LensFrame User Guide

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1.1 Prerequisites

LensFrame requires the following elements, which are distributed with the application installer. During installation you will be prompted to accept and install them:

- Microsoft .NET v4.5 Redistributable x86.
- Visual C++ 2012 Redistributable x86.

If you already have them installed you can cancel its installation for LensFrame.

1.2 Installer

Although it is not necessary, if you have installed previous versions of LensFrame, we recommend you to uninstall them and delete them to avoid any conflict.

Run the `LensFrame v0.4.4 Setup.exe` file. The installation wizard will guide you through the installation.

2 LensFrame User Guide

This guide will instruct you on how to use the program for real time HD Camera Stitching. We will cover many usage possibilities. Please read carefully and execute each task as instructed.

2.1 Previous steps

2.1.1 Virtual Camera Ports

We create a virtual Onvif Camera in your system.

Port `554` is used as default for the RTSP video stream. In case this port is occupied, it can be changed. (Port `8554` is recommended).

Port `80` is used for Onvif. In case that port 80 is occupied, another port can be selected modifying the file `LFDIR\bin\data\config.xml`. The parameter `onvifPort` can be changed to the desired port.

Moreover, if the device has more than one Network Interface (e.g. Ethernet and Wifi) the parameter `userSelectedNetworkInterface` can be modified to choose between interfaces.

The user must select the interface through which he will connect to LensFrame. Choosing `0` will select the first interface found in the device, `1` will be the second and forth on.

```
<NetworkVideoTransmitter>
    <cameraName>LensFrame</cameraName> <!-- Camera name -->
    <onvifPort>80</onvifPort>
    <videoStreamingPort>554</videoStreamingPort>
    <userSelectedNetworkInterface>0</userSelectedNetworkInterface>
    <streamType>H264</streamType> <!-- Do not modify -->
</NetworkVideoTransmitter>
```

Make sure no other applications are using these ports.

2.1.2 Administrator rights

In some installations, depending on your Windows configuration, it might be necessary to run the program as administrator.

In order to configure LensFrame to always run as administrator, right click on the LensFrame icon (the Desktop shortcut or the file in LFDIR\LensFrame.exe) and go to the Compatibility tab, in the Privilege Level section check the "Run this program as administrator" checkbox.

2.2 Scene configuration files

LensFrame works with its own configuration files. These files describe the scene to be visualized. Some samples of configuration files can be found in `LFDIR\bin\data`.

These are XML files with information about the scene. In order to configure your own scenes you will need to change or create LensFrame configuration files. This has to be done only once.

Notice: Change only the information we advise you to, otherwise the program might not work.

Open `LFDIR\bin\data\RTSP_sample.lf` using a text editor, this file contains a scene configuration for two RTSP cameras.

2.2.1 Add cameras to the scene

Notice: Demo versions have a limit of 4 cameras.

In the configuration file, find the `<cameras>` tag. In there you will have all available cameras in the scene. For each `<camera>` (singular) tag, you can manually modify its information. It is important that you correctly set the following attributes:

```
<camera>
        <logicalID>rtsp://{IP}</logicalID> <!-- RTSP URI -->
        <user>admin</user> <!-- RTSP Username -->
        <pass>admin</pass> <!-- RTSP Password -->
        <fov>50.0</fov> <!-- Must resemble real camera FOV -->
        <transform><!-- No need to modify manually -->
        <px>0.000000000</px>
                <py>0.000000000</py>
                <pz>0.000000000</pz>
                <qx>0.000000000</qx>
                <qy>0.000000000</qy>
                <qz>0.000000000</qz>
                <qw>1.000000000</qw>
        </transform>
</camera>
```

The `logicalID` field refers to the camera's RTSP URI, notice that the & character must be replaced by `&` otherwise the XML file format will not be able to recognize it. You can also set the user name and password for the RTSP URI in the provided fields.

The `fov` field is the field of view, angle of your camera in degrees. Notice that zooming will vary the angle. Please see your camera's data sheet to see the lens angle. We use this value for several computations.

