ISSN (ONLINE): 2454-9762
ISSN (PRINT): 2454-9762
Available online at www.ijarmate.com

International Journal of Advanced Research in Management, Architecture, Technology and Engineering (IJARMATE)
Vol. 7, Issue 4, April 2021

AN EFFICIENT TECHNIQUES OF QR CODE USING DENOISING AND DEBLURRING

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Abstract— **QR code is the type of matrix barcode, which was first designed for the automotive industry by Denso Wave in Japan. The QR Code system has become admired outside the automotive industry due to its fast readability and greater storage capacity compared to standard UPC barcodes. With the technology of mobile phones constantly emerging, especially in the area of mobile internet access, QR codes seem to be an adequate tool to quickly and efficiently converse data and URLs to users. This also allows offline media such as magazines, newspapers, business cards, public transport vehicles, signs, t-shirts and any other medium that can embrace the print of a QR code to be used as carriers for advertisements for online products. QR code being so versatile because of its structural flexibility that it leads to so many diverse field for research such as increasing data capacity, security applications such as different kinds of watermarking and steganography as well. In this paper hybrid method is proposed to deblur and denoise the QR barcodes in the presence of noise. The proposed system mainly focused on regularization based method for their simplicity of implementation.**

***Index Terms*— Image Processing-QR Code-Image Denoising-Existing Method-Proposed System-System Specification**

I. INTRODUCTION

Models of objects, environments, and lighting, instead of being acquired (via imaging In imaging science, image processing is processing of images using mathematical operations by using models any form of signal processing for which the input is an image, such as a photograph or video frame; the output of image processing may be either an image or a set of characteristics or parameters related to the image.[1] Most image-processing techniques involve treating the image as a two-dimensional signal and applying standard signal-processing techniques to it.

Image processing usually refers to digital image processing, but optical and analog image processing also are possible. This article is about general techniques that apply to all of them. The acquisition of images (producing the input image in the first place) is referred to as imaging.

Closely related to image processing are computer graphics and computer vision. In computer graphics, images are manually made from physical

devices such as cameras) from natural scenes, as in most animated movies. Computer vision, on the other hand, is often considered high-level image processing out of which a machine/computer/software intends to decipher the physical contents of an image or a sequence of images (e.g., videos or 3D full-body magnetic resonance scans).

In modern sciences and technologies, images also gain much broader scopes due to the ever growing importance of scientific visualization (of often large-scale complex scientific/experimental data). Examples include microarray data in genetic research, or real-time multi-asset portfolio trading in finance.

II. EXISTING METHOD

The use of traditional one-dimensional bar codes has been greatly limited by their small information capacity. For this reason,the two-dimensional bar code was developed . The two-dimensional bar code has high density, has an error correction ability, and can represent multiple forms of language, text, and image data with encryption . At present,the most commonly used type of the two-dimensional bar code is the matrix bar code , which consists of a matrix of

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International Journal of Advanced Research in Management, Architecture, Technology and Engineering (IJARMATE)
Vol. 1, Issue 1, August 2015

elements. Each element represents the value of 1 or 0. Representative matrix bar code protocols include Data Matrix, QR Code and Maxi Code .

To deblur the 2D bar code the previous work proposes a fast deblurring algorithm called the Increment Constrained Least Squares filter that is specifically designed for two-dimensional bar code images. After analyzing the bar code image, the standard deviation of the Gaussian blurkernel is obtained. Then, the bar code image is restored through on iterative computations. In each iteration, the bi-level constraint of the bar code image is efficiently incorporated.

PROPOSED SYSTEM :

In proposed method TV based regularization method is proposed for the debluring and denoising of QR code. Proposed system denoising the QR code via a weighted TV flow and deblur the QR code via blind deconvolution approach. The method is applied to a class of blurred and noisy bar codes with either Gaussian blur or motion blur, and four types of noise(Gaussian, uniform, speckle, and salt and pepper).

a) Creating Blurred and Noisy QR Test Codes

To create blurry and noisy versions of the clean bar code z following method is used.

b) Gaussian noise : (with zero mean and prescribed standard variation) via the addition to each pixel of the standard variation times a pseudorandom number drawn from the standard normal distribution.

c) Uniform noise : Noise is created by adding a uniformly distributed pseudo random number each pixel

d) salt and pepper noise (with prescribed density),implemented using MATLABs "imnoise" function

e) speckle noise (with prescribed variance), implemented using MATLABs "imnoise" function.

