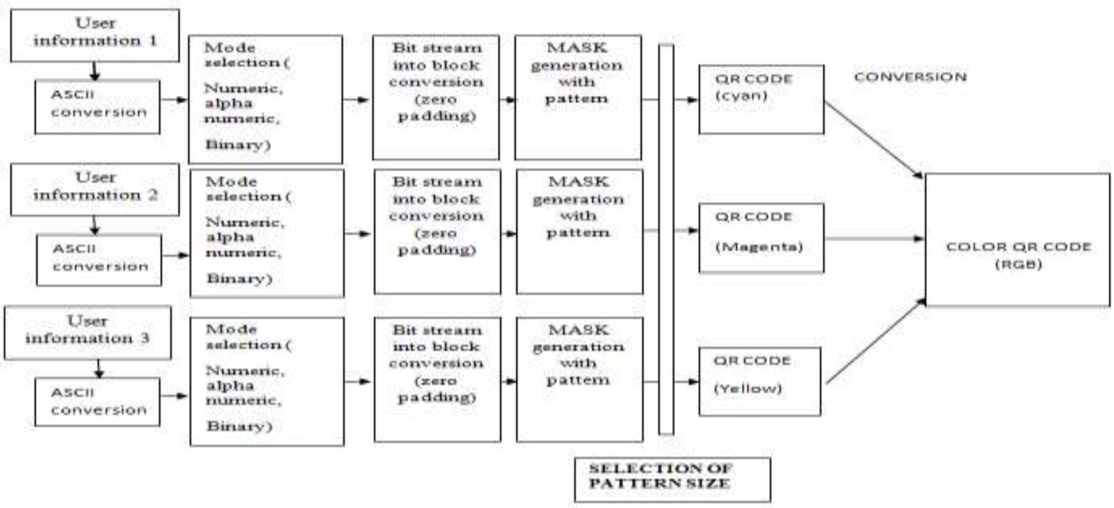
Step 2.2 —correct the geometric distortion in IC" incurred in the image acquisition process, yielding a corrected image IC"';

Step 2.3 — identify the unit blocks in IC"' automatically and divide IC"' accordingly into pattern blocks, each with 2×2 unit blocks;

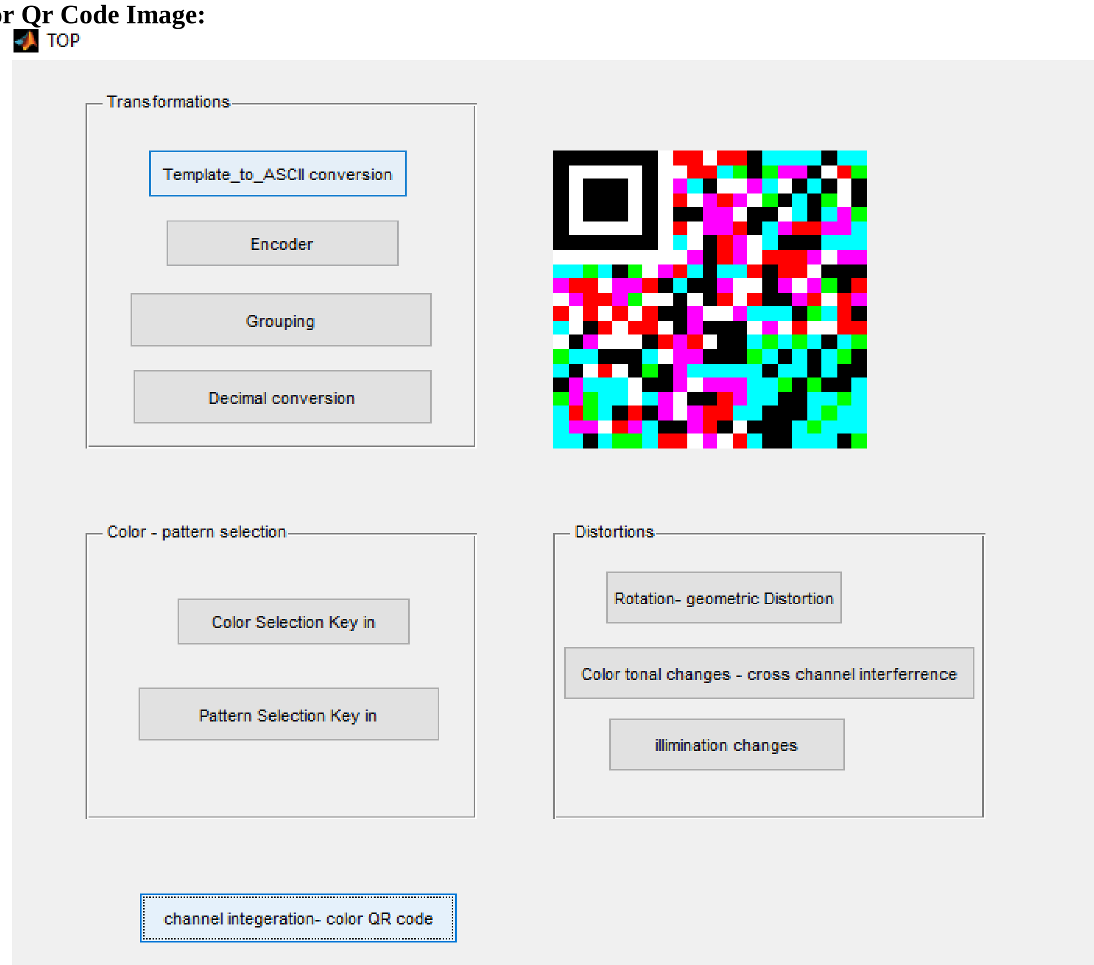
Step 2.4 — binarize each pattern block of IC"', recognize the result to extract the bits embedded in it, compose all the extracted bits to form a bit stream B, and transform B reversely to get a message M'.

Localized Inverse Perspective Transform

Here Assume that the signal-rich-art code image IC is printed and posted or displayed against a white background, and that the captured image Id contains only the original image of IC and the background. The first assumption here may be removed simply by adding a white surrounding zone to IC. To extract the message from Id, we must localize the region of IC in Id.



Color Qr Code Image:



II. Conclusion

Here we analyzed the performance of type of signal-rich-QR image for applications of data transfer, called signal-rich-art code image which act as a carrier of a given message. The target image is kept in the created image, achieving the signal-rich-art effect. Here we use configurable color set selection with QR code pattern design, unit block segmentation are proposed for message data extraction. The output image visual appearance of pre-selected target image and acquired versions of the with screen blurring is proved with MATLAB simulation.