



Image analysis
Laboratory exercise manual

**Application of Vision Assistant
for the selection of elements using the OCR technique**

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1. The purpose of the exercise

The aim of the exercise is to get acquainted with the procedure of using the OCR technique to identify objects described in text using the Vision Assistant module.

2. Introduction

OCR (Optical Character Recognition) is a set of techniques or software used to recognize characters and entire texts in a raster image file. The OCR task is usually to recognize text in the analyzed image. In the most advanced form, these are systems that allow you to transfer documents available as an image (usually scanned) to editing software, including text formatting, tables, etc. In industrial practice, textual information from labels and imprints on objects usually serve to identify and carry out, for example, selection or control.

In OCR algorithms, the processing program divides the page into individual elements, identifies places where text is located. Next, the text is divided into smaller and smaller elements: paragraphs, lines, words and characters. The document is remembered as a collection of individual characters. An important element of the OCR technique is the use of patterns. This requires the previous preparation of databases.

The technique of recognizing characters from raster images requires proper preparation of material for processing. What matters here is the resolution, contrast, and the quality of the image to be analyzed. By preparing the output materials for text recognition (eg the form of labels) the effectiveness of recognition can be increased by:

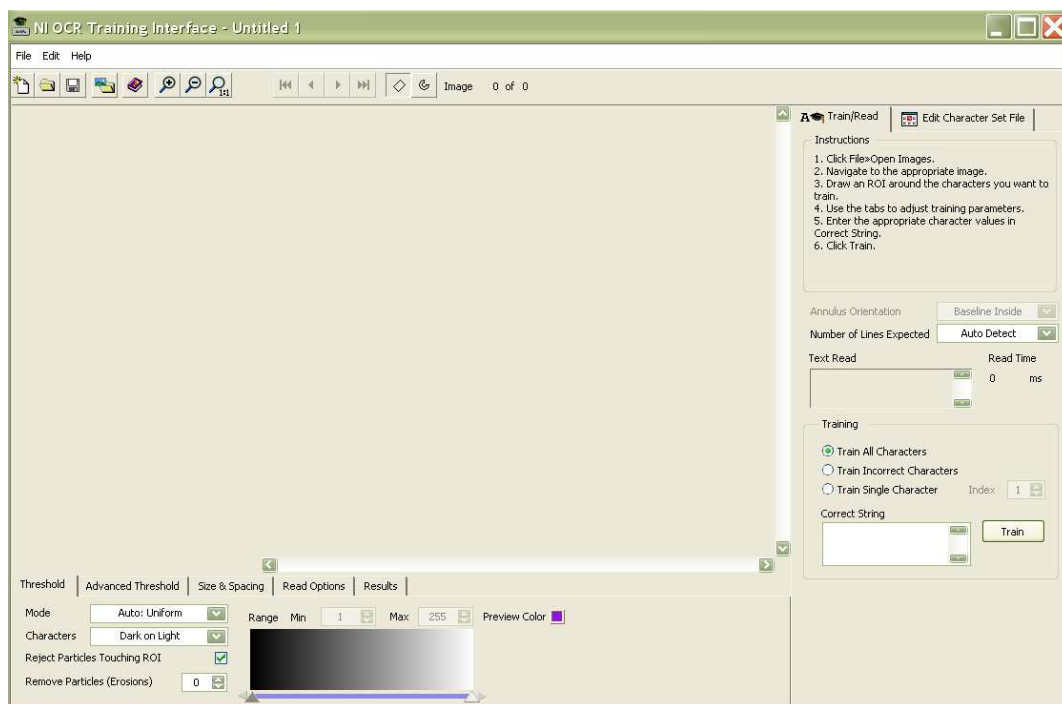
- the background for the text should be clear, without defects (creases, dirt),
- the document should be scanned at a resolution of at least 300 dpi or higher
- the image intended for OCR should be saved in shades of gray, preferably in uncompressed format (TIFF, GIF, BMP, PNG)
- test the brightness and contrast settings in the scanning program, or pre-process the image before applying OCR procedures,
- the most difficult to interpret small characters such as dots, commas, or similar letters (j-i, n-m, b-h).

