

Vision Components® Documentation

nano 3D interface to Halcon

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1 Scope and Requirement

This document describes a way to interface Vision Components' nano 3D laser profiler to machine vision library Halcon.

The interface is provided as a HDevelop (prototyping interface of Halcon) script. All functions are accessible and could be modified as needed and are provided as demonstration.

1.1 Halcon

The script requires Halcon 10.0 to be installed including HDevelop (part of the development environment). The script works with the demo version, and in that case is limited to this version capability (reminder window popping up regularly). A full or evaluation license is recommended for best experience.

1.2 Files

The script comes as a single file: 'HVC3D_vx.x.hdev' (where x.x represents the version of the interface), and minimum must be accompanied by another file: 'HVC3D Sensor Commands.csv' the descriptor of the commands of the nano 3D protocol.

1.3 Network configuration

The nano 3D must be configured to be identifiable and accessible on the network where the computer running the script belongs.

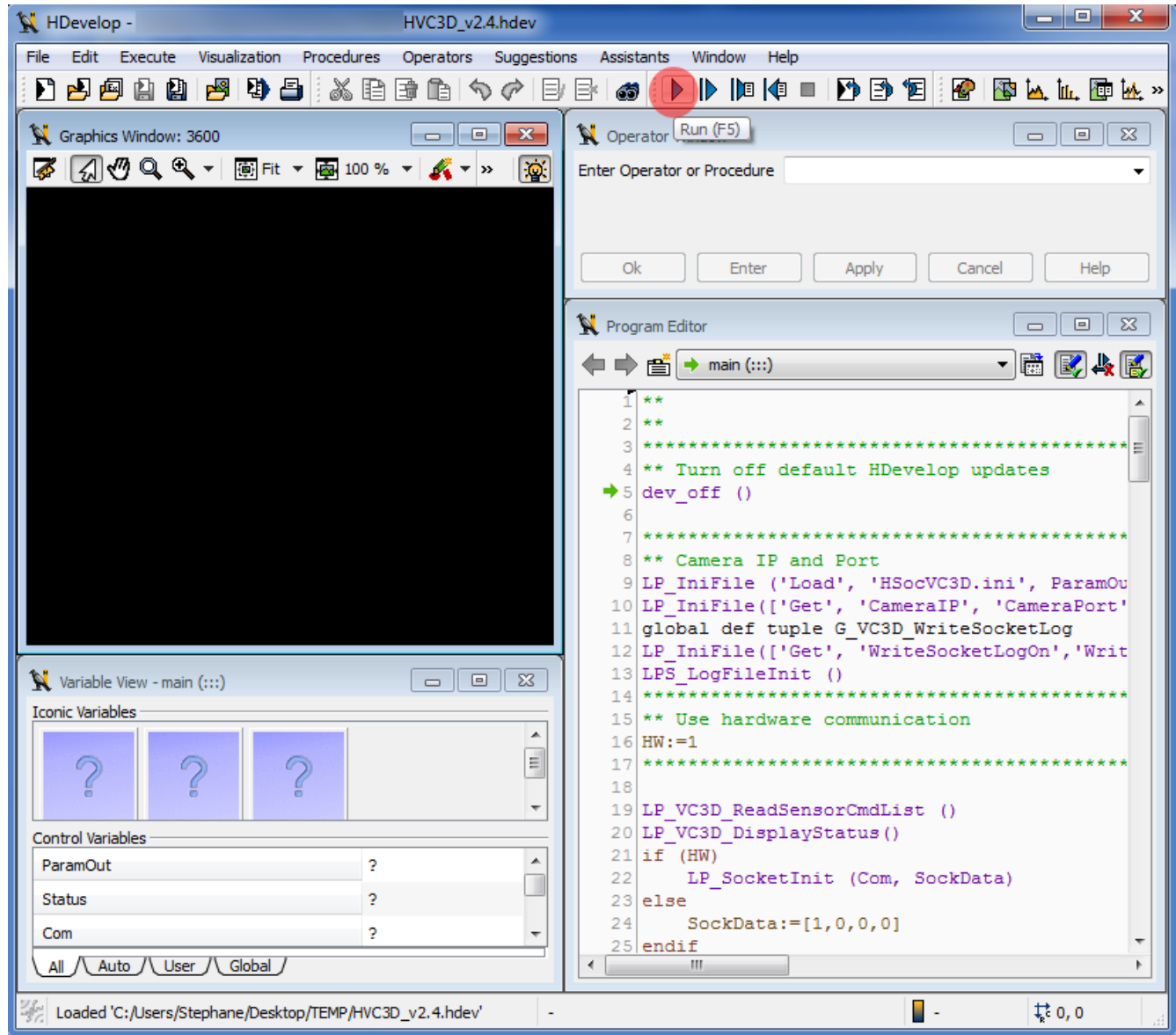
By default the nano 3D has a static address of 192.168.0.65 and uses port 1096. Consult nano 3D's manual to change IP address, then look at the ini section of this document to set the IP address and port used in your network configuration if different from the one noted above.

