



Real Time Barcode Recognition System using LabVIEW

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Abstract— Now days barcodes are essential on the products for the identification of products at point of sale and to maintain its inventory so that it can be available for on demand supply. An entrepreneur prints the label on product in coded form (barcode) to mention its information. The proposed work presents a technique for scanning barcode on any product. This work is based on image processing techniques of National Instruments' LabVIEW. In this system USB camera is used with proper lighting conditions. The results of the scanned barcodes are stored in a database for further uses and analysis. To use this system at large scale a conveyer belt mechanism can be used.

Keywords— Barcode, Labview, Real time barcode detection, 1D barcode, Barcode Recognition.

I. INTRODUCTION

A barcode is an optical machine-readable representation of data, which shows certain data on certain products. Originally, barcodes represented data in the widths (bars) and the spacing's of parallel lines shown in figure1 [1], [2]. Some barcodes also include symbols and they can be 2 or 3 dimensional [1]. Barcodes are the symbols that represents the product information that is unique. The speed of barcode scanning and its reliability improves many operations like forwarding, packing, reception, and inventory control. Barcodes can be found on the books, factory equipment, blood banks, supermarkets etc. Barcodes are the easy way of rapid data input [3]. This information refers to the information which stores the companies purchase and sales of the product separately. When the barcodes are read using scanning device, a signal is generated and it is processed by some software stored in the computer. This information is used to specify the selected product [4]. There are many types of barcodes name as EAN-13, EAN-8, Code 39, Code 93, Code 128 and UPC (Universal Product Code) which are very popular and they comes under 1D barcodes [1], [2]. EAN-13 is used in the Europe and Turkey, UPC is used in the Canada and America. EAN-13 was originally called as European article number and now it is called as international article number. Barcode sample (EA N-13) in the figure 1, the thick black colour lines represents '1' and blank represents '0'. There are 12 numbers in the barcode and each number has 7 bits. It has 3 start, 3 stop and 5 bits in the middle for referencing [4]. In the figure1 EAN-13 is used to determine the process of reading barcode. Barcodes are arranged in a bit string according to the thickness of lines. This paper describes the useful method which helps in reading barcodes more efficiently.



Fig 1 barcode

II. RELATED WORK

Previous approach to read barcode using MATLAB under the title barcode recognition system [3]. Firstly, image that contains the barcode information is acquired either by using a camera or selected image from any file from computer. The colour image contains full usable information. The image is then being converted to grayscale format and transformed into a pre-processed, grayscale image for reducing noise and enhancing the image contrast between bars and spaces [3]. A barcode orientation is identified that is parallel to bars in the pre-processed image [3], [5]. A projected sequence is generated by projecting pixels of the pre-processed image along the barcode orientation. Because the acquired image will typically contain an area larger than the barcode, it is initially required to crop the barcode area as the rest of the image is unnecessary [3]. Since the barcode region is required, the borders of the barcode line coordinates must be determined. An edge detection algorithm is used to determine the borders. The binarized sequence is generated by applying a threshold to detected peaks and valleys of the projected sequence [3]. A barcode-encoding sequence is then generated from the binarized sequence, in which each barcode bar module and each barcode space module are represented by a single respective bit in the barcode-encoding sequence. The barcode encoded information is extracted

from the barcode-encoding sequence. For these purposes MATLAB's Image Processing Toolbox and Image Acquisition Toolbox are used in this work. These toolboxes support a wide range of image processing operations including spatial image transformations, morphological operations, block operations, linear filtering and filter design, transforms, image analysis and enhancement, image registration, de-blurring and region of interest operations [3]. The hardware in this work the webcam. With the correct MATLAB command, the webcam is able to capture the image correctly by using image acquisition toolbox and image processing toolbox of MATLAB. MATLAB provides a complete environment for developing customized imaging applications as shown in figure3. The block diagram of this work is shown in figure2.

