

**Opole University of Technology** 



Department of Mechanics and Machine Desing

Image analysis Laboratory exercise manual

## Development of acquisition and image processing path

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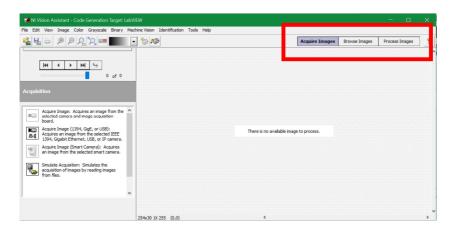
## **1.** The purpose of the exercise

The aim of the exercise is to get acquainted with the functionality of the Vision Assistant package. The exercise includes familiarizing with the NI Vision Assistan environment, building the image acquisition track and acquiring the ability to create an image processing script.

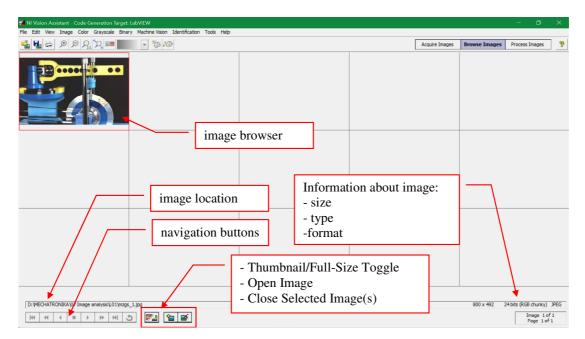
## 2. Vision Assistant environment

The package is launched from the menu Programs / National Instruments / Vision Assistant path. The start window opens, where the individual modules are started using the tabs: **Acquire Image, Browse Image, Process Image**.

Option **Acquire Image** requires access to the camera. This exercise will focus on image previously acquired and saved.

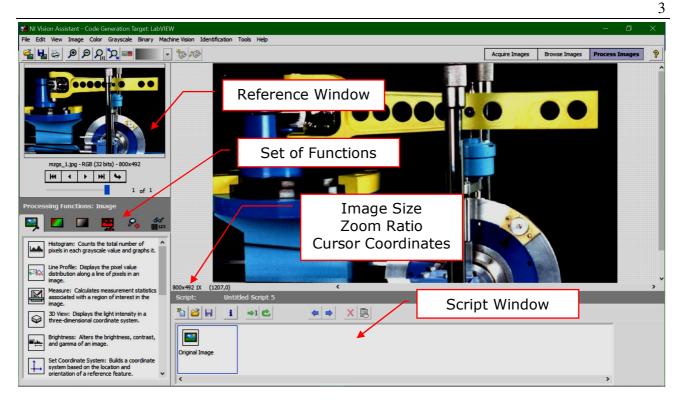


Switch to **Browse Image** tab and using *Open Image...* option read the image named **mzgs\_1.jpg** (attached to this manual):



It is possible to read more images previously stored. **Browse Images** tab is used only to load files. The main image processing operations from the file can be found in the tab **Process Image.** 

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Functions are grouped in palettes: Image, Color, Greyscale, Binary, Machine Vision, Identification.

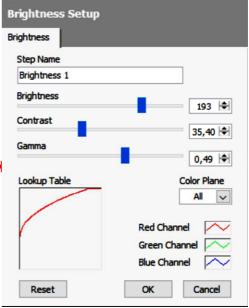
## 3. Createing a script

The package is launched from the menu Programs / National Instruments / Vision Assistant path. The start window opens, where the individual modules are started using the tabs: **Acquire Image, Browse Image, Process Image**.

A script is a series of functions arranged in series, where the analyzed image will be processed by each of the functions in the script according to the order given.

To place a function in a script, search for it in the function set and click. It will be automatically inserted into the script and the function configuration field will open, e.g. for the **Image / Brightness** function:





The user can freely change parameters affecting the processing of the image according to the settings. You can simultaneously observe changes as a result of processing. To confirm result press OK button. Function will be placed in the script.

# At any time, you can re-open and edit the function by double-clicking its icon in the script.

The current state of the processed image can be saved using the **File / Save Image** function from the **Main Menu**.

Save In	Data (D:)	~		
	LE.BIN	^	Images Sele Selection All Images	
MZGS	Sterowanie		O From	1 🖨
ROL			To	1 🖨
DOKUM			Step	1 🔤
File Name	image 1		Expand Dyn	
File Name File Format	jmage 1 JPEG - File Interchan	ge 🗸	Expand Dyn Binary Imag	
		itmap hange Format file Format etwork Graphic age File Forma	Binary Imag	

## NOTE !!! Some function may not work with actual state of image. e.g. functions in Greyscale palette can process images in Greyscale only in 8b or 16b type !

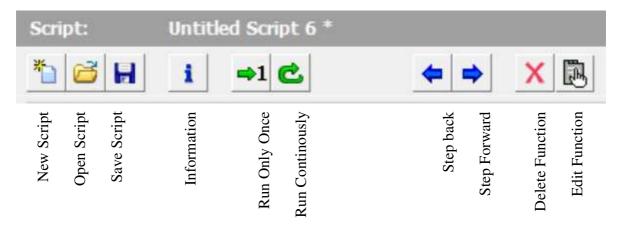
The function inserted as the next processing step will perform operations on the image processed one step earlier.

Script:	Untitled Script 6 *		
*1 🗃 🖬	i ⇒1 C	<b>♦ ×</b>	
Original Image	Brightness 1	Color Operators 1	Color Plane Extraction 1

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The completed script can be repeated for other images indicated in the **Browse Image** tab.