3. Creating a database - a pattern of characters.

Creating a character database for OCR functions is possible using a dedicated tool available from the operating system level:

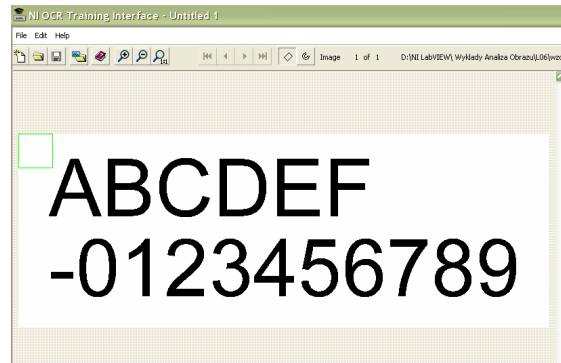
START / All Programs / National Instruments / Vision / Utilities / Ocr Trainig.

A program will be launched whose main window is shown below.

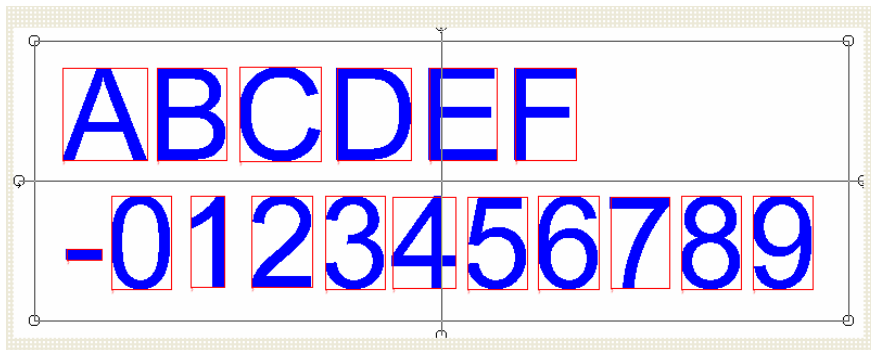


The process of creating the character database takes place on a pre-prepared set of characters containing all necessary for correct identification letters, numbers and special characters, the reference image should be prepared in a format and with parameters such as a scanning system.

In this case, it is a graphic file **template.png** loaded with the *File / Open Images ...* option. A set of characters for learning will appear on the screen.



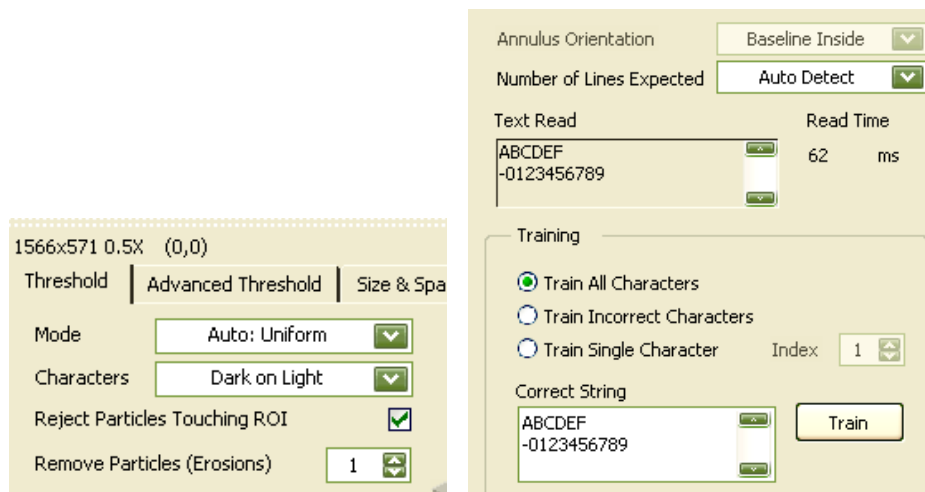
Then select the area that includes all characters that should be recognized by the program.



In the *Threshold* tab, set the fields: *Mode = Auto: Uniform, Characters = Dark on Light.*

The *Reject Particles Touching ROI* option allows you to discard all objects accidentally covered by the character area selection area for learning. The *Remove particles (Erosions) = 1* option will perform a filtration process called erosion, which will better separate the edges of the characters from the background.

The process of creating the database consists in entering the correct sequence of characters creating the pattern in the *Correct String* field. To save all the characters, select *Train All Characters* and then press the *Train* key.



The character string recognized by the system will be displayed in the **Text Read** window. Here you can check the correctness of creating a database.