2 Executing the script

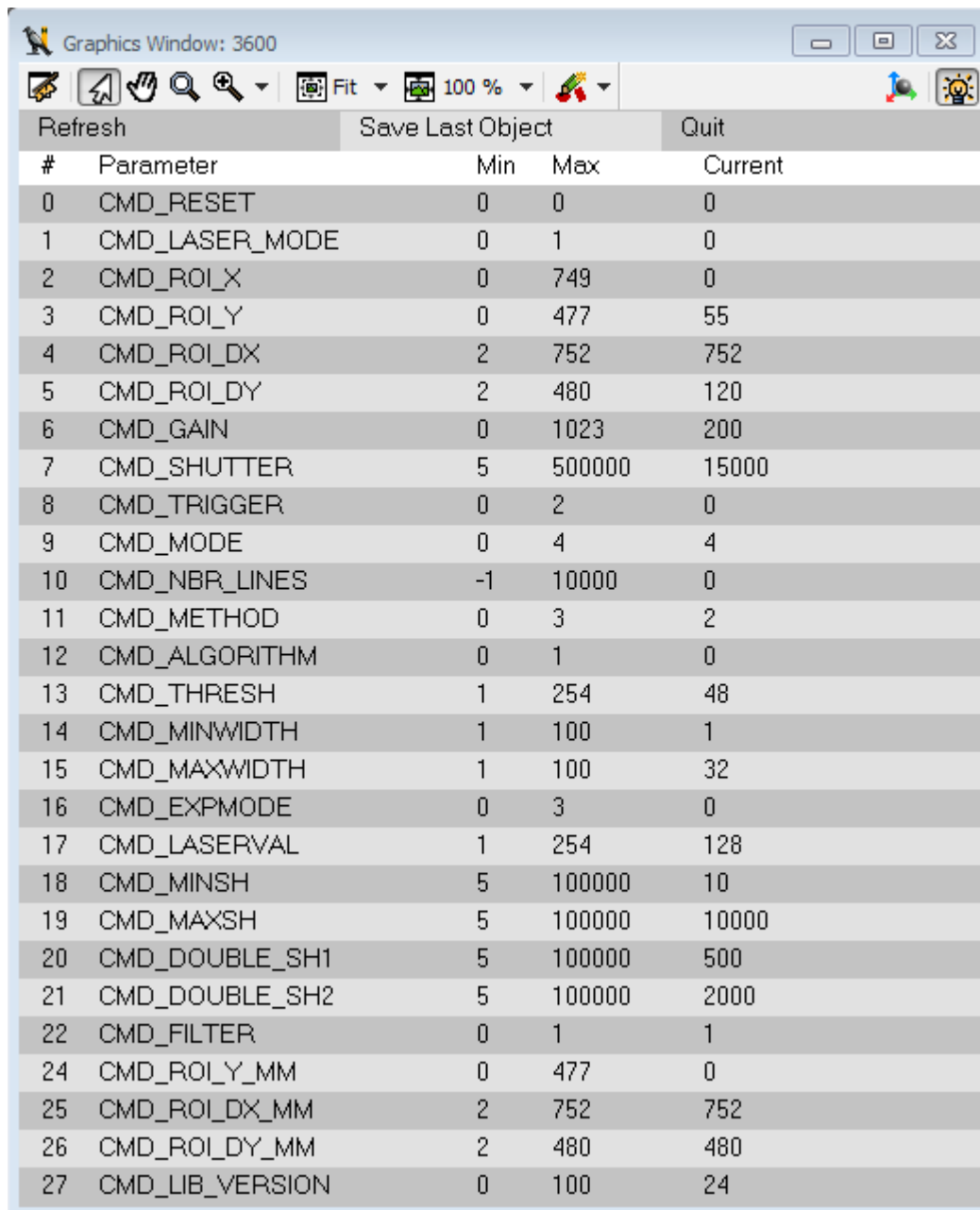
In windows, a double-click on 'HVC3D_vx.x.hdev' should start HDevelop and load the script automatically.



