EN

DNNP007

Software Add-Ons for uniVision: Fanuc Interface Seam Tracking

Operating Instructions

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1. General

The software add-on permits communication between a uniVision application DNNF012 and a robot for seam tracking applications. In this way, a 2D/3D Profile Sensor can be used with a uniVision application for seam detection and tracking in realtime with a robot.

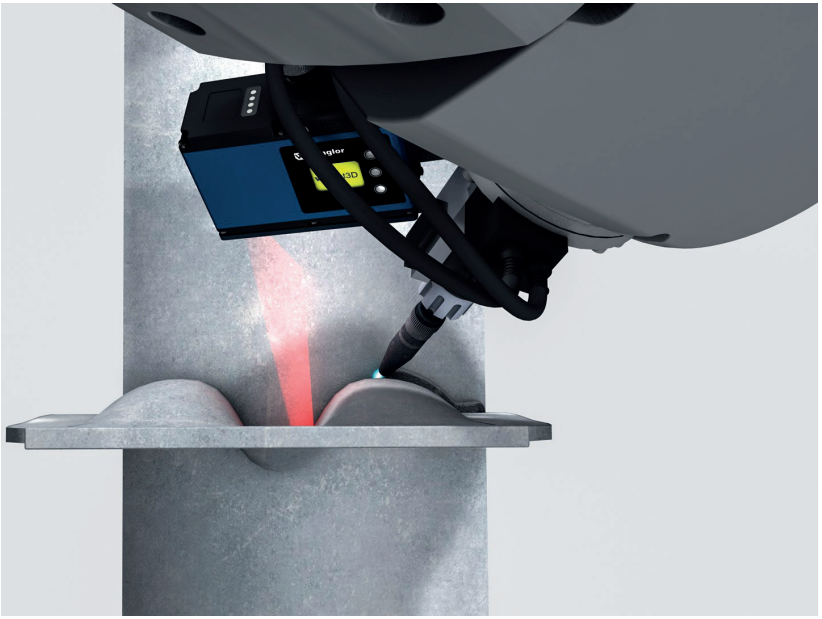


Figure 1: Seam tracking with 2D/3D Profile Sensor and robot

NOTE!
These instructions are limited to a description of the interface between the uniVision application and the robot controller. Comprehensive information regarding uniVision parameters configuring software and the mode of operation of the 2D/3D Profile Sensors can be found in the operating instructions of the respective products. Details concerning available robot commands can be obtained from the respective robot manufacturer.

2. Connection Overview

Communication between the 2D/3D Profile Sensor's control unit and the robot controller takes place via a TCP/IP interface.

NOTE!
Bridge the network settings at the control unit of the 2D/3D Profile Sensor in order to be able to use a LAN interface for the 2D/3D profile sensor and a LAN interface for connection to the robot controller. Open the properties window for the control unit in the device list and set the "Bridge" parameter to "LAN1 and LAN2" to this end.

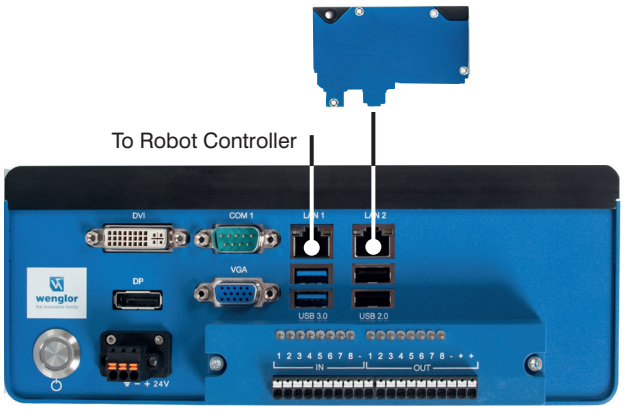


Figure 2: Connection between Control Unit and robot controller

3. Functions Overview

The "robot interface" software add-on is installed to the control unit of the 2D/3D profile sensor. It controls communication between the uniVision application and the robot controller.

