Barcodes Detection and Description from Video Images

Summary

The objective of this work is to develop an application to detect 1D barcodes (figure 1) and describe their contents, using computer vision techniques applied to images similar to those in figure 2.

Figure 1 – Examples of different types of 1D barcodes

General aims

To apply the theoretical knowledge about Image Processing and Analysis, acquired in the Computer Vision course, namely, feature detection and segmentation techniques, using the OpenCV library as development tool.

Specific aims

The program must (basic version - 80% of the grade):
- allow the acquisition of a color image containing one or more 1D barcodes, using a computer connected camera, or the selection of a pre-acquired image;
- segment the acquired image, isolating the barcode from the background;
- describe the *bars* (rectangles with the foreground color, usually black) and *spaces* (intervals with the background color between the *bars*, frequently white) present in the barcode, by reporting their sequence and width (as a percentage of the whole width of the barcode); also, plot a "dotted", colored line, along the width of the code, composed of short red line segments (over the *bars*) and short blue line segments, over the *spaces*. Note that the identification of the digits in the barcode is not part of this work.

For the basic version, you may use some simplifying assumptions such as:
- there is only one barcode in the acquired image;
- the image of the barcode is acquired in almost frontal view (as in figure 1);
- the barcode is not blurred;
- the barcode occupies a significant portion of the image;
- the barcode is not partially occluded by other objects;
- the background is almost constant and uniform.

Possible improvements (20% of the grade): remove one or more of the above referred simplifying assumptions, for example, to deal with: more than one barcode in the same image, slanted barcodes, barcodes placed over a curved surface, cluttered background,… (some examples in figure 2).

Figure 2 – Possible situations to be dealt with in the basic version (top row) and the improved version (bottom row).

Project development, report and delivery

The work must be done by groups of 3 students.

A short report (max. 3 pages) must be delivered, including:
- any additional specifications (if needed);
- the description of the proposed global solution, including illustrations of the results of the main intermediate steps;
- relevant comments about the efficacy of the used methods, describing the main problems that were encountered and any proposed solutions;
- the status of the proposed method and the degree of fulfillment of the aims;
- an analysis of performance of the proposed method, illustrated with some results.

The code, with meaningful comments, must be presented in a report annex. Other annexes may be included to show additional results that do not fit in the main report.

The work must be submitted at the Computer Vision page, in Moodle, until the end of 2019/Oct/31.

Bibliography

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- Barcode, available at https://en.wikipedia.org/wiki/Barcode (accessed on 2019/10/09)
- Barcode dataset, available at http://alumni.soe.ucsc.edu/~orazio/Data/UCSC_UPC_Dataset.zip (accessed on 2019/10/09)