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A review on barcode localization method

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ABSTRACT

Barcodes are used in many commercial applications; thus, fast and robust localization is important. There are various techniques for barcode localization which are characterized by accuracy and speed. In this paper, we provide a review on different techniques for barcode localization i.e. Morphological Operations, Bottom-Hat Filtering, YOLO (You Only Look Once) along with its advantages and disadvantages.

Keywords— Barcode localization, Morphological operations, Bottom-hat filtering, YOLO (you only look once).

1. INTRODUCTION

In recent years, the trend to use barcodes has become ubiquitous. They are used in many fields such as Advertising, Games, Tracking food products, etc. Barcodes are categorized into different categories i.e. 1D (One Dimensional) and 2D (Two Dimensional) barcodes. The popular known 1D barcodes are EAN (European Article Number) and UPC (Universal Product Code) which are used in commercialized products.

1D barcodes are linear barcodes. They consist of vertical lines of varying widths with specific gaps resulting in a pattern [1]. 2D barcode is a set of small geometric shapes organized within a square or rectangle to store information [2]. There are two main approaches for decoding barcodes, the former uses a laser scanner and the latter uses a simple camera [3].

Barcode detection is needed in a wide range of real-life applications. Many barcode localization techniques have been developed for automatically segmenting barcode patterns from an image. There are two main objectives. Of Barcode Localization. i.e. Speed and Accuracy. The accuracy is crucial, for the industrial environment, since undetected barcodes may lead to loss of profit whereas, processing speed is the secondary desired property of the detectors [4]. Localizing barcodes within an image presents many challenges.

There are several techniques for barcode localization i.e. Morphological operations, Bottom-hat filtering, YOLO. This paper presents different Barcode Localization techniques along with its advantages and disadvantages.

2. TECHNIQUES

Existing Techniques for locating or finding barcodes was based on Morphological Operations, Bottom- Hat Filtering, YOLO.

2.1 Technique based on Morphological Operation

This technique basically relies on basic morphological operations, which is used for separation out barcodes from an original image [5]. In the first step pre-processing is done, with the help of quantization whereas, in this step, the input image is converted into binary. In the next step, the gradient of the image is calculated using a Sobel kernel in a horizontal and vertical direction. After this resultant image is dilated with the help of a square structuring element, to merge nearby objects to form a region.

In the further step, morphological erosion is performed to remove thin lines from the image. After this, the resultant image which contains only barcodes is obtained by removing all small area objects. Next, the dilation is performed again so as to highlight, the area containing barcodes. This is followed by subtracting the resultant from the original image, in order to obtain the true shape of barcodes.

The Advantage of this technique is that it is suitable for blurry and skewed images. It is also able to locate multiple barcodes in an image. The Disadvantage of this technique is that it is not effective for complex images.

2.2 Technique based on Bottom-Hat Filtering

This technique is used to localize the barcodes, which utilizes dark on a light pattern and directional continuity of barcodes [5]. In the first step, the image is converted to grayscale. This is followed by contrast stretching which highlights the difference between light and dark areas of an image. In the next step, Bottom-Hat Filtering of the image is performed by taking the close of the image. This expands, white areas of an image but does not affect areas that are originally white and then the resultant image is subtracted from the original image, which highlights the bars and textual information in the image. In the further step, the image is skeletonized by subtracting erosion of the image from itself, which reduces large areas in the image to their outlines. After this, the orientation of barcodes is found out.

The directional image opening is performed at 16 different orientations on the same image, to find out orientations.

The Advantage of this technique is that it is more accurate than the previous technique i.e. technique based on morphological operation and it is also providing orientation details. The Disadvantage of this technique is that it is not suitable for blurry, skewed and complex images. It is also not able to locate very small barcodes.

2.3 Yolo (You Only Look Once)

YOIO is a real-time object detection algorithm, by Joseph Redmon. First, an image is taken and the YOIO algorithm is applied to it. Then the image is divided into any number grids, depending on the complexity of the image. Once the image is divided, each grid undergoes the classification and localization of the object. Then for each grid, confidence score or objectness is calculated.

If the object is found in the grid, then the objectness or confidence score is 1 or If the object is not found in the grid, then the objectness or confidence score will be zero. Each grid cell predicts B Bounding Boxes as well as C class probabilities. A Bounding box describes the rectangle that encloses an object. Then the bounding boxes having the class probability above a threshold value are selected and used to locate the object within the image.

The Advantage of this algorithm is that it is able to locate multiple objects in an image, and is also suitable for complex images

The Disadvantage of this algorithm is that it struggles with small objects within the image.

3. CONCLUSION

In this Paper existing technique for locating or finding barcodes have been studied. It can be concluded that the first two techniques i.e. Morphological Operations and Bottom-Hat Filtering are not effective for complex images, whereas YOLO struggles with small objects within the image.

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