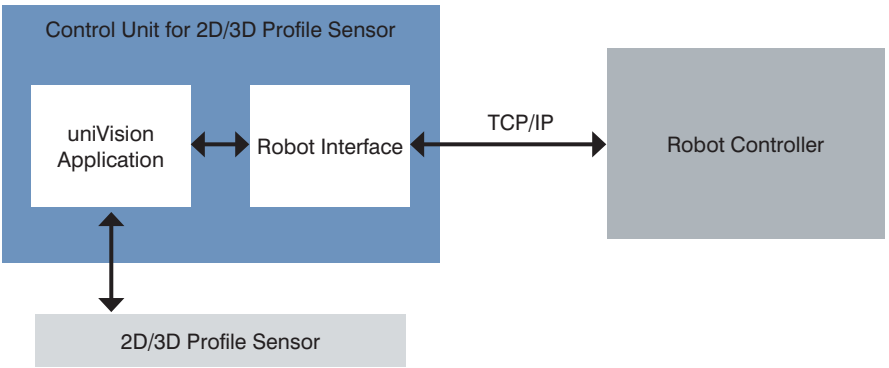


Figure 3: Function diagram

4. Installing the Interface

Install the software add-on to the control unit of the 2D/3D profile sensor.

1. Download the file and save it to a USB stick.
2. Connect the USB stick to one of the USB ports on the control unit.
3. Select the file and copy it to the /media/card/firmware directory.
4. Restart the control unit.
5. The software add-on is installed and started the next time the system is booted.

5. Universal Sensor Interface for Seam Tracking in Fanuc

5.1 Setting up an uniVision Application Project

The user should create at first a uniVision project and configure it to detect the seam. Once the project is created and configured, the user should save the project using a number as project name.

Example:

- Job number on robot side: 1
- Matching name of the uniVision project:1.u_p

A uniVision project for robot interface should mainly consist of three basic modules:
1. Module device weCat3D
2. A module to detect the seam (e.g. module Pointcloud Measure)
3. Module Device TCP

Figure 4 shows a simple uniVision project for robot interface to find the V joint.

The user can use the point cloud measuring module together with the find line or find line segment tool, to detect the seam. The start and end points of the detected lines are determined and can be used as points for tracking.

NOTE!
uniVision 2.1.0 or higher provides ready to use templates to find different sets of simple joints. The user is free to modify a template to match his own needs.

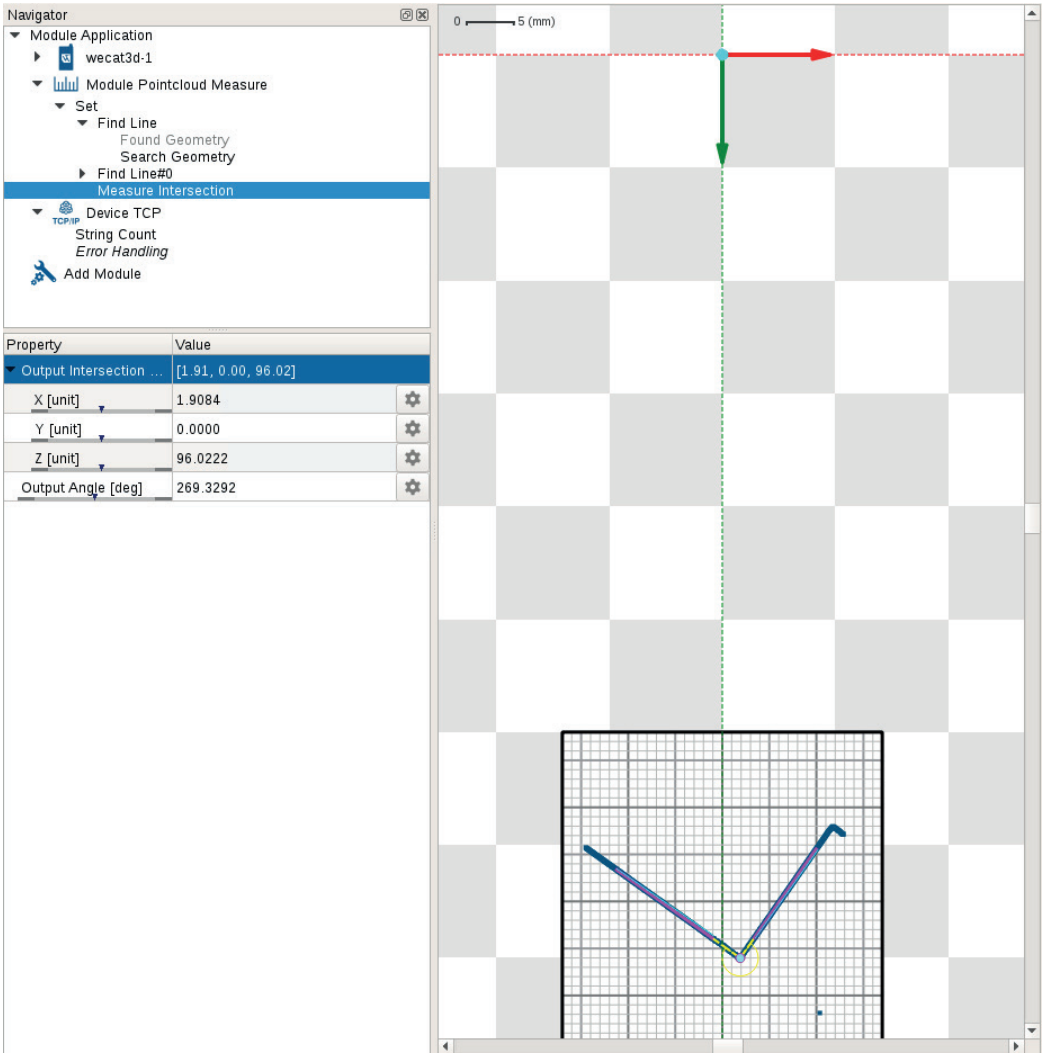
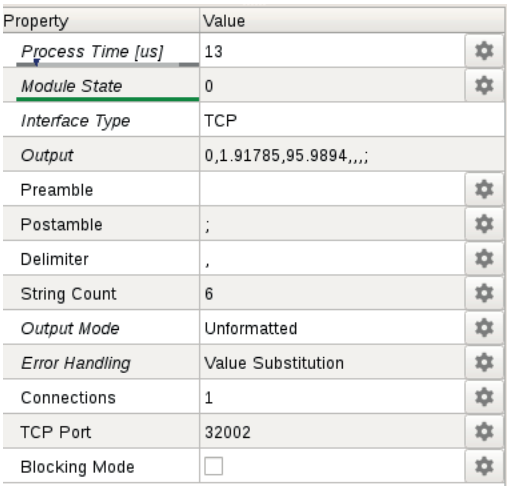


