SIMULATION OF BARCODE READER USING MATLAB

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Abstract

Barcodes are employed in a wide range of settings and applications these days. A handheld scanner suffices for the majority of applications, such as pricing calculations and access control. However, hardware scanners are not the ideal option in other contexts where there is a great volume of information and time is of the essence. Under such circumstances, barcode readers in scanned documents can be processed by a strong software barcode reader without the need for human intervention.In this paper we present a method based on the Hough transform which solves the aforementioned problem, and that can be easily adapted to read any 1D barcode. In this research, we provide a solution to the above problem based on the Hough transform, which can be simply extended to scan any type of 1D barcode.

Keywords: *Barcode Localization, Barcode Recognition, WebCam, Hough Transformation, Peak Detection*

Introduction :

A barcode, consisting of bars and spaces, is a machine-readable representation of numerals and characters. Today, stripes as shown on packages of products sold at supermarkets, convenience stores and other stores are ubiquitous. Since 1952, various kinds of scanners were developed to read barcodes. Most of these barcode readers use a laser beam to scan the barcode and give the resulting value. There are some disadvantages in these kinds of barcode readers.These disadvantages includes that the barcode has to be manually oriented towards the laser beam to get the barcode value, high cost and the harmfulness for the user from exposure to the laser.

Literature Survey :

ANDO, S., HONTANI, H., et.al [1]. The authors describes that, Automatic finding and reading barcodes in 3D scene has wide demands. The key problem is to search barcodes and supply them to a reading subsystem. In the previous papers (see IEEE Trans. PAMI, vol.22, no.2, p.179-90, 2000, and vol.22, no.3, p.252-65, 2000), we proposed a method of "feature extraction after categorization and projection" for edges, ridges, corners, and vertices. The categorization is based on uni- and omnidirectionality of significant local variation. In this paper, we describe an extension of this method that is more efficient to detailed images with closely spaced features like barcodes. Defining a barcode region with these features, we describe an application of it to extraction and reading of barcodes in 3-D scene.

MUNIZ, R., JUNCO, L., OTERO et.al [2]. According to the authors, Barcodes are employed in a wide range of settings and applications these days. A handheld scanner suffices for the majority of applications, such as pricing calculations and access control. However, hardware scanners are not the ideal option in other contexts where there is a great volume of information and time is of the essence. Under such circumstances, barcode readers in scanned documents can be processed by a strong software barcode reader without the need for human intervention. The most typically way used to construct this kind of software scanners is to replicate the handheld scanner behavior by tracing one or more lines (the hardware laser beam) and measure the width of the barcode's lines and spaces.

SHU-JEN LIU, HONG-YUAN LIAO, LIANG-HUA CHEN, HSIAO-RONG TYAN, et.al [3]. As authors says that, their creation is an inexpensive barcode reader that uses a low-resolution camera to extract and decode barcodes on crowded backgrounds. It consists of three parts: using the raw image to localize the barcode, transforming the localized barcode, and using an intelligent algorithm to decode the sequence. Finding the locations with the greatest density differential between two normal directions is the foundation of the localization technique. The transformation approach is based on the Hough line detection method and can identify any orientation. The barcode waveform's peak/valley detection technique and a consistency checker form the basis of the decoding procedure. An artificial intelligence searching technique is used in the constraint network consistency checking method.

HOWLETT, R.J., BERTHIER, S., AWCOCK, et.al [4]. they have created a low-cost, low-resolution barcode scanner that uses a camera to extract and decode barcodes on chaotic backgrounds. It consists of three parts: first, it locates the barcode from the raw image; second, it transforms the localized barcode; and third, it uses an intelligent algorithm to decode the sequence. The localization approach relies on identifying the regions with the greatest difference in density between two normal directions. Based on the Hough line detection approach, the transformation method can recognize any orientation. The decoding technique is based on a consistency checking approach and the barcode waveform's peak/valley detection technique. An AI-based search technique is used in the constraint network consistency checking approach.

JAIN, A.K., CHEN, Y., et.al [5]. According to them, Barcodes are a type of data representation technique that are widely used in many different fields. Barcode technology has found wider uses, particularly with the popularity of smartphones and other handheld devices with high-resolution cameras and powerful computing capabilities. It is very important for barcode scanning systems in the industrial sector to be resistant to changes in pitch, rotation, blur, lighting, and scale. In this study, a novel approach to barcode localization using a region-based gradient statistical analysis is presented. Based on this concept, four algorithms have been created to handle different types of barcodes: linear, PDF417, stacked 1D1D, and stacked 1D2D.