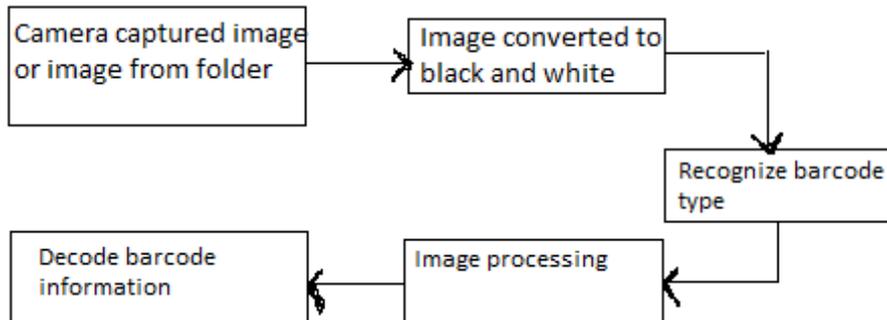


Fig.2 working block diagram of system



Fig.3 matlab user interface

III. PROPOSED WORK

In this system the main functional units are the Camera unit, Image Processing unit, Barcode decoding unit. When the product close to the camera, its image is captured with proper illumination so that decoding is possible and is error free. The camera then processes the obtained image using image processing algorithm and techniques [4], [6]. Different type of barcodes use different techniques for decoding the information stored in them [1]. When the barcode is decoded, its data is generated as a string of numbers and characters. This data is also stored in a database for accessing and analysing [7], [8]. All this system is provided with Power supply unit. The barcode is first obtained from the camera and then it is pre-processed in which the image is filtered for its proper brightness, contrast, saturation. Then it is converted to binary image for decoding [9], [10]. After this, the region of interest (ROI) is found and barcode is localized [8]. Then the actual decoding algorithm works and the data is extracted as mentioned in section 3.2. Finally this data is displayed on the Front Panel window of the LabVIEW programming environment as shown in figure 9.

A. Image Acquisition by LabVIEW

In this work USB camera is used for the image acquisition. USB camera is configured using the measurement and automation explorer tool of LabVIEW [7],[8]. The best way to capture the image contain barcode is to use IMAQdx drivers and Vision Development module [8]. Vision acquisition palette is used in the block diagram of LabVIEW programming environment as shown in figure 4. These LabVIEW tools work same as MATLAB tools and open CV softwares. This function is used to grab picture containing barcode and generate output image which can be observed on front panel of LabVIEW programming environment and this output image can be used for image processing [7].

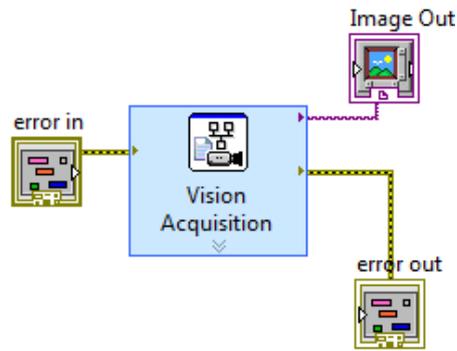


Fig. 4 Image acquisition palette

B. Barcode Image Processing and Database Storage
Processing on Barcode Image

For the processing of barcode images first of all barcode image is acquired by vision express tool offered by vision acquisition software. Then acquired image is applied on the IMAQ read barcode VI for processing [7]. As the result of processing it generates a duplicate digital image [9]. This digital data of the image is send in the next loop for the further classification and barcode data extraction. Barcode function VI is shown in figure 5 and figure 6.

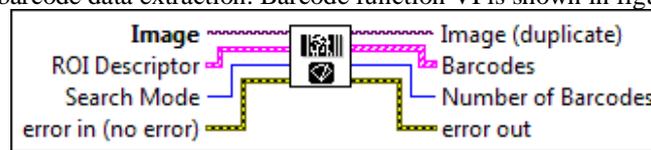


Fig. 5 Barcode function palette

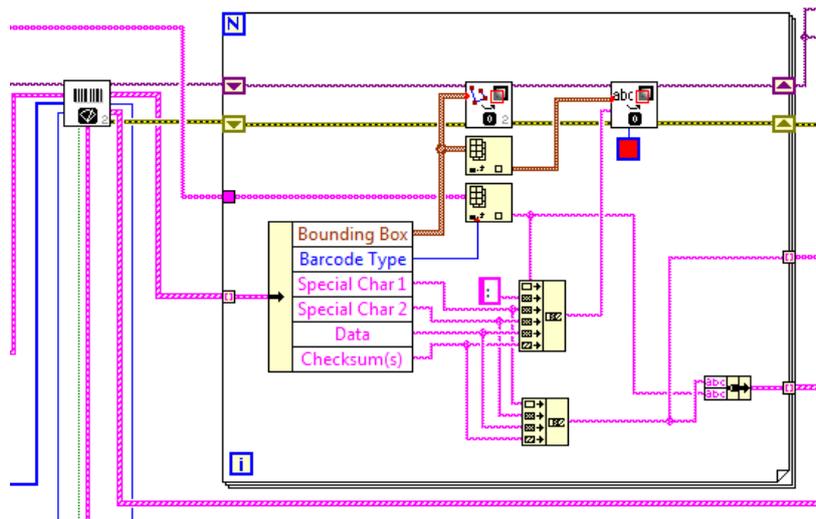


Fig. 6. Barcode specification vi

Creating database

To create a database we first capture a number of images for which we want to match our real time barcode and save it in a well specified location in the computer memory or on the cloud memory [11]. To link our programming code to this folder (that will work as database) we used build path function as shown in figure 7. The output of build path function is applied on vision acquisition tool for further processing [11].