By default, HDevelop is in editor mode, you need to press 'F5' or click 'Run' to start executing the script.



Then, you should see a window like the following; the values may varies from your configuration:



#	Parameter	Min	Max	Current
0	CMD_RESET	0	0	0
1	CMD_LASER_MODE	0	1	0
2	CMD_ROI_X	0	749	0
3	CMD_ROI_Y	0	477	55
4	CMD_ROI_DX	2	752	752
5	CMD_ROI_DY	2	480	120
6	CMD_GAIN	0	1023	200
7	CMD_SHUTTER	5	500000	15000
8	CMD_TRIGGER	0	2	0
9	CMD_MODE	0	4	4
10	CMD_NBR_LINES	-1	10000	0
11	CMD_METHOD	0	3	2
12	CMD_ALGORITHM	0	1	0
13	CMD_THRESH	1	254	48
14	CMD_MINWIDTH	1	100	1
15	CMD_MAXWIDTH	1	100	32
16	CMD_EXPMODE	0	3	0
17	CMD_LASERVAL	1	254	128
18	CMD_MINSH	5	100000	10
19	CMD_MAXSH	5	100000	10000
20	CMD_DOUBLE_SH1	5	100000	500
21	CMD_DOUBLE_SH2	5	100000	2000
22	CMD_FILTER	0	1	1
24	CMD_ROI_Y_MM	0	477	0
25	CMD_ROI_DX_MM	2	752	752
26	CMD_ROI_DY_MM	2	480	480
27	CMD_LIB_VERSION	0	100	24

This window is the main interface with the nano 3D. The window displays all the parameters of the nano 3D with their min and max values.

To change the value of a parameter, you just have to left-click with the mouse.

Consult the nano 3D manual for detail information about each parameter.

To acquire data from the nano 3D, you have to set the 'Mode' and then specify the number of lines/images to acquire.