ARNOULD, S., AWCOCK, G.J., THOMAS, R., et.al [6]. One technique that enhances the image by producing better imaging and concentrating on the image's interest information is mathematical morphological image processing. For the objectives of observation and comparison, mathematical morphological is applied to the image utilizing different structural element (SE) features. MATLAB software is used to program and execute mathematical morphological analyses. The output result for each mathematical morphological process is acquired and amply demonstrated. Mathematical morphological analysis can augment and improve the image based on the output result; nevertheless, the morphological performance can be improved by the SE's characteristic as the key probe, which is chosen to suit the image's interest information.

SHELLHAMMER, S.J., GOREN, D.P., PAVLIDIS, T., et.al [7]. They have created a low-cost, WebCam-based optical barcode scanner that can extract and decode sequences on crowded backgrounds. It consists of three functions: barcode localization from the raw image, transformation of the localized barcode, and sequence decoding using an intelligent algorithm. The localization approach is based on determining the locations with the greatest density difference in two normal directions. The transformation approach, which can detect any orientation, is based on the Hough line detection method. The decoding method is based on peak/valley detection of the barcode waveform and consistency verification. The consistency testing method, which uses a constraint network, makes use of artificial intelligence searching techniques.

Methodology :

Research and Requirements Gathering:
Understand the purpose and scope of the barcode reader project. Determine the types of barcodes you need to support (e.g., UPC, QR code, etc.). Evaluate different barcode scanning technologies such as laser scanners, CCD scanners, or smartphone cameras.Choose the appropriate hardware and software components based on your requirements and budget.

Software Development : Develop or select a suitable barcode recognition library or SDK (Software Development Kit) depending on your platform (e.g., desktop, mobile).
Implement the barcode decoding algorithm and integrate it into your application.Develop additional features like barcode generation, error handling, and user interface design.

Testing : Conduct thorough testing to ensure the barcode reader functions correctly under various conditions (different lighting, angles, distances, etc.).
Test the application on different devices and operating systems if applicable. Perform regression testing to ensure new features or updates haven't introduced any issues.
User Feedback and Iteration : Gather feedback from users and stakeholders through usability testing or surveys. Iterate on the application based on feedback to improve user experience and function.

These methods present a serious handicap, since they are highly sensitive to eventual noise (human signatures, marks) that can be present in a code. In this paper we present a method based on the Hough transform which solves the aforementioned problem, and that can be easily adapted to read any 1D barcode. These techniques have a significant drawback in that they are extremely susceptible to potential noise in codes, such as markings or handwritten signatures. In this research, we provide a solution to the above problem based on the Hough transform, which can be simply extended to

scan any type of 1D barcode.

Result and discussions :