Figure 4: Basic uniVision project to detect V joint

Device TCP module should be configured as follows:

Postamble: ; (semicolon)
Delimiter: , (comma)
Number of characters: 6



Property	Value
Process Time [us]	13
Module State	0
Interface Type	TCP
Output	0,1.91785,95.9894,,,;
Preamble	
Postamble	;
Delimiter	,
String Count	6
Output Mode	Unformatted
Error Handling	Value Substitution
Connections	1
TCP Port	32002
Blocking Mode	☐

Figure 5: Device TCP module configuration for robot interface

1. Link the values for the character strings using the “number of characters” submodule:

Character String Number	Linked Value
Character string #1	Link with a value which provides information concerning the validity of the measured value (e.g. module status of module pointcloud measure). **NOTE!** The linked value is interpreted as follows: **Linked Value** — **Meaning** 0 or false — The ascertained value is valid. Value not equal to 0 or false — The ascertained value is invalid. The robot ignores the measured value.
Character string #2	Link to the X-coordinate of the tracking point (e.g. the X-coordinate of the detected endpoint of a line).
Character string #3	Link to the Z-coordinate of the tracking point (e.g. the Z-coordinate of the detected endpoint of a line).
Character string #4	Link to a value which represents information concerning the width of a gap (e.g. the X-value difference at a gap).
Character string #5	Link to a height difference (e.g. the Z-value difference at an edge).
Character string #6	Link to a surface (e.g. a detected surface from the point cloud region module).

NOTE!
Character strings 1 through 3 must be linked, but linking of character strings 4, 5 and 6 is optional.

NOTE!
It is fine to add more than 6 strings in the module Device TCP and link them to different values. The robot interface reads only the first 6 strings and ignores the rest.

5.2 Configuring the Robot Interface

The robot interface includes various setting options and results displays.