III. QR CODE

QR Codes have already overtaken the conventional bar codes because of the main fact that the capacity of data that can be stored by a conventional bar code is very much less when compared to the data that can be stored by a 2-D barcode, the QR Code. QR Code contains data both in horizontal and vertical positions. QR Codes have already overtaken the classical barcode in popularity in some areas. This stems in many cases from the fact that a typical barcode can only hold a maximum of 20 digits, whereas as QR Code can hold up to 7,089 characters. QR Codes are capable of encoding the same amount of data in approximately one tenth the space of a traditional bar code. A great feature of QR Codes is that they do not need to be scanned from one particular angle, as QR Codes can be read regardless of their positioning. QR Codes can be easily decoded with a mobile phone with appropriate software (Kaywa Reader) . Secure communication can also be established using QR Encoding techniques

QR code (abbreviated from Quick Response Code) is the trademark for a type of matrix barcode (or two-dimensionalbarcode) first designed for the automotive industry in Japan. A barcode is a machine-readable optical label that contains information about the item to which it is attached. A QR code uses four standardized encoding modes (numeric, alphanumeric, byte / binary, and kanji) to efficiently store data; extensions may also be used.

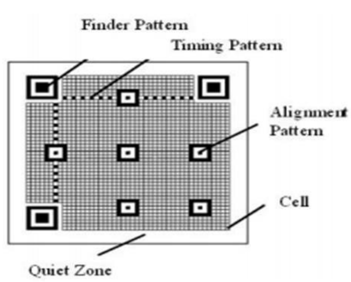

Fig. 1. QR Code structure

QR Codes are actually black modules in square patterns

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the structure of QR Code. The importance of each area is as described as follows Each QR Code symbol consists of mainly two regions: an encoding region and function patterns. Function patterns consist of finder, timing and alignment patterns which does not encode any data. The symbol is surrounded on all the four sides by a quiet zone border. A QR Code can be read even if it is tilted or distorted. The size of a QR Code can vary from 21 x 21 cells to 177 x 177 cells by four cell increments in both horizontal and vertical direction.

1.3.1 Finder Pattern

This pattern can be used for detecting the position of QR Code. The position, size and angle of the QR Code can be determined with the help of the three position detection patterns (Finder Patterns) which are arranged at the upper left, upper right and lower left corners of the symbol. The patterns can be easily detected in all directions.

1.3.2 Alignment Pattern

The alignment pattern consists of dark 5x5 modules, light 3x3 modules and a single central dark module. This pattern is actually used for correcting the distortion of the symbol. The central coordinate of the alignment pattern will be identified to correct the distortion of the symbol.

1.3.3 Timing Pattern

The timing patterns are arranged both in horizontal and vertical directions. These are actually having size similar to one module of the QR Code symbol. This pattern is actually used for identifying the central co-ordinate of each cell with black and white patterns arranged alternately.

1.3.4 Quiet Zone

This zone is mainly meant for keeping the QR Code symbol separated from the external area [9]. This area is usually 4 modules wide.

1.3.5 Data Area

The data area consists of both data and error correction code words. According to the encoding rule, the data will be converted into 0's and 1's. These binary numbers will be then converted into black and white cells and will be arranged. Reed-Solomon error correction is also employed here.

IV. ALGORITHM

Wiener blind deconvolution

In mathematics, Wiener deconvolution is an application of the Wiener filter to the noise problems inherent in deconvolution. It works in the frequency domain, attempting to minimize the impact of deconvoluted noise at frequencies which have a poor signal to noise ratio.The Wiener deconvolution method has widespread use in image deconvolution applications, as the frequency spectrum of most visual images is fairly well behaved and may be estimated easily.

Definition

Given a system

$$y(t) = h(t) * x(t) + n(t)$$

Where * denotes convolution and:

x(t) is some input signal (unknown) at time t .

h(t) is the known impulse response of a linear time-invariant system

n(t) is some unknown additive noise, independent of

y(t) is our observed signal

Our goal g(t) is to find some so that we can estimate x(t) as follows:

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$$\hat{x}(t) = g(t) * y(t)$$

where is $\hat{x}(t)$ an estimate of x(t) that minimizes the mean square error

The Wiener deconvolution filter provides such a g(t) . The filter is most easily described in the frequency domain:

$$G(f) = \frac{H^*(f)S(f)}{|H(f)|^2 S(f) + N(f)}$$

where:

G(f) and H(f) are the Fourier transforms of g and h , respectively at frequency f.

