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QR Images: Optimized Image Embedding in QR Codes

A.Sreeja
M.Tech, Embedded Systems,
Department of Electronics and Communication,
Gokaraju Rangaraju Institute of Engineering and Technology, Hyderabad.

K.Nagaja
Assistant Professor,
Department of Electronics and Communication,
Gokaraju Rangaraju Institute of Engineering and Technology, Hyderabad.

Abstract:

Till now it is being implementing QR and bar code recognition system is through files. The file consists of QR code and bar code images. Through the file one can only retrieve and recognize the images. But the generation of the codes from cameras or keyboards. It not possible we to generate a code lively, this method does not support. This is the main drawback present in the existing system. In proposed method one can overcome the drawback present in existing system. This embedded project recognizes both QR code and bar codes. The QR Codes can be detected by webcam which is connected to ARM micro controller through USB device and the image is processed by using image processing technique. Image processing is 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. In this project recognition of QR code but along with generation of color image from the QR code is done. The main advantage of this project is to recognize the QR Code from the webcam and generates color image. The controller will display the results on display unit as well as the QR code and color image can be saved into pen drive. By Using RFID cards we will recognize the authorized or unauthorized persons by checking data base.

Index Terms:

QR codes, UVC camera, Raspberry Pi board.

I. INTRODUCTION :

QUICK response (QR) codes have rapidlyemerged as a widely used inventory tracking and identification method in transport, manufacturing, and retail industries. Their popularity is due to the proliferation of smartphones, capable of decoding and accessing on line resourcesas well as its high storage capacity and speed of decoding.

QR codes are used in a variety of applications, such asaccessing websites, download personal card information, postinformation to social networks, initiate phone calls, reproducevideos or open text documents. This versatility makes them a valuable tool in any industry that seeks to engage mobile users from printed materials. Not surprisingly QR codes have been widely adopted in the marketing and publicity industry thanks to the advantage they provide in tracking the performance of publicity campaigns.An important problem of QR codes is its impact on theaesthetics of publicity designs. The square shapes and limitedcolor tolerance severely impairs their integration into bill board designs or printed materials. This challenge has generated great interest for algorithms capable of embedding QR codes into images without losing decoding robustness. There havebeen several efforts to improve the appearance of such embeddings which can be classified in two categories, methods that modify the luminance or color of image pixelsand methods that replace QR modules.The methods presented in and base the strategy on finding the best group of QR modules to substitute by theimage or logo in the QR code. Other methods take advantage of unused modules in the padding regions to introduce the image without affecting the decoding robustness. In the impact of replacing code modules with image pixels was studied. The authors concluded that to retain high rate of decodability, the ratio between image and code area should be approximately proportional to the correction capacity of the code. It was also found that superimposing images over finder or alignment patterns severely decrease the probability of correct decoding. As a consequence it is common for logos or images to be located at the center of the code for these methods .In general these approachesdo not take advantage of the code word generation process and this imposes restrictions in the location of modified modules.This problem was addressed by recently developed techniques which manipulate the Reed Solomon encoding procedure to maximize the area coverage without reducing the correction capacity.The second category of embedding algorithms is based on the modification of the pixel's luminance.

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QR code and source image is optimized by changing the luminance value. To take advantage of local correlations between the luminance of the image and the values of the QR code, the optimization of the transformation parameters is performed. Optimization of source image makes it possible to specify regions of the image which require higher visualquality or higher decoding robustness. The masking process is employed which is based on the user specified range for masking of the pixels of source image.Genetic algorithm is implemented to select the pixel of QR code. The genetic algorithm is a powerful search algorithm that performs an exploration of the search space that evolves in analogy to the evolution in nature. It uses probabilistic transition rules instead of deterministic rules, and handles a population of candidate solutions that evolves iteratively. The first generation of this process operates on a population of randomly generated individuals. From there on, the genetic operations, in concert with the fitness measure, operate to improve the population. The evolution of the species is simulated through a fitness function and some genetic operators such as crossover and mutation. The fittest individuals will survive generation after generation while also reproducing and generating offspring's that might be stronger and stronger.