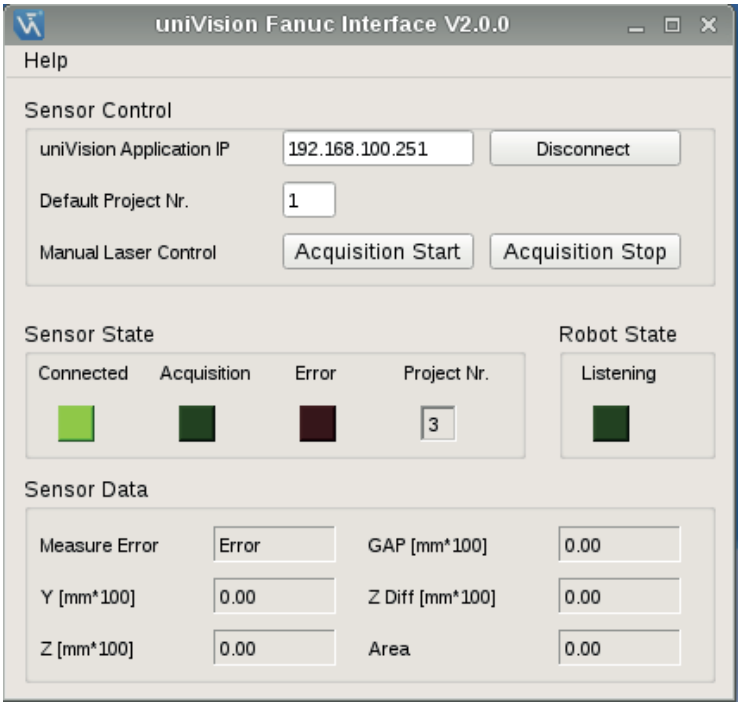


Figure 6: uniVision Fanuc interface

5.2.1 Sensor Control

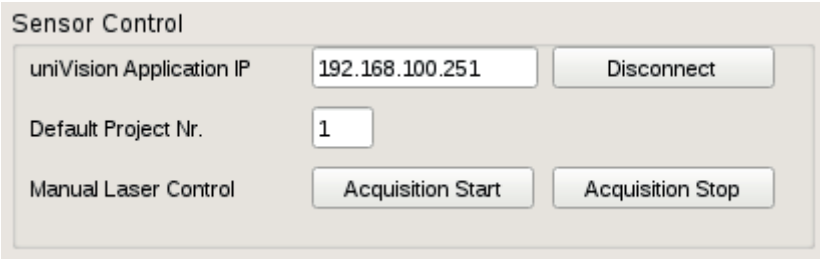


Figure 7: Sensor control

The robot interface automatically connects to the uniVision project through the given IP. For safety reasons the laser of the 2D/3D Profile Sensor will be automatically deactivated after establishing a connection. You can manually control the laser of the 2D/3D Profile Sensor from the robot interface through the buttons “Acquisition Start” and “Acquisition Stop”.
The robot interface communicates with the uniVision application via a TCP/IP connection.

NOTE!
The IP address of the uniVision application is visible in the device list of the uniVision software. The default IP address is **192.168.100.251**.

NOTE!
In case of an open connection between the robot interface and the uniVision project, the uniVision project can be used in live mode. Changing to edit mode is only possible if the connection from the robot interface to the uniVision project is closed before.

5.2.2 Sensor State

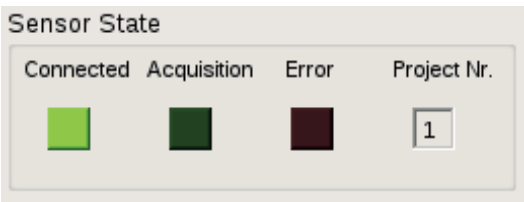


Figure 8: Sensor state

The table below describes the state of each LED in sensor state.

Status Value	Meaning	
Connected	Connection status, robot interface to uniVision project:	
	Orange	Not connected Possible causes: • The IP address of the uniVision application is incorrect. • The uniVision project is in edit mode. Remedy: • Enter the correct IP address. • Switch the uniVision project to run mode.
	Dark green	The connection to the uniVision application is active and the uniVision application project is being loaded.
	Bright green	The connection to the uniVision project is active and the 2D/3D Profile Sensor is ready.
Acquisition	**Dark green**	The 2D/3D Profile Sensor's laser is off.
	Bright green	The 2D/3D Profile Sensor's laser is on.
Error	**Dark red**	No errors
	Bright red	Problem in communication with the uniVision project
Project number	Number (name) of the project which is currently loaded in the uniVision application	

5.2.3 Robot State

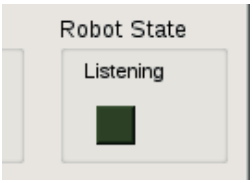


Figure 9: Robot state

The table below describes the state LED in robot state.

