Quick Response Code Scanner

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ABSTRACT

Advances in semiconductor manufacturing processes and large scale integration keep pushing demanding applications further away from centralized processing, and closer to the edges of the network (i.e. Edge Computing). It has become possible to perform complex in-network image processing using low-power embedded smart cameras, enabling a multitude of new collaborative image processing applications. This paper introduces the concept of QR code scanning using OpenMV, a new low-power smart camera that lends itself naturally to wireless sensor networks and machine vision applications. The uniqueness of this platform lies in running an embedded Python3 interpreter, allowing its peripherals and machine vision library to be scripted in Python. In addition, its hardware is extensible via modules that augment the platform with new capabilities.This research work concentrate on the concept of QR code and the scanner used to detect the QR code successfully . A QR code (short for "quick response" code) is a type of barcode that contains a matrix of dots. QR code holds data like simple text , addresses , phone numbers ,email addresses , URL , price of commodities etc . It can be scanned using a QR code scanner or a smart phone with built-in camera. For example, scanning a QR code with your phone might open a URL in your phone's web browser . Firstly , the obvious drawback of smart phones is that it requires internet connection to read the QR codes . QR codes cannot be scanned if there is no internet connection. Secondly , the smart phones are far more expensive. Thirdly, the speed of scanning QR code is less in smart phones for industry. This paper proposes a solution to many of above problems by using Open MV Cam M7 smart vision camera. By using the Open MV cam M7 the rate of scanning is increased thereby reducing the expenses.

1. INTRODUCTION

QR code is the trademark for a type of matrix barcode two-dimensional barcode,is often used to provide access to information through a mobile phone.QR code scanner is the tool to scan QR code anytime anywhere.QR codes are widely used in service industry today, such as transport, food services, hospitality, entertainment industry, financial services, and tourism.QR Code is becoming popular and extensive adoption in international. Especially in Japan and Korea, people who are using QR Code scanning to visit Internet accounts for 96%. The QR Code is often used on newspapers, magazines, journals, websites, advertisement, and advertisement board to store websites‟ addresses, content information and miscellaneous data. For instance, QR Code is used in advertisements 7 to guide people to visit their websites in business world. (Jin & Du 2014, 910-911.) Additionally, QR Code becomes an official tools is utilized in governments and companies (Speed & Nykamp & Heiser & Anderson & Nampalli 2013, 18). In 2011, the Royal Dutch Mint announced QR Code embedded into the official coin that QR Code would direct a user to a website about the Royal Mint‟s centennial. The world's largest QR Code is created by Hacherspace and painted on the top of their company's building in Charlotte, North Carolina in 2010 (MCNC, cited by Speed & Nykamp & Heiser & Anderson & Nampalli 2013, 18.) In China, QR Code is used on the train tickets on the corner of the right bottom and the names of passengers and relevant personal information are also included in this QR Code (TCHINASIA 2011, cited by Speed & Nykamp & Heiser & Anderson & Nampalli 2013, 18). Nowadays the major requirement of the industry is to scan the thousands of products in very few seconds.By considering the increasing involment of QR code in every sector of industry and in order to save the time as well as to increase the efficiency. This project completely focuses on increasing the speed of QR code scanning.In this project we will be using open MV camera for the scanning purpose.The speed of scanning can be increased by making the required changes in the

algorithm of qr code scanning.The idea behind using this camera is that whole setup requires very low power and we can scan thousands of products in very less time and can be converted in a standalone system.