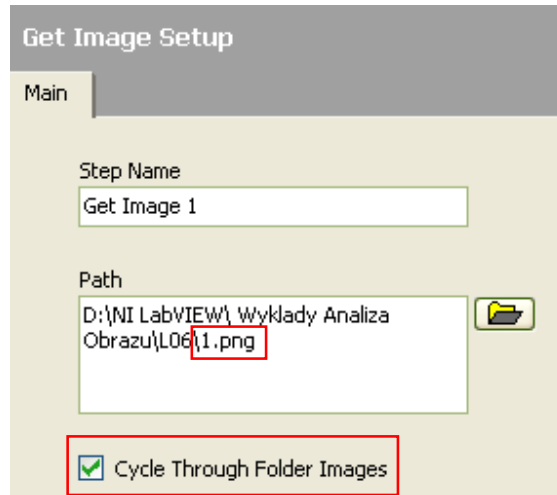
NOTE: save the created database using the *File / Save Character Set File* option and a file with the extension **".abc"** will be created.

4. Image processing script

4.1. Loading the image for analysis

Start the Vision Assistant module. From the *Processing Function: Image* palette, select the *Get Image function*.

In the function configuration window, locate the **1.png** file and check the *Cycle Thru Folder Image* option. Confirm the selection.



4.2 OCR configuration

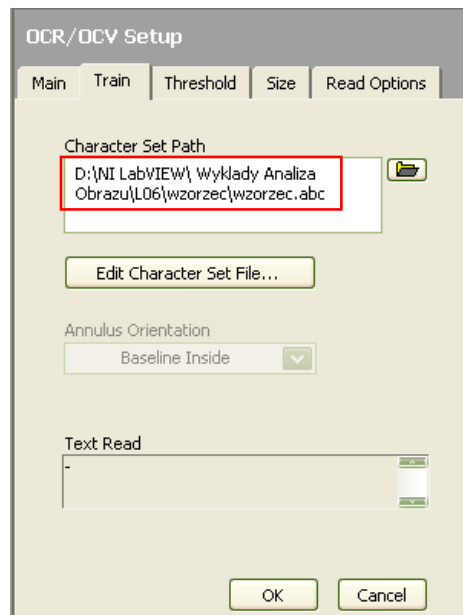
From the *Processing Function: Identification* palette, select the *OCR / OCV* option: Reads characters in a region of the image.



OCR/OCV: Reads characters in a region of the image.

In the configuration window in the Train tab, read the file created earlier with the character database created (in this case **pattern.abc**).

Note: If necessary, the *Edit Character Set File ...* key allows you to edit and correct a pattern with characters by running a previously used program to create databases.

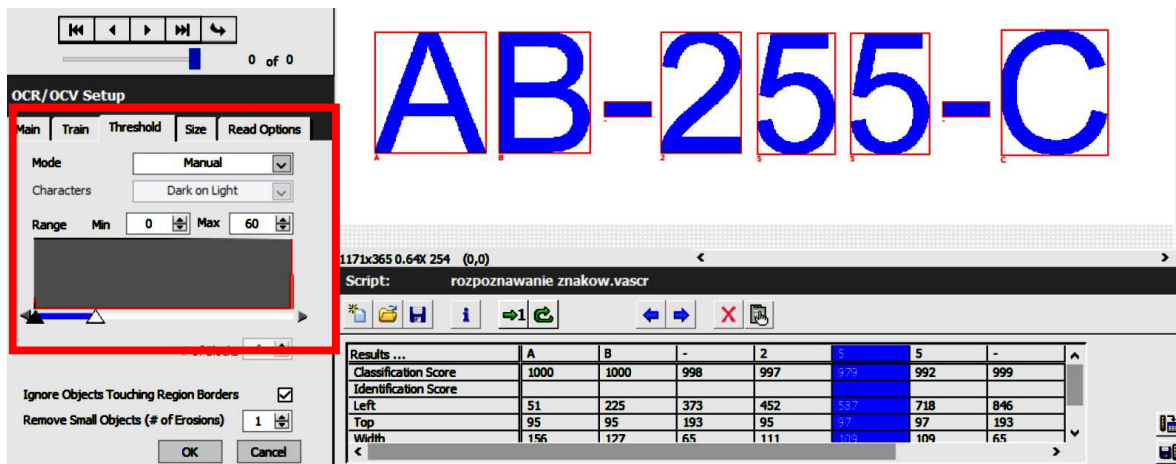


Note: the *other tabs* allow you to change the recognition parameters. They are used in the case when images appear in a way that significantly deviates from the accepted standard and *the results of the diagnosis are incorrect*.