At the same time, the weakest individuals disappear from each generation. In each cycle of genetic evolution, a subsequent generation is created from the chromosomes in the current population. The cycle of evolution is repeated until a termination criterion is reached. The pixel regions within the particular range are identified as the selected pixels using genetic algorithm. The selected pixels are encoded into the luminance of the color image to obtain the QR embedding.The method which finds the best group of QR modules to be replaced with the image generates the embedded QR code. The embedded QR code is decodable by a standard decoding application. The use of tiny part of QR code which is replaced by the image is the limitation of such method. The method used in [12] generates the embedded QR code with the decoding robustness but result shows the visual distortion. However it uses the entire area of code to produce the visual QR code. In [10], author gives the visually significant QR code by blending the color image into the QR code. This technique is also compatible with the existing decoders. The technique presented in [1] is based on modification of luminance values and halftoning method for the selection of modified pixel which generates the more visual pleasant result.

This method always reduces the robustness of the code however it can be controlled by changing the value of maximum acceptable probability of error and the size of center region in pixels. Our approach embeds the source image into the QR code with full area of the code. This work gives the more visual pleasant result than the most of the previous results. The only issue is that the decoding robustness of embedded QR code is reduced. Pixels of the embedded code are a mixture of pixels from the image and the QR code. This mixture distorts the binarization thresholds with respect to the black and white QR code, and in general increases the probability of binarization error. The probability of binarization error is the error of sampling the incorrect binary value at any pixel in the QR module. Thisprobability is subjective by different factors such as the local distribution of luminance values in the image, the distribution of pixels in the QR code and the parameters of the luminance transformation. The problem can be minimized by optimizing the luminance parameters, but this presents a tradeoff between decoding robustness and image quality. The future work is to reduce the probability of binarization and sampling error by constructing probability of error modules.

II. HARDWARE IMPLEMENTATION:

A.Raspberry pi:

The Raspberry Pi is a credit-card-sized single-board computer developed in the UK by the Raspberry Pi Foundation with the intention of promoting the teaching of basic computer science in schools.

Fig.1: Raspberry pi board

The Raspberry Pi is manufactured in two board configurations through licensed manufacturing deals with Newark element14 (Premier Farnell), RS Components and Egoman. These companies sell the Raspberry Pi online. Egoman produces a version for distribution solely in China and Taiwan, which can be distinguished from other Pis by their red coloring and lack of FCC/CE marks.

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The hardware is the same across all manufacturers. The Raspberry Pi has a Broadcom BCM2835 system on a chip (SoC), which includes an ARM1176JZF-S 700 MHz processor, Video Core IV GPU, and was originally shipped with 256 megabytes of RAM, later upgraded to 512 MB. It does not include a built-in hard disk or solid-state drive, but uses an SD card for booting and persistent storage.

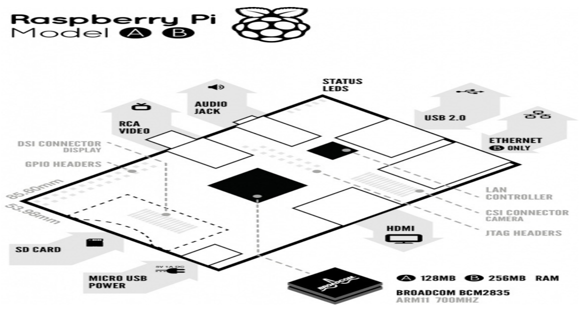

Fig.2: Board features

The Foundation provides Debian and Arch Linux ARM distributions for download. Tools are available for Python as the main programming language, with support for BBC BASIC (via the RISC OS image or the Brandy Basic clone for Linux), C, Java and Perl.

B. UVC Camera Driver:

Fig3. UVC Driver Camera.

A UVC (or Universal Video Class) driver is a USB-category driver. A driver enables a device, such as your webcam, to communicate with your computer's operating system. And USB (or Universal Serial Bus) is a common type of connection that allows for high-speed data transfer. Most current operating systems support UVC. Although UVC is a relatively new format, it is quickly becoming common.