2. LITERATURE SURVEY

The history of the bar code can be traced to the supermarkets, which gained popularity in the U.S Supermarkets were required to stock thousands of products of different brands. In 1948, Bernard Silver, a graduate student at Philadelphia's Drexel Institute of Technology and Norman Joseph Woodland, a twenty-seven-year-old graduate and teacher at the same institute, worked on transactions at the supermarkets by automatic capture of productinformation at the checkout counters.In 1952, Woodland and Silver built a reading device that was the size of a desk and had to be wrapped in lack oil cloth to keep out the ambient light. The invention of the transistor in 1950's helped the electronic components and circuits. Till 1960, the idea of automated check-out in food chain industry exited only at the conceptual level. It was only in 1967 that a pilot project system was installed in Kroger store in Cincinnati. In 1977, the first high-density symbology was invented. Code 11 was developed to solve a problem AT&T was facing in bar coding telecommunications equipment. The concept of bar code spread to other countries. In 1974, 12 manufacturers and distributors from the European countries formed a council to examine the possibility of developing a standard article numbering system for Europe, similar to the Universal Product Code (UPC). As a result, in 1977 a non-profit body, the European Article Numbering Association (EAN) was created to develop a UPC compatible system. QR (quick response) Codes, a type of barcode, are beginning to make inroads in the United States. They are still largely unknown, but early adopters in higher education and recent urban promotional campaigns are changing that. As with any new technology, it is important to understand what they can do and when they can help our users. Quick Response code is a matrix barcode readable by smartphones and mobile phones with cameras. They are sometimes referred to as 2d codes, 2d barcodes, or mobile codes. On most phones purchased in the United States, one must download a free app (application) in order to read the QR code, although some phones have one preinstalled.This process of scanning requires internet conection.

I. M.V. Sunil, N.S. Harinarayan and Kumbar, Mallinath, (2014) study on QR code technology in libraries. The study is based on empirical data from a B-School which explains the implementation rigmarole of Q R Code and users capability to use Q R code for web based services. The result indicates that differentiated implementation strategies focused on specific services are like to be more successful than a single broad-brush strategy for all services and activities.

II. Okazaki, et.al.(2012) found three studies in Japan indicated that QR codes were largely used in print media for promoting loyalty programs, convenience, savings.Walsh, Andrew(2011) explained the use of technologies including GPS, QR codes and RFID tags to personalize the learning environments in academic libraries and reported on the use of QR codes at the University of Hudders field, including information on how the QR codes have been received by users.

III. Pranch and Kanji (2007) in the titled an application on 3G mobile phone and two dimension barcode in classroom communication support system valuation focused on how users make use of the QR code in the current system, which contains class attendance, class evaluation and student collaborative functions.

3. CIRCUIT DIAGRAM

Functional circuit diagram of the Open MV camera is shown below.Open MV cameras are programmable in Python3 and come with an extensive set of image processing functions such as face detection, key points descriptors, color tracking, QR and Bar codes decoding, April Tags, GIF and MJPEG recording and more. The circuit diagram is given below in fig 1.

Fig -1 circuit diagram of the module

4. COMPONENTS USED AND THEIR FEATURES

4.1 OPEN MV SMART CAMERA

The main board measures 1.4"x1.2" and consists of the image sensor, the MCU, power supply, a micro-SD card slot and extension headers, see Figure 6. In addition, built-in RGB and IR LEDs are provided on board, for status indication and night vision, respectively.

4.1.1 Image Sensor:

Open MV uses Omni Vision's OV7725 VGA CMOS sensor. The OV7725 supports cropping and windowing to output arbitrary frame sizes, as well as standard resolutions. The OV7725 was chosen mainly for its low-cost and its high sensitivity in low-light operation (enabled by its 6.0x6.0µm pixels). The OV7725 does support JPEG, however the MCU has a hardware JPEG encoder. JPEG compression is mainly used to transfer frames to the host for debugging, however it can enable advanced features such as medical images compression (El-Sonbaty et al, 2003).

4.1.2 Microcontroller:

Open MV is based on the STM32F7 ARM Cortex-M7 dual-issue MCU running at 216MHz. The MCU features 512KiBs SRAM, 2MiBs flash (part of which is used for lookup tables and internal flash file system) DMA and DMA2D, USB OTG, a single precision FPU, DSP instructions, a digital camera interface (DCMI), JPEG encoder, timers and multiple serial peripheral interfaces such as I2C, SPI and UART. The MCU'sSRAM is divided into two non-contiguous blocks; a main block and a core-coupled memory (CCM). The main block is used for the frame buffer, and for storing computed integral images (Crow, 1984) and other temporary images when needed, while the CCM is used exclusively for the stack, heap and data.

4.1.3 Networking

The main Open MV board is decoupled from the networking modules using extension modules (or shields). This decoupling allows the `camera` to work with different networks (such as WiFi, BLE or Zigbee) using different radio transceivers to easily integrate the sensor into existing network infrastructures.

4.1.4 Power Consumption

To minimize idle power consumption, the CPU can enter low-power modes from which it can be awaken via interrupts. Additionally, in a few key places in the code, such as waiting for an image readout, the WFI (Wait For

Interrupt) instruction is executed to force the processor to suspend execution until an IRQ is received. Furthermore, the MCU supports switching to lower frequencies (frequency scaling).

