OPTO ENGINEERING®

SOFTWARE LIBRARY & STAND-ALONE TOOLS FOR 360 OPTICS SETUPS

360LIB Suite

INSTALLATION MANUAL,
GUI REFERENCE AND
SETUP PROCEDURE

V 1.4 - eng

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1 • GENERAL INFORMATION

1.1 Description

360LIB Suite is a C++ based computer vision software designed to optimize the optical performances of 360° optics setup, as the ones typically used for single camera, lateral inspection purposes. With the use of both a .dll library and dedicated stand-alone tools, it makes it easy to take care of all the aspects of a typical 360° optics setup (correction of decentering and unwrapping) which, if not properly addressed, can affect negatively the results of the inspection, such as OCR/OCV/barcode reading.

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This Software uses OpenCV library which license terms can be found below:

1.3 Installation instructions

When a license is purchased, a short URL for the download of the software will be contained in the License Key packaging. The software can be also downloaded from Opto Engineering website www.opto-e.com.

The downloaded file is a compressed zip containing this manual and the setup executable. In order to install, double-click on the setup file, insert your administrator credentials and follow the on-screen wizard.

During installation, the user will be prompted for the installation of Visual C++ Redistributable runtime. If the user is sure that this component is already installed in the PC, it is possible to cancel the runtime installation. In any other case, the runtime is strictly needed for the execution.

The installer installs the software in the PC, creates a start menu shortcut to the 360LIB APP executable and prepares the environment for the integration of the library in your code.

In particular, two environmental variables are created:

- 360LIB_LIB: path to the .lib files for binaries reference.
- 360LIB_INCLUDE: path to the library header files.

For the deployment of a software that integrates the 360LIB it is necessary to operate a fresh installation of the 360LIB Suite on every machine that will be built. Doing so will install and add to the system PATH the needed DLL binaries for runtime execution.

During installation both release and debug builds of the library are installed. The libraries with the "_d" suffix are debug builds.

1.4 Minimum requirements

360LIB Suite requires a Windows based PC with the following:

- Intel® Core™ i3 Dual Core (4th gen) or AMD Ryzen™ 3 Processor (*Minimum*)
- Intel® Core™ i5 Quad Core (4th gen) or AMD Ryzen™ 5 Processor (*Suggested*)
- Windows 7 64 bit or later
- Color WXGA-H monitor (1280 x 720 resolution)
- 4GB (*or more*) RAM
- At least 150MB free hard disk space (*for installation*)
- An internet connection (*for installation download*)
- Available USB port (*for USB License Dongle*)
- Visual C++ runtime version 2015 or later
- .NET framework 4.5.2 or later
- Administrative privileges (*for installation*)

For the development of software using the 360LIB Suite Visual Studio 2015 is highly recommended. The installation of OpenCV 3.4.0 or higher is also needed. In order to use 360LIB Suite, an explicit

reference to the core header of OpenCV library is needed (see example at section 2.2 of this manual).

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> ***NOTE:*** *Although the software is designed to work with the Windows Operating Systems listed above, Opto Engineering s.r.l. cannot guarantee operation on OSs no longer supported by Microsoft Support Life Cycle Policy.)*

360LIB APP is a full GenTL compliant software. Any GenTL compliant camera device can be used with this software. Camera manufacturer drivers need anyway to be installed in order for the program to operate correctly.

2 • 360LIB REFERENCE

2.1 Interactive documentation

At the act of installation, the library documentation is copied in the *doc* folder inside the installation directory. A simple double click on the *index.html* file will open a web browser at the index of the interactive documentation.

The documentation is a web-based manual containing all information regarding the integration of the library, the classes and the function calls necessary to operate correctly the software library.

2.2 Application example in C++

```
#include "IUnwrapper.h"

int main(int argc, char** argv)
{
	OELib::Unwrapper unw = OELib::IUnwrapper::Create();
	//Load from File
	OELib::ImagePtr srcImage = OELib::ImageFactory::load("test.bmp");
	OELib::ImagePtr outImge;
	/*
		- Template1
		- Template2
		- Searching Area

		Template parameters:
		- 2% Radius Tolerance
		- 50 px circle shift
	*/
	OELib::Circle c1 = OELib::Circle(1260,1044,300);
	OELib::Circle c2 = OELib::Circle(1248, 1044, 600);
	OELib::Circle searchArea = OELib::Circle(1260, 1044, 150);
	unw->SetRadiusTolerance(2);
	unw->SetMaxOutCenter(50);
	unw->SetFirstTemplate(srcImage, c1);
	unw->SetSecondTemplate(srcImage, c2);

	/*
		- 2% Radius Tolerance
		- Check Area Stability1 4 px and Check Area Stability2 4 px
	*/
	unw->SetSearchingArea(searchArea,4,4);

	//set OutputImage Size
	unw->SetUnwrapImgResolution(1500,500);

	//Unwrap!
	outImge=unw->Unwrap(srcImage);
}
```

This integration example makes use of OpenCV library for image loading and saving. Ensure that the library is correctly referenced in your project to use this example as-is.