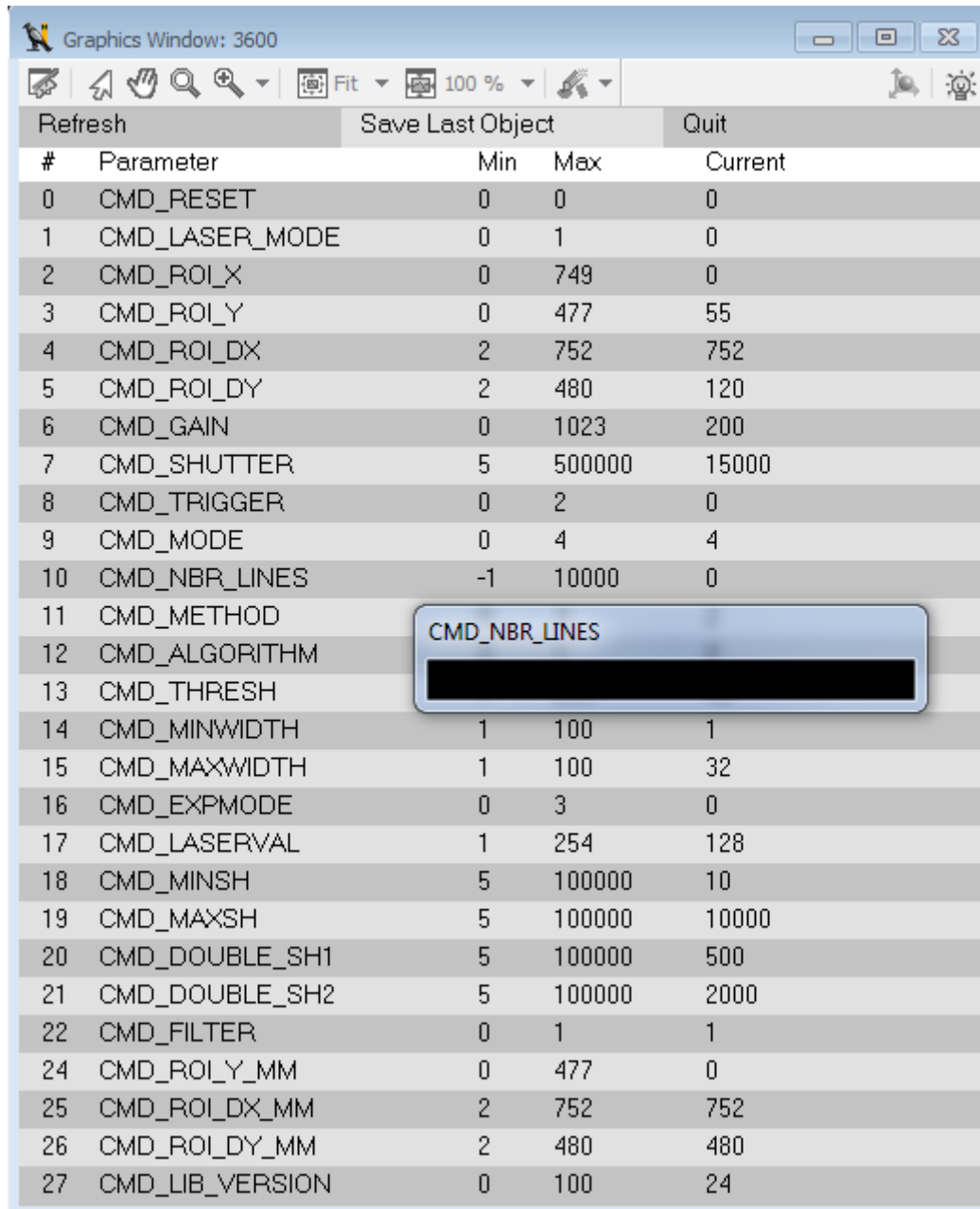
CMD_MODE	0	1	2	3	4
Description	Standby	Sensor Image	Profile	Profile + Laser Intensity	Calibrated [X,Z]

CMD_MODE 1 helps in setting up the shutter and ROI area.