S(f) is the mean power spectral density of the input signal x(t).

N(f) is the mean power spectral density of the noise n(t)

the superscript * denotes complex conjugation.

The filtering operation may either be carried out in thetime-domain, as above, or in the frequency domain:

$$\hat{X}(f) = G(f)Y(f)$$

(where $\hat{X}(f)$ is the Fourier transform of $\hat{x}(t)$) and then performing an inverse Fourier transform on $\hat{X}(f)$ to obtain $\hat{x}(t)$.

Note that in the case of images, the arguments t and f above become two dimensional however the result is the same.

V. ARCHITECTURE DIAGRAM

Image noise is random (not present in the object imaged) variation of brightness or color information in images, and is usually an aspect of electronic noise. It can be produced by the sensor and circuitry of a scanner or digital camera. Image undesirable by-product of image capture that adds spurious and extraneous information.

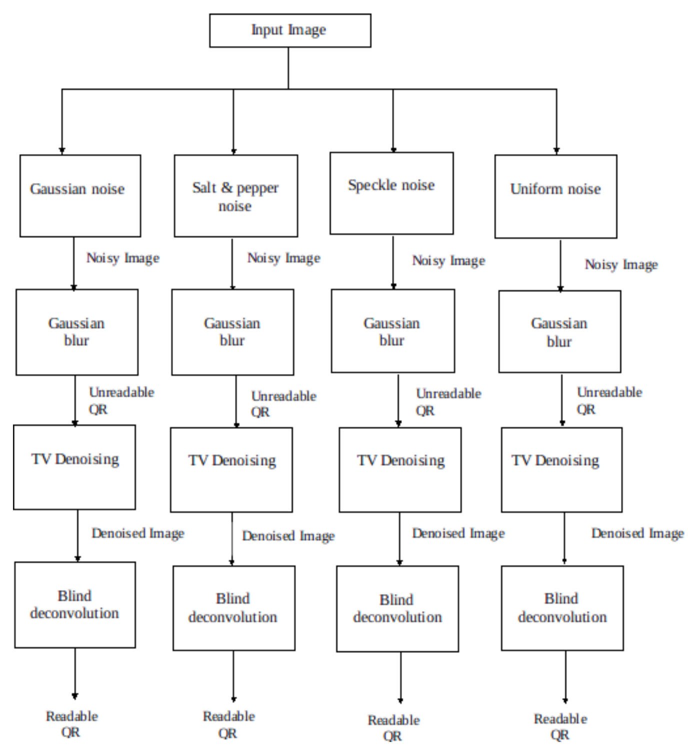

Fig.2 Architecture diagram for proposed system

VI. CONCLUSION

When the original form of an image is changed due to unwanted information, the term is called Noise in Image Processing. It generally carries corruptive effects by deteriorating the image quality

There are four types of noise (Gaussian noise, salt & Pepper noise, Speckle noise and uniform noise)

VII. FUTURE ENHANCEMENT

QR codes have various advantages as an information sharing tool. They allow fast and easy distribution of various

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of the vulnerabilities inherent in the standard, in their particular reader, and the ease of social manipulation attacks, QR codes can be used safely. The key is having awareness of the various attacks presented in this paper and implementing preventative measures by use of the standards also presented. If this is done, QR codes can be used globally as a secure and efficient standard for many different purposes.

We extend our sincere thanks to the Management of Dhaanish Ahmed Institute of Technology, **Alhaj K Moosa**, Chairman **Mr. K.A Akbar Basha**, Director and **Mr. A.Thameez Ahmed**, Chief Executive Officer for providing us with all sort of support in the completion of our project.

We respect and thank our Principal **Dr. K.G.Parthiban M.E., Ph.D.**, for giving us an opportunity to do the project work and provide me all support and guidance which made us to complete the project on time.

We owe profound gratitude to **Mr. R.Anbarasan M.E.**, Head of the Department, Department of Computer Science and Engineering, for his plausible support and timely assistance rendered for completing this project.

We heartily thank **Mr.M.Vignesh M.E.,** Project Guide, Department of Computer Science and Engineering, for his valuable suggestions and remarkable guidance throughout the course of this project.

We also extend our thanks to all the teaching and non-teaching staffs of the Computer Science and Engineering department, family and friends for providing their moral support in successful completion of this project.

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IJARMATE
International Journal of Advanced Research in Management, Architecture, Technology and Engineering (IJARMATE)
Vol. 1, Issue 1, August 2015