C.TFT display unit:

TFT stands for Thin Film Transistor, and is a type of technology used to improve the image quality of an LCD. Each pixel on a TFT-LCD has its own transistor on the glass itself, which offers more control over the images and colors that it renders.While TFT-LCDs can deliver sharp images, they also tend to offer relatively poor viewing angles, meaning they look best when viewed head-on. If you view a TFT-LCD from the side, it can be difficult to see.

III. SOFTWARE REQUIREMENTS:
Software Specifications

Operating System : Linux
Qt for Embedded Linux
Platform : OpenCV (linux-library)

A.Linux Operating System:

The Linux open source operating system, or Linux OS, is a freely distributable, cross-platform operating system based on Unix that can be installed on PCs, laptops, net books, mobile and tablet devices, video game consoles, servers, supercomputers and more.

B. Qt for embedded Linux :

Qt for Embedded Linux is a C++ framework for GUI and application development for embedded devices. It runs on a variety of processors, usually with Embedded Linux. Qt for Embedded Linux provides the standard Qt API for embedded devices with a lightweight window system.

C.OPEN CV:

Open CV is an open source computer vision library originally developed by Intel. It is free for commercial and research use under a BSD (Berkeley Software Distribution) license. The library is cross-platform, and runs on Linux, Windows and Mac OS X. It focuses mainly towards real-time image processing, as such, if it finds Intel's Integrated Performance Primitives on the system, it will use these commercial optimized routines to accelerate itself.

IV .PROPOSED SYSTEM:

In proposed method we can overcome the drawback present in existing system. Our embedded project recognizes both QR code and bar codes. The QR Codes can be detected by webcam which is connected to ARM micro controller through USB device and the image is processed by using image processing technique.

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Image processing is 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. In this project we are not only recognizing QR code but also generating color image from the QR code.

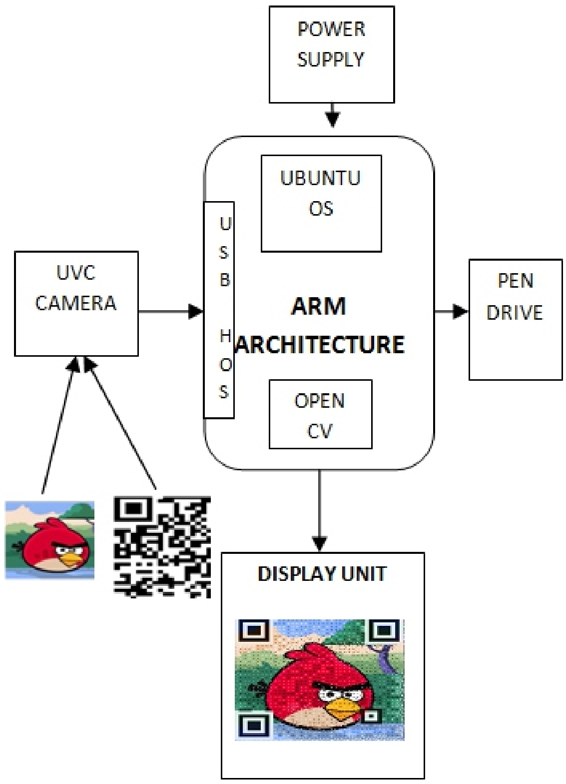
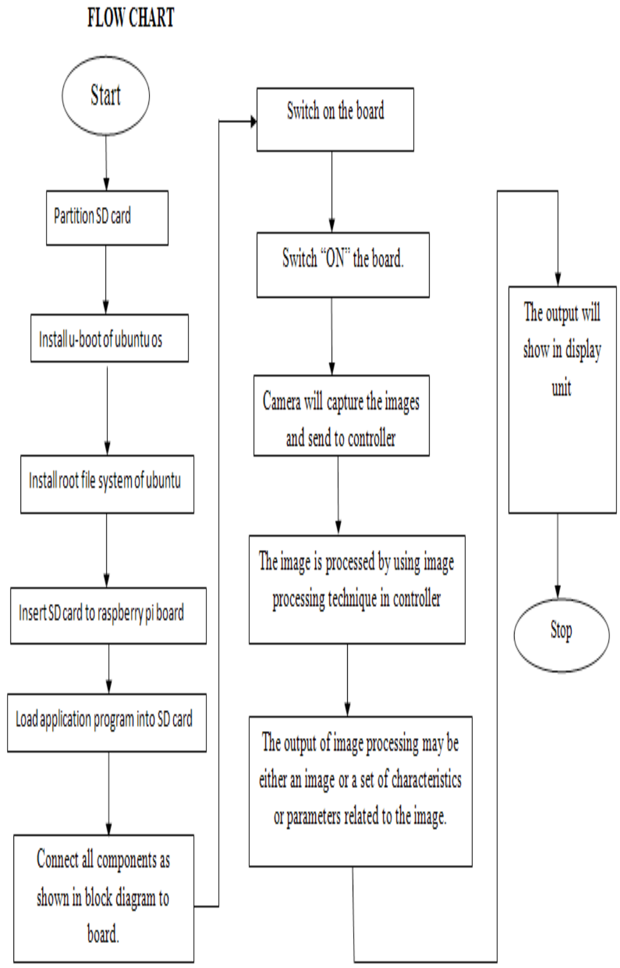


