

Label Inspection System using LabVIEW

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Abstract— Labels on any product are essential for the identification of that product. An entrepreneur prints the label on product in coded (barcode) form to mention the details of that product. The significance of label is to provide information to a prospective customer about the various parameters of the product. Identification of defect in labels is thus important for any Producer. The proposed work presents a technique for scanning a label on any product. This work is based on application of LabVIEW image processing techniques. During development of proposed system a web camera is used with proper lighting conditions. Also the results of the scanned label are stored in a database for further analysis. To make the system more efficient so that it can be used on large scale, efficient conveyor belt mechanism should be designed.

Index Terms— LabVIEW, Label Inspection, Barcode, QR Codes.

I. INTRODUCTION

In today's fast moving world, a company must be flexible, cost effective and efficient for its survival. In Process and Manufacturing Industries, this has resulted in a great demand for industrial automation in order to stream-line operations in terms of speed, reliability and product output. Industrial automation applications frequently combine the need for computerized motion control and machine vision. Industries involve many products to be manufactured and should be classified into different workshops which are very difficult to perform manually. In order to overcome the difficulty, the automatic process has to be achieved [1], [2], [3]. This project aims at designing an automated system for product identification. Identification of the product is done using the barcode present on the product using LabVIEW software. The Image is acquired using an image acquisition device and the Image Processing Techniques are used to get the barcode of the object. After the suitable information is extracted using image processing techniques, the data of the respective barcode is stored in a new database file which is accessible to the manufacturing unit.

II. SYSTEM ARCHITECTURE

In this system the main functional units are the Camera unit, Image Processing unit, Barcode decoding unit, Power Supply

unit, Microcontroller unit and Power supply unit. It is as shown in following fig. [1]

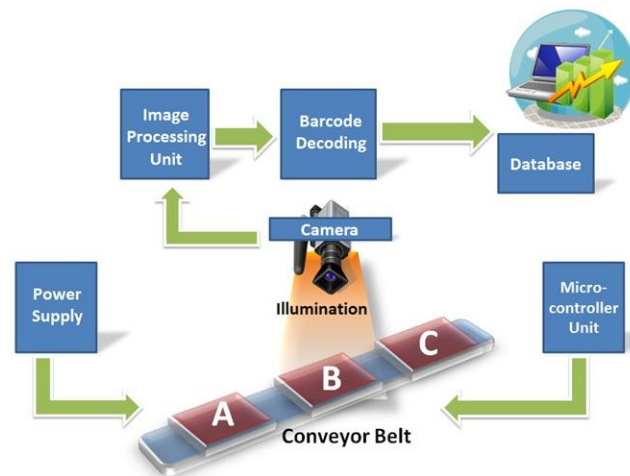


Fig. [1] Approach for Inspection

The products with Barcode attached on them move on the conveyor belt mechanism. This mechanism is automatic so that as soon as a new product is on the belt, the belt starts moving forward. All this is controlled by using IR sensor module and microcontroller unit. When the product reaches 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. Different type of barcodes use different techniques for decoding the information stored in them. 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 it later and for analysis. All this system is provided with Power supply unit.

As shown in the figure 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. After this the region of interest (ROI) is found and barcode is localized. Then the actual decoding algorithm works and the data is extracted. Finally this data is displayed on the Front Panel window of the LabVIEW software.

The speed of the system can also be varied using Pulse Width Modulation technique.

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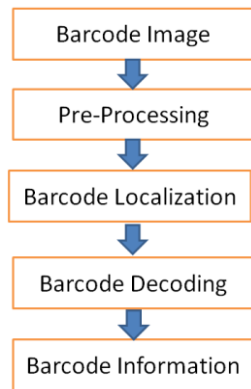


Fig. [2] Algorithm approach

III. PROGRAMMING IN LABVIEW

Laboratory Virtual Instrumentation Engineering Workbench (LabVIEW) is a high-level programming language with Graphical Language developed by National Instruments. It can support interfaces such as GPIB, USB IEEE1394, MODBUS, SERIAL, PARALLEL, IRDA, TCP, UDP, Bluetooth, NET ActiveX, SMTP, etc. LabVIEW is usually used for data acquisition, instrument control, and industrial automation on all kinds of platforms including Microsoft Windows, various flavors of UNIX, Linux, and Mac OS.

LabVIEW is built for the design, simulation, modification, and compilation of digital instrumentation systems. The basic entity of the resulting program is the virtual instrument (VI) that consists of executable code controlled via a graphical front panel on the screen similar to a real instrument. In contrast to conventional programming languages, LabVIEW is programmed on the basis of block diagrams and front panel elements. These elements are connected by means of a wiring tool. The main application areas are data acquisition, system management and the simulation of a digital signal processing system. In cases where real input/output connections are required, IEC, VXI and MXI compatible equipment with serial links or plug-in boards for the PC can be accessed via available drivers. After having tested a virtual instrument, the graphical language built from an application, compiles standalone executable code.