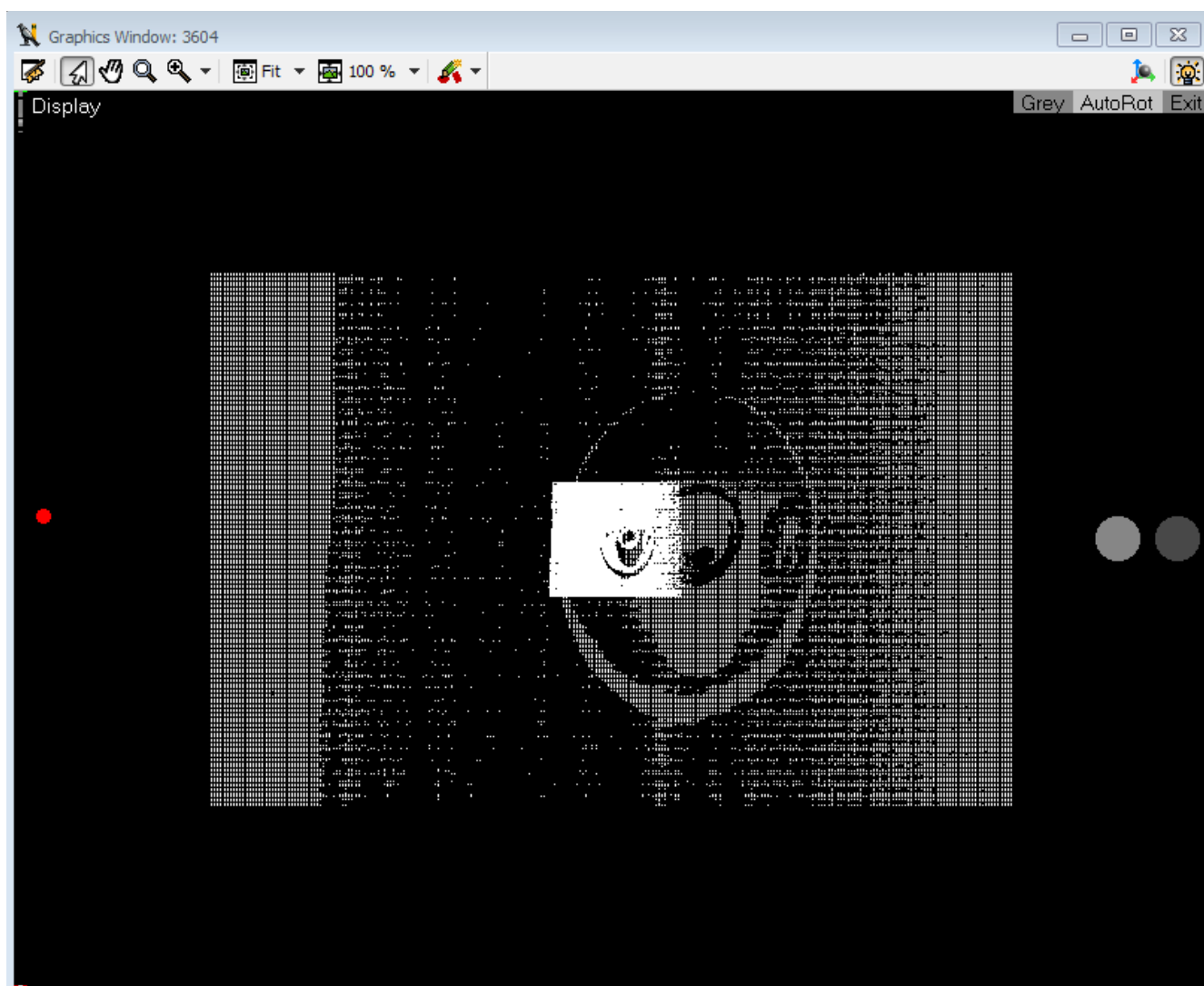
CMD_MODE 4 returns calibrated [X,Z] values. The Halcon script opens a 3D point visualization.

CMD_NBR_LINES is either the number of images to acquire and display (when CMD_MODE=1) or the number of profiles to acquire from the sensor.

Enter a value for CMD_NBR_LINES for example 500



If you had CMD_MODE=4 then you will acquire calibrated profiles. Once the profiles have been received (it could take 30s or so), the Halcon script will display the points in 3D like this:



3 Command Window

The Command Window has a menu line at the top:

<u>Refresh</u>		<u>Save Last Object</u>		<u>Quit</u>
#	Parameter	Min	Max	Current
0	CMD_RESET	0	0	0
1	CMD_LASER_MODE	0	1	0
2	CMD_ROT_X	0	749	0

'Refresh': request to update the value of all the parameters from the nano 3D

'Save Last Object': saves the last image(s) or point cloud to disk. You'll have to specify a filename and the file(s) will be placed in the same directory where the script is located.

'Quit': ends the communication with the nano 3D and ends the execution of the script. To restart, you need to reset (F2) and then run (F5).

4 3D Points Visualization

The point cloud visualization open after acquiring data in Mode 4. The visualization window has several active areas:



4.1 Menu line



'Grey': Displays the point cloud using grey scale to represent the Z position of the point.

'AutoRot': Rotates automatically the point cloud around the Z axis.

'Exit': Exit the point cloud visualization and closes the window. Once closed, interaction continues on the Command Window.

4.2 Navigation



To change the relative view to the point cloud, you can left-click with the mouse in the window. While maintaining the click and move left/right, the view will rotate around the Z axis and moving up/down will rotate around X axis.