Status Value	Color	Status of connection between controller and robot interface
Robot status	Orange	The robot interface software is not licensed. Please refer to section 5.3 to learn more about licensing the robot interface
	Dark green	Waiting for a connection from the robot controller
	Bright green	Connected

NOTE!
Please refer to section 5.4 to learn more about configuring the robot controller to build a connection to the robot interface.

5.2.4 Sensor Data

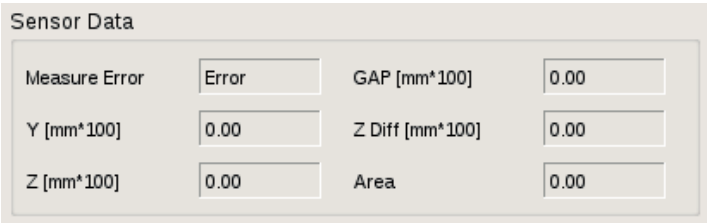


Figure 10: Sensor data

Sensor data shows the linked data in Device TCP module in the loaded uniVision project. If the laser of the 2D/3D Profile Sensor is deactivated or the uniVision project could not compute the tracking point, the measure error label will show “Error” and the data will not be updated.

5.3 RobotInterface Licensing

The robot interface needs to be licensed in order to accept a connection from the robot controller.

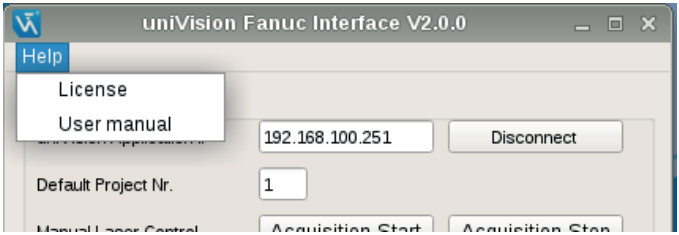


Figure 11: Robot interface licensing

In the Help menu in the menu tool click on license to open the license dialog window.
In the “License Request” tab enter your data to the lines provided for this purpose and activate the checkbox next to the desired module (see Figure 12). Click “Generate request”, save the displayed license request key on the desktop and send it by e-mail to **order@wenglor.com**.

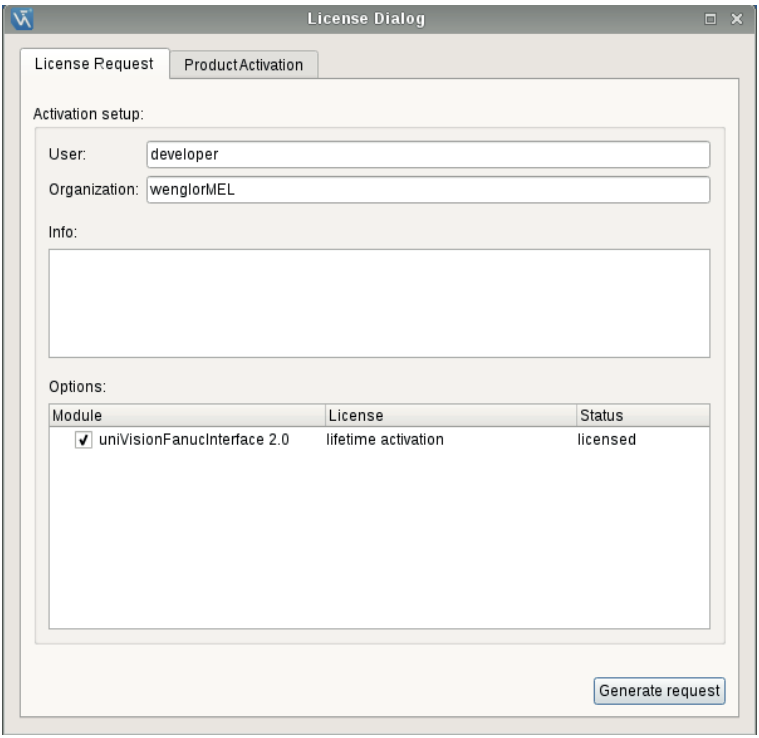


Figure 12: License window

NOTE!
Please make sure that the licensing process is executed on the control unit which will actually be used in the application. The license is restricted to the respective control unit.

You will receive your license activation key. Save it on your desktop. Select the “Product Activation” tab in the license dialog box and open the corresponding file. Click “Activate License” in order to enable the software.

