Barcode detection with uniform partitioning and morphological operations

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Visual codes referred as barcodes have two major groups, 1- and 2-dimensional barcodes. 1D barcodes consist of a well-defined group of parallel lines aiming easy automatic identification of carried data with endpoint devices such as PoS terminals, smartphones, or computers. Most two-dimensional barcodes serve the same purpose as their one-dimensional ancestors. They usually consist of simple picture elements (e.g. rectangles, dots, hexagons) organized in a 2D pattern layout.

Barcode detection methods have two main objectives, speed and accuracy. On smartphones, fast detection of barcodes is desirable, but accuracy is not so critical since the user can easily reposition the camera and repeat the scan. For industrial environment, accuracy and speed are desired properties for detection.

For 1D barcodes, the basic approach for detection is scanning only one, or just a couple of lines of the whole image. This method is common at hand-held PoS laser scanners or smartphone applications. Scanned lines form an 1D intensity profile, and barcode-detector algorithms [1, 2, 3] work on these profiles to find an ideal binary function that represents the original encoded data. The main idea is to find peak locations in blurry barcode models, then thresholding the intensity profile adaptively to produce binary values. For 2D barcodes, most approaches involve the extraction of texture-like properties and detection of properties that refer to code-like appearance. Also, there are approaches for detection of specific types of codes with heavy perspective distortion, motion blur [4], and noise [5].

The MIN-MAX method [6, 7, 8] uses the difference image of the dilated and eroded original image. White blobs on these images show the possible barcode locations. Further processing, like segmentation and filtering of small blobs are required on these difference images. This approach can be used on both 1D and 2D barcodes with minor modifications. Methods based on wavelet transformation [9] look at images for barcode-like appearance by a cascaded set of weak classifiers. Each classifier working in the wavelet domain narrows down the possible set of barcodes, decreasing the number of false positives while trying to keep the best possible accuracy. Variants of Hough transformation [10] detect barcodes by working on the edge map of the image. The two most common methods are standard and probabilistic Hough transformation. Both transform edge points into Hough space first, and make decisions of line locations. Our proposed method examines the image in small, disjunct or overlapping tiles, and make local measurements. We use distance transformation [11], clustering and morphological operations for these measurements.

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