> ***NOTE:*** *The libraries of the 360LIB are native C++ dynamic libraries and as such they are fully based on unmanaged code. In order to use it in .NET based applications, a wrapper implementation is needed. A Dynamic-link library wrapper (360LibNET.dll) is located in bin/ subfolder.*

3 • 360LIB-APP

3.1 General overview

The 360LIB APP is a full featured deploy of the 360LIB. It serves both as a demonstration and as a guided tool for unwrapping procedure. All functions reported in the 360LIB-APP are available in the 360LIB library.

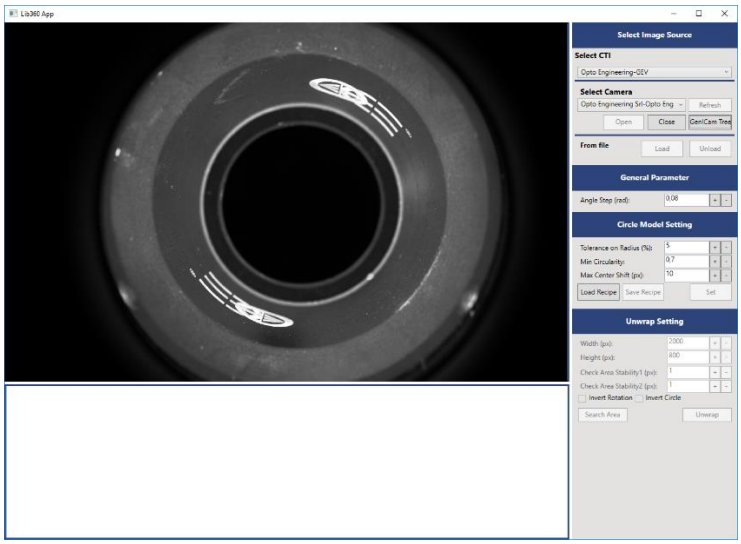
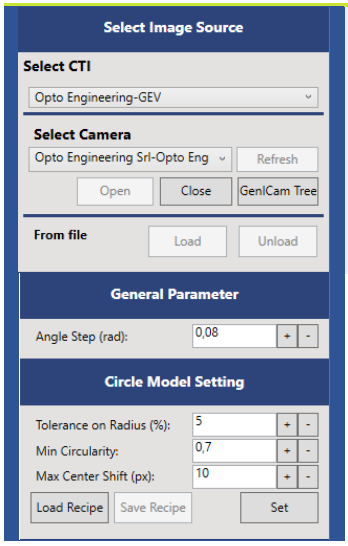
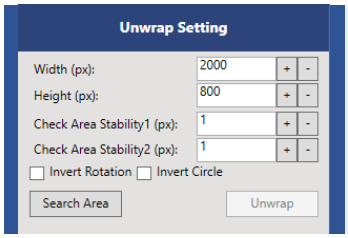


Figure 1

Section 3.2 quickly the APP Control Panels and the detailed use of each panels and parameters. Section 3.3 describes how to setup 360LIB-APP.

3.2 Control Panels

Panel	Title	Description
	Image Source Panel	Camera source settings: - Image from camera - Image from file
	Model and Input parameters Panel	- **General Parameter:** it defines what scanning step is used for circles matching. - **Circle Model Setting**: it defines parameters used in template definition

	- Output Image and post processing parameters - **Unwrap Setting**: sets output image size and post processing parameters

3.3 360LIB Procedure

3.3.1 Image Source Setup

You can choose if load an image from file or capture the stream from a Camera. In the second case you can set camera parameters using *GenICam tree* menu.

3.3.2 Template Setup

Once source is selected, the next step is choosing a pair of circles that represent searching template. Left click on three points of the image to build the first circle and adjust the template by moving the mouse cursor, then left click to confirm. Repeat the procedure for the second circle (red circles in Figure 2).