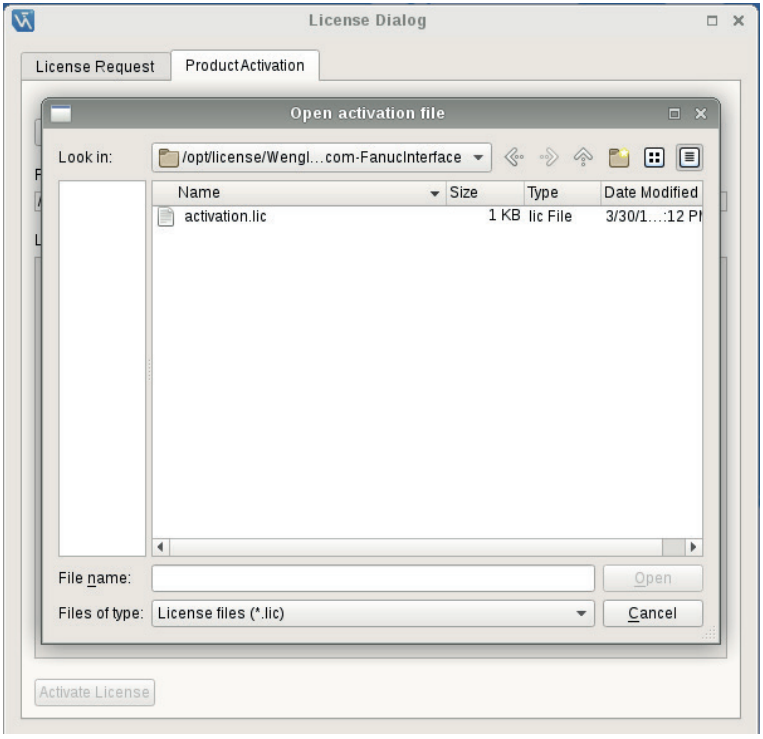


Figure 13: License activation window

5.4 Configuring the Universal Sensor Interface in Fanuc Robot

The robot controller should be configured to build a connection to the robot interface.

NOTE!
Make sure the software packages R691 Universal sensor interface and R648 User Socket Messaging are already installed on the robot controller. Please contact your Fanuc support to learn more about the topic.

The R30iA Fanuc robot controller has two 10 Base T or 100 Base TX interfaces through the RJ45 Ethernet connectors. Connect the uniVision controller to one of the two ports.
Press “Menus”, select “Setup” and then press [F1]. Select “Host Comm” then TCP/IP.
Configure the IP of the Host (the control unit in this case). Both robot IP and control unit IP should be in the same subnet (i. e. 192.168.100.xxx). The port number of the robot controller should be 5020.
You can test the connection between the robot controller and the control unit by pressing the ping [F4] in the robot controller.

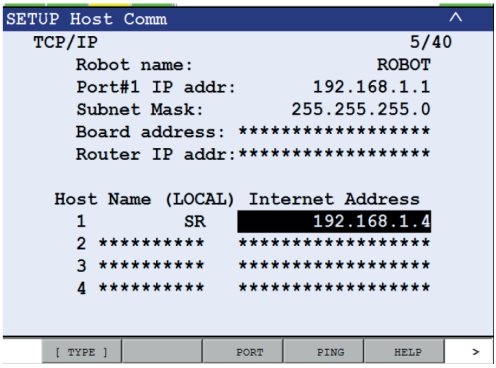


Figure 14:Setup Host communication

5.5 2D/3D Profile Sensor Calibration for Fanuc Robots

Universal sensor interface in Fanuc controllers provide its own calibration process to compute the sensor frame.
The calibration process in Fanuc controller is called Ten Point Teaching Method. Please refer to the Universal Sensor Interface documentation or contact your Fanuc support to learn more about this topic.

6. Troubleshooting

6.1 The robot is not able to track the seam

Possible reasons:

• The uniVision project is not able to detect the seam.

Solutions:

• Make sure, that the uniVision project is able to detect correctly the seam to be tracked.

6.2 Activating the Debug Ouput Log

The debug output log saves the communication between the robot controller and the uniVision application.
The debug output log helps the support team understanding the issue and find an appropriate solution.
To activate the debug output log go to the config.ini file located in /opt/WenglorMEL.com-FanucInterface/bin and change the value of the variable DebugLog to 1 (default is 0).
The robot interface will create a new file DebugLog.txt.
After doing the tests, disconnect the robot controller from the robot interface, copy the file and send it to your support team for further analysis.

NOTE!
Please deactivate the debug output log at the end of the test.