Fig4. Block diagram



The main advantage of this project is to recognize the QR Code from the webcam and generates color image. The controller will display the results on display unit as well as we can store the QR code and color image into pen drive.

VI. RESULTS:

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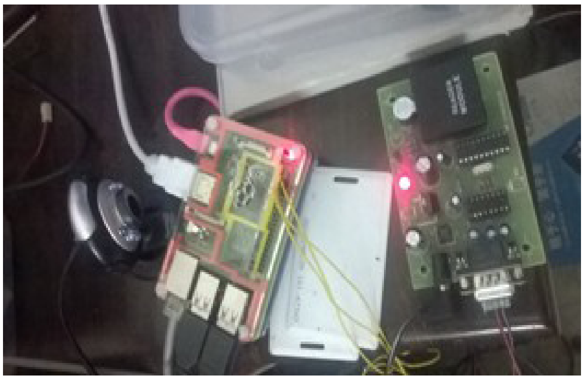

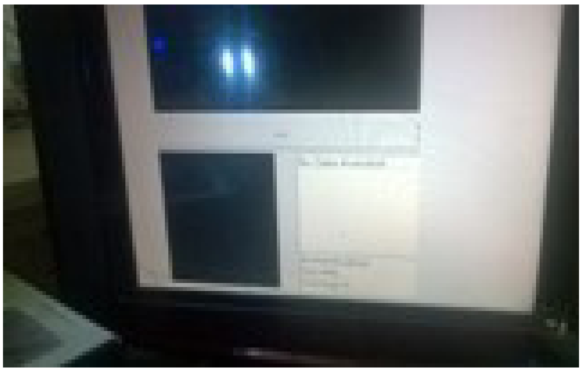

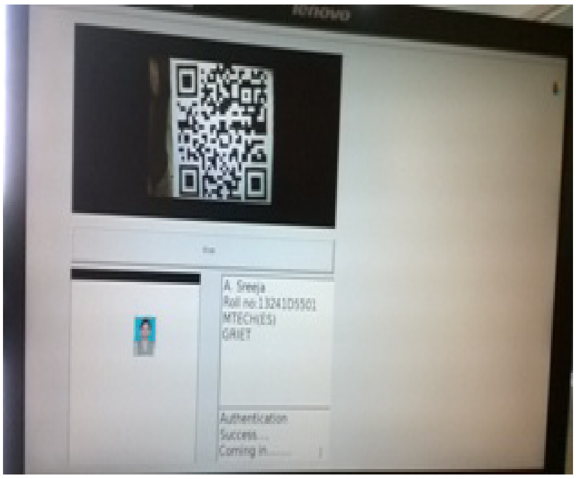

VII. CONCLUSION:

The project "QR IMAGES: OPTIMIZED IMAGE EMBEDDING IN QR CODES" has been successfully designed and tested. It has been developed by integrating features of all the hardware components and software used.

Presence of every module has been reasoned out and placed carefully thus contributing to the best working of the unit. Secondly, using highly advanced Raspberry pi board and with the help of growing technology the project has been successfully implemented.

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