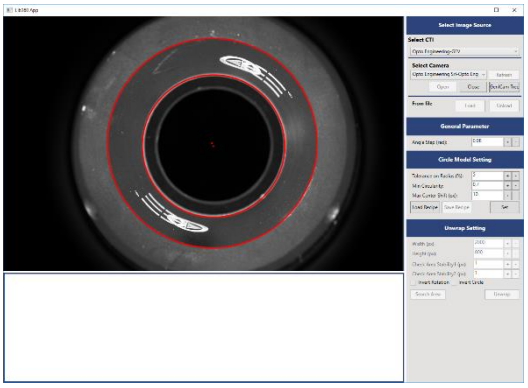


Figure 2

Take a look at General Parameter and Circle Model Setting Panels:

- **Angle Step** defines the scanning step in radians to calculate the circle position. Higher values mean less precise matching.
- **Tolerance on Radius (%)** defines the maximum percent change (increase/decrease) between what you select on image and a circle on image.
- **Min Circularity** defines the minimum score for detected circles. Min score has a normalized range of value between 0 and 1 (the maximum value means perfect circle).
- **Max Center Shift (px)** defines the maximum shift between what you select on image and a circle on image.

At the end press *Set* button; the software will select the best templates (blue circles in Figure 3) according to parameters in Circle Model Panel.

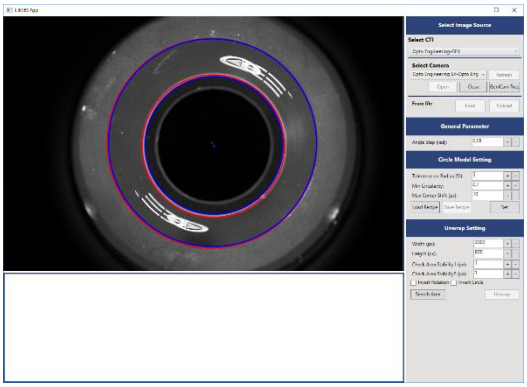


Figure 3

3.3.3 Searching Area Setup

Click on *Search Area* button to select the maximum searching area on the image (green circle on Figure 4). Keep in mind that you are selecting the maximum displacement of the circle center.

Figure 4

3.3.4 Output Image Parameters

- Width (px) and Height (px) are the two values of the size of output image
- Check Area Stability1 (px) and Check Area Stability2 (px) prevent possible unwrapping instability of output image. Higher values produce more stable images and prevent instability caused by image noise but excessively high values may produce inaccurate matching.
- Selecting Invert Rotation and Invert Circle mirror the output image respectively along the vertical and the horizontal axis.

3.4 Setup Test

Click on *Unwrap* Button to get the output image (Figure 5)

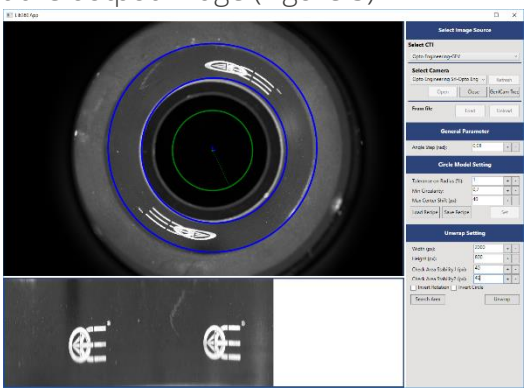


Figure 5

If you set a camera source, the unwrapping function will be active for all camera frames so you can test the correct setup moving the object (Figure 6-7). As shown in the examples, the output image is not influenced by object displacement.

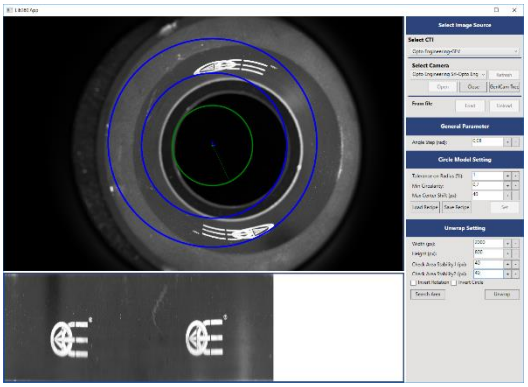


Figure 6

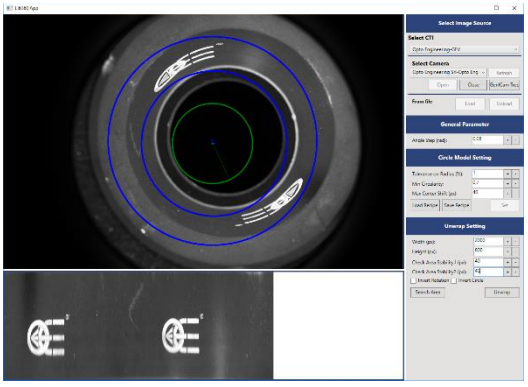


Figure 7