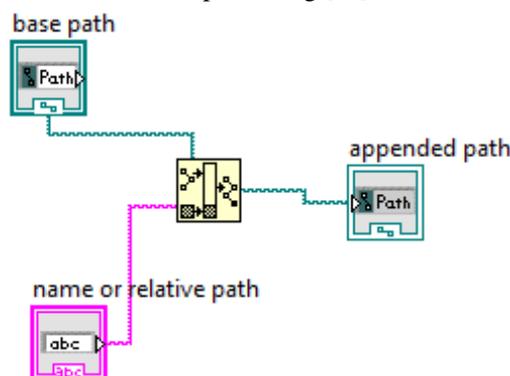


Fig.7 Image path function palette

Barcode Database Matching After the final processing from both real time acquired image and database images we have two data strings set that have information of corresponding barcode. Here at this stage we compare these string set as shown in figure 8. If it is match perfectly program will give a pop up of barcode matched and terminate at this point. Otherwise it continuously running [11].

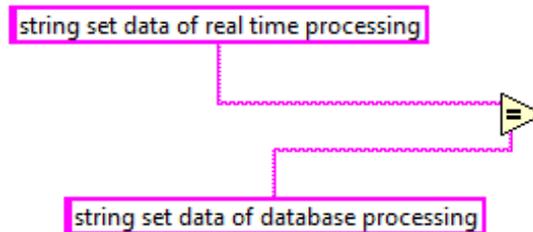


Fig. 8 String set comparison

IV. RESULT

This proposed work is tested over 200 barcodes and the recognition result is examined carefully. It is found that the system works properly with almost 98 percent accuracy. Also the detection speed of this system is high enough. This proposed barcode detection system work well with camera having resolution greater than 640*480 and normal lighting conditions. Proper lighting condition on the barcode images is necessary for the higher accuracy and speed. This proposed system can also detect the slanted barcodes. The whole process of this system is shown on front panel of Labview programming environment is shown in figure 9.

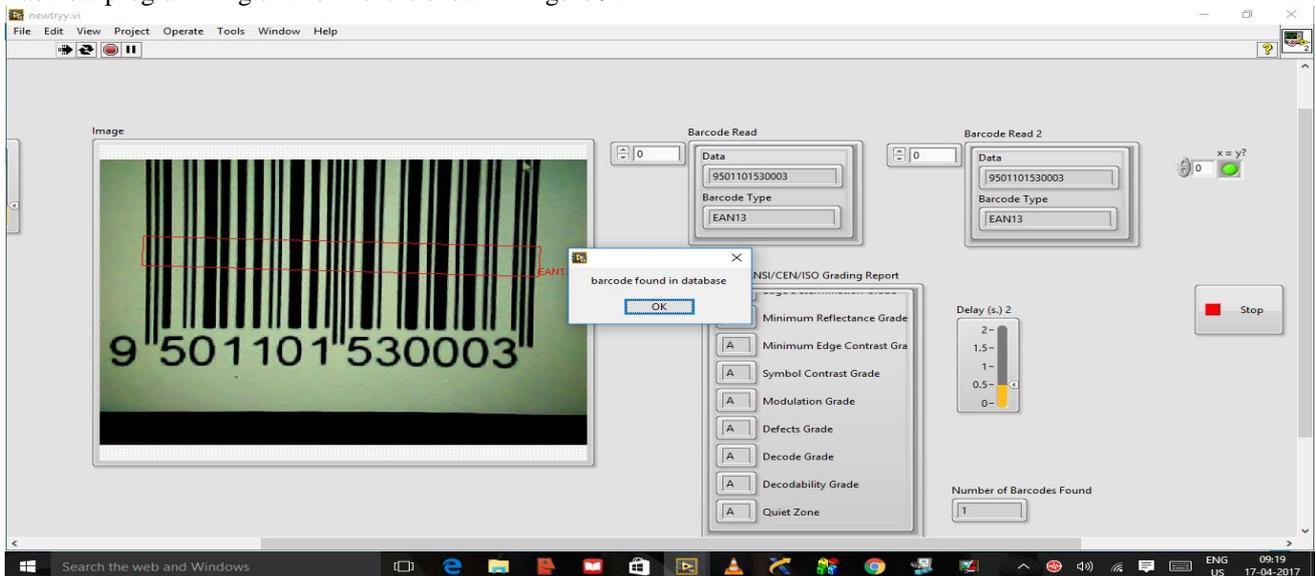


Fig. 9 Labview user interface

V. CONCLUSION

This proposed model recognize Barcode with high accuracy. This model recognizes barcode's orientation from 0° to 360°. Detects multiple barcodes from black & white, grayscale, palletized and colour images. Returns the type of each barcode recognized. Detects nearly six industrial barcode types. It is fast, accurate & easy to use hence it can be used in current business market. Due to flexibility of the LabVIEW software that it can be installed on various operating system like windows, Linux and IOS, so this proposed barcode recognition system can be used with almost all computer and laptops. Also LabVIEW provides a very user friendly interface so this system is very easy to operate for any user..

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