By changing the *Mode* option to *Manual*, the user can specify the intensity range of the pixels that the text creates.

In the *table containing the results*, attention should be paid to the **Classification Score**, which determines the readability. A **value of 1000** means that the read letter **is perfectly compatible with the pattern**.

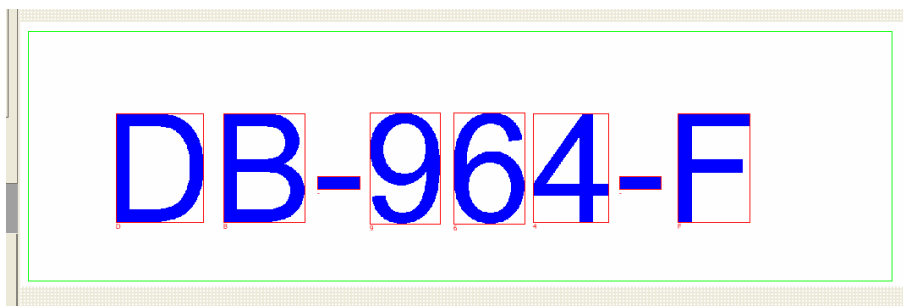
In the *Read Options* tab, use the **Acceptance Level** option to change the minimum acceptable level of confidence for character recognition.



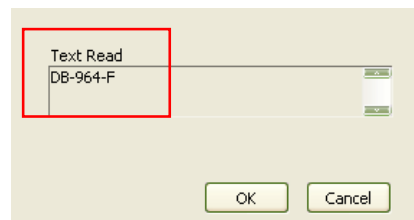
Results ...	A	B	-	2	5	5	-
Classification Score	1000	1000	998	997	979	992	999
Identification Score							
Left	51	225	373	452	537	718	846
Top	95	95	193	95	97	97	193
Width	156	127	65	111	109	65	

Then select the area that will contain the sequence of characters to be recognized.

Note: if the character position is not the same in subsequent images, you may not be able to identify characters. In this case, select a larger area (green frame):



The characters will be recognized and displayed in the *Text Read* field and additionally all characters will be identified in the table along with a description of the location and value of the *Classification Score* coefficient, which determines the degree of compatibility of the recognized character with the pattern (the closer to 1000, the better).



Results ...	D	B	-	9	6	4	-	F
Classification Score	1000	1000	1000	964	1000	999	1000	988
Identification Score								
Left	149	317	465	547	677	802	937	1028
Top	143	143	241	142	142	143	241	143
Width	138	127	65	109	111	117	65	114

Repeat the text code recognition for each of **1.png** to **4.png** images.

5. task to be done

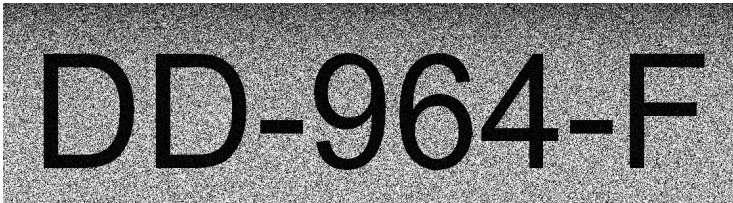
Additional image files **a1.png** - **a4.png** contain codes with distortions:



Edge erosion of characters.



Blur the edge of the characters



Clear signs with a noisy background.



Edge erosion with a noisy background.

Using the created image processing script, check which distortions affect the results of reading the code. Is it possible to correct the image so that any possible distortions can be removed and the code read correctly?

Tip: before the OCR procedure, check the function of the **Grayscale: Lookup Table, Filters, Gray Morphology** palette.

6. Report

The report should include:

1. Recognized text for pictures **1.png** - **4.png** with information on the value of the Classification Score for each letter.
2. For images **a1.png** - **a4.png**, describe the recognized characters together with the Classification Score and how the images have been transformed so that you can recognize the text. Post images after transformation.