The compiled code is executed with a speed comparable to normal compiled C-programs. The execution code may also contain communication calls for different types of supported platforms. A test executive, available in diagram source code, can be added in order to support tests and modifications at runtime. Also, the LABVIEW provides an easy-to-use graphical environment that permits the system operators to process easily the collected data, using complex data-processing algorithms, without detailed knowledge of the data-acquisition system design.

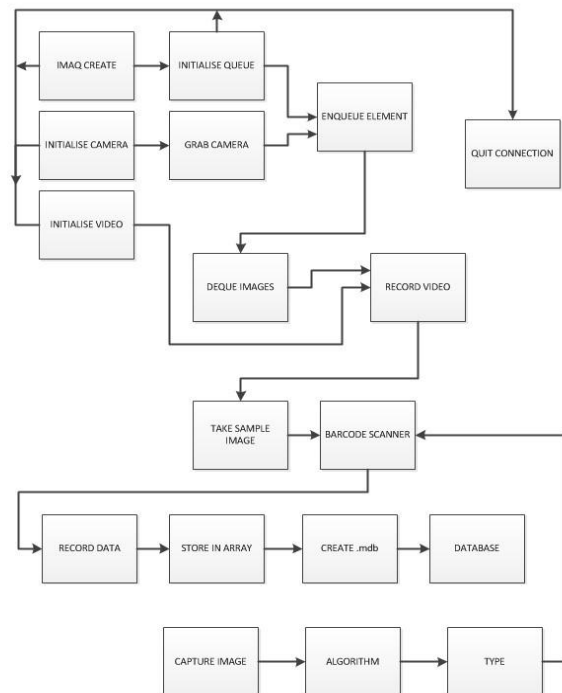
The program in the LabVIEW is as described in the following block diagram.

The block works in the form of producer consumer loop.

In this the camera is first initialized to grab images.

After this the images are enqueued and later they are dequeued. For proper functioning of the system without delay in web camera due to USB limitation, the camera records a video at the rate of 30 frames per second and this video is saved on the main computer. It is then used for decoding the data. At a time a buffer of five barcodes is set for decoding.

The front panel also displays the recently decoded barcode data. Later it is stored in database file. [4]



IV. HARDWARE IMPLEMENTATION



Fig. [3] Actual Setup for Project

The hardware involves an i-Ball C.12 Webcam which is 12 mega pixels and has resolution of 1600X1200 at 30fps. A computer with LabVIEW installed in it, a microcontroller board having IC P89V51RD2 as the controller IC, an IR sensor module, and a DC motor of 10 rpm operating at 12V power supply.

V. MATH

The following mathematical operations take place [5]:-

1. Mathematical interpretation of a digital image:
2. Image transformations:
3. Image Histogram
4. Image Segmentation

- 5. Smoothing Filters
- 6. Pattern Recognition

VI. PRACTICAL RESULTS

A. Figures and Tables

Sr No	Data given	Data obtained	Result	Remark
1	8901057510028 (EAN18)	8901057510028 (EAN18)	Accurate	
2	8902393003212 (EAN18)	8902393003212 (EAN18)	Accurate	
3	9788129111913 (EAN18)	9788129111813 (EAN18)	Wrong	Too much lighting.
4	4260113520666 (EAN18)	4260113520666 (EAN18)	Accurate	
5	WXEZ07143292 (Code 128)	WXEZ07143292 (Code 128)	Accurate	
6	6048631118031445 (Code 128)	6048631118031445 (Code 128)	Accurate	
7	SJYN1181A (Code 39)	SJYN1181A (Code 39)	Accurate	



Fig. [7] Test 4 Result found accurate



Fig. [8] Test 5 Result found accurate



Fig. [9] Test 6 Result found accurate



Fig. [4] Test 1 Result found accurate



Fig. [5] Test 2 Result found accurate



Fig. [6] Test 3 Result found Wrong

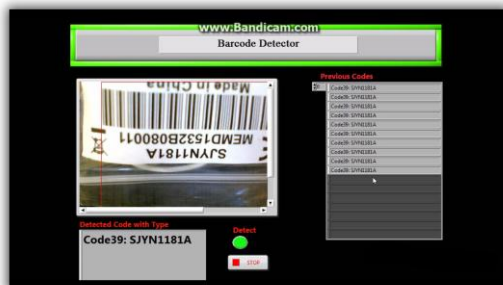


Fig. [10] Test 7 Result found accurate

Fig. [4-10] shows test results done on same environment with different codes. From the above results the efficiency of system is found to be more than 85% which can be improved with more number of tests and can be raised upto 99%.

VII. CONCLUSION

Using this system we can conclude that LabVIEW can make system more efficient compared to other systems existing presently. The luminance source must be uniform so that results will improve. Using dedicated industrial smart cameras the system performance can be greatly enhanced and more accurate results will be obtained.

VIII. ACKNOWLEDGEMENT

Thanks to Prof. A.A. Hatkar for their support and guidance throughout the project work. Also thanks to Sanket Yavalkar, Scientist, SAMEER, Mumbai for guiding us in LabVIEW software and entire designing work.

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