For rotating around the Y axis, left-click on the left lighter grey circle ('Y') hold and move up/down.

The distance to the object is adjusted with the right darker grey circle ('D') left-click, hold and move up/down.

4.3 Z-range selection

The visualization allows to interactively modify the Z range of the points to display. This is done through the left area of the window:



The green and red lines represent respectively the top and bottom limits. Note that the full range of the Z values are spread across the full height of the window. Also, a representation of the presence and amount of point for each Z is displayed in grey value.

The limits can be adjusted by left-click on this area. The red circle indicates that the bottom limit (red) will be changed; to change the top limit, just left-click on the red circle, it will become green, the color of the top limit, and then left-click in the left area to set the position of the top limit.

5 Capability

5.1 Nano 3D default state

The script loads all the possibles commands and parameters of the protocol of communication for the nano 3D with the file: 'HVC3D Sensor Commands.csv'

In this file:

- 'N/A' indicates the parameter shouldn't be set in this file.
- 'Default' indicates the parameter will stay as it is currently set on the sensor.
- User value will be used to set the parameter when the script start executing.

5.2 Configuration file

The script reads an optional configuration file 'HVC3D.ini'. If the ini file doesn't exist, the script creates one automatically with all settings commented out (note: all the parameters might not be present, it depends if the section using the parameter was run or not).

To activate a parameter in the ini file, edit the file and remove the '*' in front of the parameter. Modify the value to your needs and save the file.

To undo any modification, you can delete the ini file, the script will create another one automatically.

Parameter	Default value	Description
CameraIP	"192.168.0.65"	IP address of the nano 3D.
CameraPort	1096	Port of the nano 3D.
ComProtocol	"TCP4"	Protocol used by nano 3D.
ComTimeOut	15	Time out on the communication in seconds.
WriteSocketLogOn	0	Turn Off(0) or On(1) logging the communication of the nano 3D.
WriteSocketLogFile	"HSocVC3D_Socket.log"	Filename of the log data.
SensorCmdFilename	"HVC3D Sensor Commands.csv"	Filename containing the commands of the nano 3D with default configuration.
MaxObjects	100	Number of objects (images, profile set, point clouds) kept in memory by the script (FIFO).
3D_Points_mm_Y_step	"Auto"	Increment of the Y position of the profiles received in Mode 4. "Auto" uses the average X spacing of the points received. It is possible to specify a value in mm (i.e. 0.01), can be negative.
PointCloudWndWidth	800	Width of the window displaying point clouds.
PointCloudWndHeight	600	Height of the window displaying point clouds.
MaxPointsInCloud	50000	Maximum number of points to be displayed in a point cloud (auto-decimation).

6 Recommended steps for using the nano 3D

6.1 Ethernet communication

Connect power to the nano 3D: plug power supply base in an active power outlet and then plug the power supply connector in the nano 3D's corresponding receptacle. Some LED light on the nano 3D should light up.

Connect the Ethernet cable on the nano 3D and then on your computer or network switch.

By default, the nano 3D has a IP address of '192.168.0.65' set your network settings to accept communication with the nano 3D, or change nano 3D IP address (see nano 3D manual).

Then, to optimize Ethernet traffic, set your network adapter number of receiving buffers to its maximum value, for many adapters it is not the default value.

6.2 Image of the laser

Once you can communicate with the nano 3D, you can run the script.

For good scanning results, the laser line should be the only light source visible in the image (at least for all gray value above the level indicated in the parameter CMD_THRESH).

To achieve this you can get sensor images by setting CMD_MODE to 1, and requesting a number of images with the parameter CMD_NBR_LINES and then CMD_SHUTTER and CMD_GAIN when the image acquisition has completed.

You can also adjust the image size (ROI) by looking at the minimum and maximum position of the laser line in the image and set the ROI parameters around this area.

6.3 Scanning

After setting the image properties you are ready to scan objects.

It is recommended that you set the '3D_Points_mm_Y_step' parameter to your setup value in the HVC3D.ini file.

For any questions,
contact Vision Components Support at:
email: support@vision-comp.com