4.1.5 Extensions

The extension headers breakout the ADC/DAC, PWM, I2C, SPI and UART interfaces, allowing the camera to be interfaced to motors, network modules and other sensors such as thermal and distance sensors. A low-resolution thermal imaging shield was designed allowing the sensor to be used for presence detection. Other shields including WiFi, BLE and LCD shields were also designed.

5. FLOWCHART AND METHODOLOGY

5.1 Flowchart

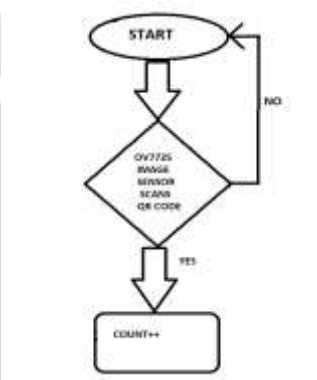

Fig 2. flowchart of the module

5.2 Methodology

QR Code Detection support is made possible by Daniel Beer's quirc library which was designed to run on low memory systems like the Open MV Cam. The library is capable of detecting and decoding QR Codes from version 1 (21x21 pixels) to version 40 (177x177 pixels). Best of all, the library code will work on both the M4 version of the Open MV Cam and the new M7 version.

On the M4 Open MV Cam we're going to be limited to detection resolutions less than or equal to 160x120 which translates into support for QR Code versions 1-5. So, we'll be able to decode QR Codes that can handle up to 255 character numeric strings, 154 character alpha numeric strings, and 106 character 8-bit ASCII/UTF-8 strings. On the M7 we'll be able to go up to 320x240 which will allow for up to version 15 QR Codes which can store 1,250 character numeric strings, 758 character alpha numeric strings, and 520 character 8-bit ASCII/UTF-8 strings

The following are the steps involved in Q R code scanning:
Step 1:Installing the open mv ide which is available open-source software.

Step 2. Open MV camera is used to scan detect the QR code.

Step 3 :The scanner illuminates the code using the illuminator system.

Step 4: The sensor/convertor part of the scanner then detects the reflected light. Once the light is detected, analog signal is generated. This signal contain varying voltage based on the intensities of the light reflection.

Step 5: The analog signal is converted by the sensor into a digital signal.

Step 6: The digital signal is then interpreted by the decoder.

Step 7: The decoder sends the information to the monitoring device.

Step 8: The speed of scanning is improved by making desired changes in the algorithms.

6. FUTURE SCOPE AND SUGGESTIONS

6.1 Suggestion 1

This technique can be implemented in every industry of India producing millions of products at a time So, it will save time as well as prevent from making different prototypes of the same product.

6.2 Suggestion 2

Existing Open MV camera has slot for sd card which has some limitations of storage so in future we can modify it and by directly giving it access to cloud we can solve the storage issue and thereby reduce the space.

7. ADVANTAGES

Below are the advantages of scanning QR codes with open MV camera.

1. QR codes can be read anytime, anywhere. – This makes them so easy to decode and convenient since special scanners are not required and the camera can scan and present the information contained in the codes.

2. There is no need to write vital details down. A simple scan captures the desired information. Multiple uses of these codes – Simplify access and without having to type anything, it is now possible to:Visit websites,See text and images,Send emails and messages,Dial telephone numbers

3..Fast and reliable web service for creating and web-linking Data Matrix and QR bar codes to information and promotional offers..

4..Ability to be read from all directions (360o) in high speed .Its resistance to distorted symbols.

5..Data restoration functionality which makes it resistant to smudge. Efficient encoding of Kanji and Kanha characters .

6..Linking functionality of QR code symbols and Code confidentiality among others.

8.DISADVANTAGES

1. It requires some time for adjustment of open mv cam and calibrate it with the industrial setup.

2. Open MV IDE displays the information stored in qr code in the form of histogram which is difficult to decode.

3.It can scan only one QR code at a time.

9. CONCLUSIONS

In this paper we proposed a solution to industry requirement by providing efficient system which scans the QR code within very less time.As well as the cost of the scanner is been reduced as compared to the others scanners manufactured by the foreign industries in this way we are contributing to make in India initiative.

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