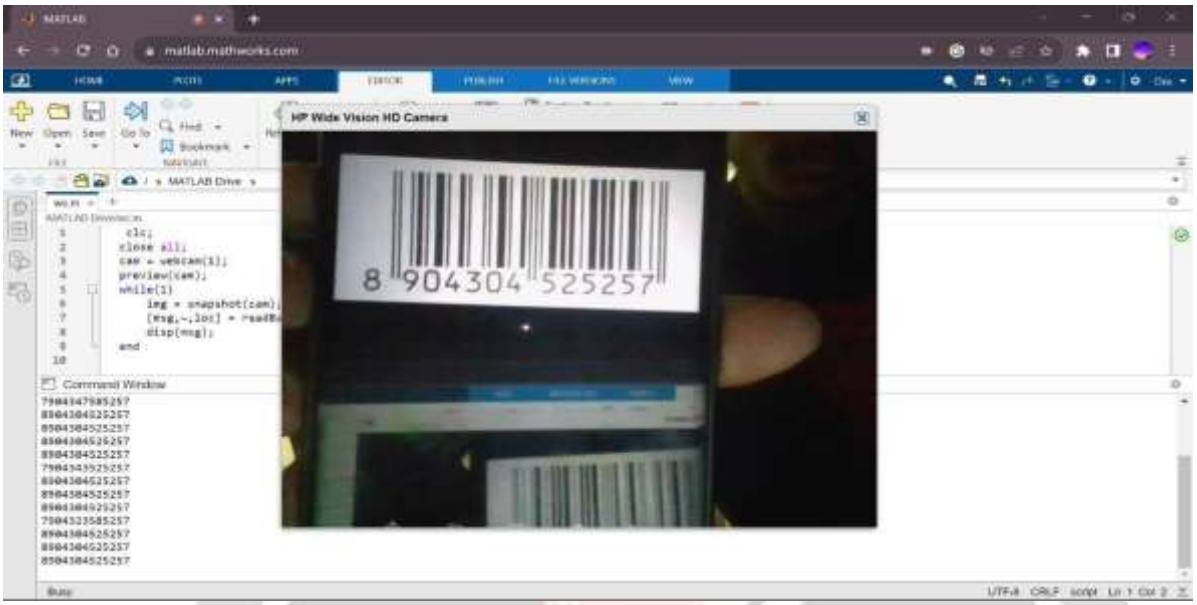

Figure 1

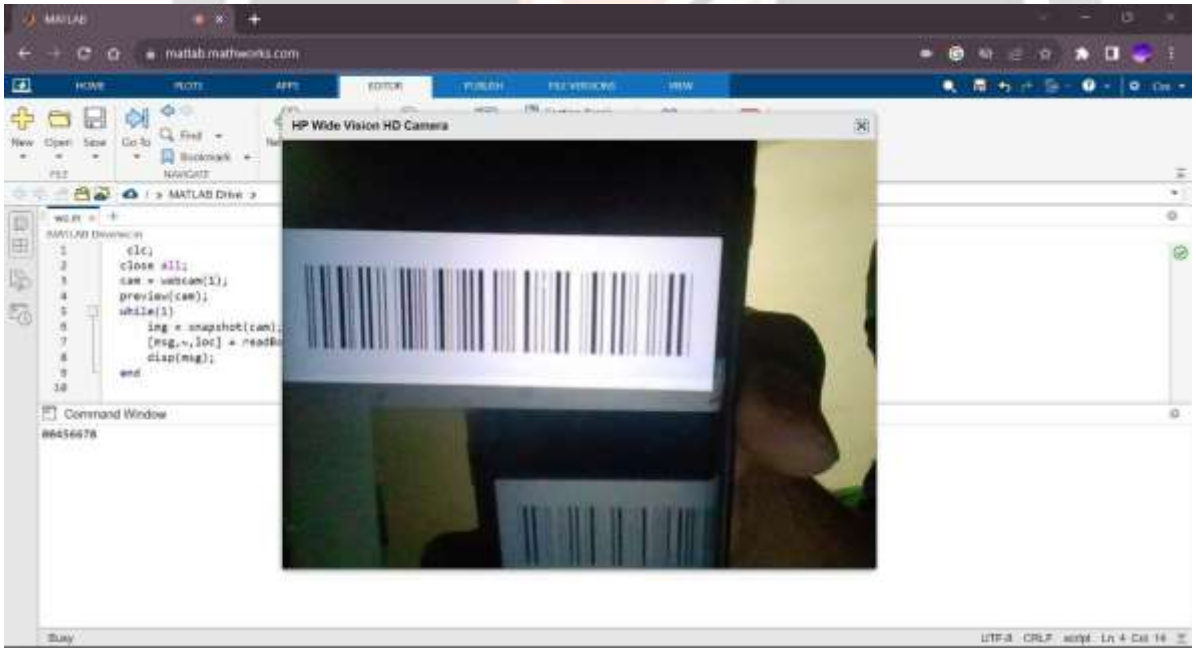

Figure 2

In the above figures 1 and 2, we have shown two examples using two different barcodes.
Case 1 : in figure 1, the barcode when placed in front of webcam of a computer, is getting scanned by the system and by using the described algotrithm the secret number of that barcode is decoded and is displayed on command window. As the program is running in loop format, the barcode number is getting displayed repeatedly on the output window as long as the barcode is in view of the camera of the system.
Case 2 : Similar to the previous example, in figure 2, the barcode number assigned to the barcode is dislayed at the output window as soon as the barode comes in view of the camera.

Conclusion :

As we seen above, one can easily develop and simulate a software to read any kind of Barcodes, which only needs access to the webcam of the system and a simple MATLAB code to run. A code can be developed through any different algorithm in many ways. The code here used is contained with a 'while' loop i.e., the code is continuously running in a loop such that one can place any number of barcodes infront of camera(one at a time), so that it can display the respective numbers of codes in serial order.

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