In the script field there are icons for saving / loading the script, launching, etc.



## 4. Example of processing

Create the following script for the mzgs\_1.jpg image:

Step 1. Function Image/Histogram

Histogram Setup		Histogram Setup	
Main Histogram		Main Histogram	
Histogram	Color Model RGB	Histogram	Color Model HSV 🔍
0 25 50 75 100 125	150 175 200 225 255		
Mapping Mode	Red 📈	Mapping Mode	Hue 📈
🔵 Linear	Green	O Linear	Saturation
<ul> <li>Logarithmic</li> </ul>	Blue	Logarithmic	Value
0 🖬 🖬 🖬	OK Cancel		OK Cancel

This function determines the number of pixels for the basic colors for the specific intensity of the color: from dark (0) to the brightest (255) for selected model of colors. Using the data storage buttons, you can export charts directly to Excel (if it is installed) or to a text file.

#### 📕 L01.txt — Notatnik

```
Plik Edycja Format Widok Pomoc
D:\MECHATRONIKA\07 Image analysis\L01\mzgs_1.jpg
Hue
Minimum Value 0,000000
Maximum Value 253,000000
Starting Value 0,000000
Interval Width 1,000000
                225,590775
Mean Value
Standard Deviation
                      59,019032
Area (pixels) 393600,000000
Intensity
                 # Pixels
        -
51838
0
        7
1
        97
2
3
        291
4
        1336
5
        25
6
        4
7
        1324
8
        18018
9
        30
10
        31
        483
11
```

## Step 2. Function Color/Color Plane Extraction

Step Name	
Color Plane Extraction 1	
RGB - Blue Plane	^
HSL - Hue Plane	
HSL - Saturation Plane HSL - Luminance Plane	
HSV - Value Plane	
HSI - Intensity Plane	~

This function allows you to select from the image the selected parameter from the available color models: RGB, HSL, etc.

## Step 3. Function Greyscale/Lockup table

This function performs one of the predefined functions for image processing based on contrast and brightness correction.

Step Name					
Lookup Table 1					
Image Source	^				
Equalize	_				
Reverse		Original Image		Processed Imag	<b>10</b>
Logarithmic		Unginal Image			
Exponential					
Square					
Square Root	~		11	A Comme	
Square Root	~				

## Step 4. Function Machine Vision/Edge Detector

This function detects edges according to user configuration. It is possible to detect one edge or more. Please note the set of factors by which the user can influence the accuracy of the result.

	Edge Detector Se	etup	
	Main Edge Detecto	r.	
MI Vision Assistant - Code Gener File Edit View Image Color Gra	Edge Detector	Advanced Edge Tool 🗸	- o x
<u>କ୍ଟ୍ରାୟର</u> ଜ୍ୟାହନ	Look For	First & Last Edge 🗸 🗸	Acquire Images Browse Images Process Images
	Edge Polarity	Kernel Size	
	All Edges	✓ 3 🗢	
	Interpolation Ty	width	<b>m</b> '
	Bilinear Fixed	✓ 3 ≑	
		Min Edge Strength	
mzgs_1.jpg - RGB (32 bits)		10	1997 A.
Edge Detector Setup	Edge Strength P 175,667 - 100		
Main Edge Detector	0		A CONTRACTOR AND A CONTRACT OF
Edge Detector Advanced	-115=	V 24	
Edge Polarity All Edges	Edges Found: 2	OK Cancel	
Bilinear Fixed V	in Edge Strength	Untitled Script 6 *	
1	0 🗄 🎽 🔛	i ⇒1 C (⇒ X	國
Edge Strength Profile 175,667	Results X Position (Pix.)	1 2 665,84314 665,25665	
0- -115=	Y Position (Pix.) Distance (Pix.) Strength	57,13358 128,68678 19,13423 90,68983 175,66667 101,66667	
Edges Found: 2 OK	Cancel K	F0.000000 F0.000000 F	

Some of the functions generate results in the form of tables. By using the data storage buttons, the user can send these results to Excel or save them to a text file.

lesults	1	2				^	
X Position (Pix.)	665,84314	665,25665					
Y Position (Pix.)	57,13358	128,68678					1
Distance (Pix.)	19,13423	90,68983					
Strength	175,66667	101,66667					
Noise	0.00000.0	0.000000		1 1	1	~	
<						>	

//// L01.t	xt — Notatnik						—	×
Plik Edy	cja Format Widok	Pomoc						
	HATRONIKA\07 In X Position (I	mage analysis\L0 Pix.) Y Po	1\mzgs_1.jpg sition (Pix.)	04.03.2019 Distance (Pix	21:34:24 .) Strength	Noise Rising		^
1	665,84314	57,13774	19,13839	174,00000	0,000000	1,00000		
2	665,25720	128,62402	90,62707	98,20000	0,000000	0,00000		

### 5. Summary

The sample task presents the most frequently appearing elements when creating a script that processes and analyzes the image. Depending on the chosen function, the image can only be processed or the ounce can provide data in the form of graphs (e.g. Histogram). Other functions generate the results of the analysis in the form of tables.

## It is important to remember these basic functionalities of the system, as they will be used in subsequent exercises without a detailed description.

Follow the check list and verify your skills:

- 1. Do you know how to load an image for analysis?
- 2. Do you know how to switch between image loading and processing modules?
- 3. Do you know where to look for image processing and analysis functions.
- 4. Do you know how to insert a function into the script?
- 5. Do you know how to change the parameters of the function (parameter edition)?
- 6. Do you know how to possibly save the results generated by the functions?

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