You do not need to modify the other camera attributes, the camera `transform` is modified from the LensFrame application, when saving a configuration. In order to reset to the original configuration you can manually copy the values present in the sample above.

2.2.2 Spherical or parallel scene

We give option to radial or parallel stitching, please see the attached document *LensFrame Features and Camera Setup* for more information about these scenarios.

You may also change the `<scene_type>` attribute of your configuration file to switch between `SPHERE` and `PLANE` scenes. If you decide to change the scene type, we recommend you to set the `transform` of each camera to the initial value. See Section 2.2.1 above.

2.2.3 Scene resolution and style

Color and other values can be modified for your convenience. The LensFrame virtual camera will give a default output resolution of 1920x1080 pixels. This can be modified using the `<style>` field. See the sample below.

```
<style draw_primitive="1">
```

```
        <resolution w="1920" h="1080" />
        <background_color r="30" g="30" b="30" />
</style>
```

The `draw_primitive` attribute can be either 1 or 0, if set to 1 the scene primitive will be shown as light dots, indicating the scene's shape (spherical or planar). Set it to 0 to remove this graphical representation.

Notice that the background color of the scene can also be modified using the usual RGB values ranging from 0 to 255. If these are not set the application will use the default dark grey background.

2.2.4 Navigation control parameters

The PTZ navigation can be limited, usually when only a few cameras are present in the scene it might be convenient to put navigation boundaries, so that the operator can always see images on screen.

This sample limits navigation to 180 degrees, the user can pan 90 degrees to both left and right. Vertically, the user can tilt 30 degrees both upwards and downwards. Zooming is also limited to a minimum fov angle of 1 degree, and a maximum of 120 degrees.

```
<ptz>
        <vertical_range min="-90.0" max="90.0">1</vertical_range>
        <horizontal_range min="-30" max="30.0">1</horizontal_range>
        <fov_range min="1.0" max="120.0">1</fov_range>
</ptz>
```

Notice there is a value within each tag, a value of 1 will enable the limitation, a value of 0 will disable it. By default vertical and horizontal boundaries are disabled.

Both the `vertical_range` and the `horizontal_range` denote the minimum and maximum angles within which the operator can move. Notice that the `min` value will usually be a negative number. For instance, a `horizontal_range min="-45"` value, will allow the operator to pan left at most 45 degrees. Equally, set a positive number to the `max` attribute to limit panning to the right.

The `fov_range` element will control zooming with the PTZ virtual camera. It refers to the navigation camera's horizontal field of view.

2.3 Starting LensFrame

Once you have prepared your configuration files, you are ready to start the program. You can try our configuration file samples in `LFDIR\data`.

To start the execution of LensFrame, run the `LFDIR\LensFrame.exe` file. You will be prompted to load a configuration file. Please select a valid configuration file from the samples or one that you have previously set up. The program will load and show the cameras in the scene.

The `sample_sphere.lf` and `sample_planar.lf` files are already configured to show seamless stitching, press `Z` to enable it.

2.4 LensFrame interface

2.4.1 Stitching setup

In the `SETUP` view, you may manually adjust the cameras within our interface. You should try to make the cameras in the LensFrame scene resemble the real world physical configuration of your cameras in order to obtain a better stitching result. Please read our *LensFrame Features and Camera Setup* file for more information.

To setup the scene:

- Use your mouse to navigate
  - Hold and move the left button to rotate.
  - Hold and move the right button to zoom.
- Follow the instructions on screen to modify the selected camera's orientation and position.
- Press `Z` to enable or disable the stitching.
- Reload the configuration file by pressing `Ctrl + R`.
- Save your configuration file by pressing `Ctrl + S`.

2.5 Video Management System

2.5.1 Adding the LensFrame Onvif Camera

Once LensFrame is running, your computer will work as an Onvif camera. Use your VMS to add the Onvif camera as you would usually do. Most modern VMSs will automatically detect the camera in your network. Finally, make sure you enter the camera's credentials (admin, admin) and that PTZ is enabled.

2.5.2 PTZ Control

LensFrame allows Onvif PTZ control. Once your stitching scene is set up and running, you may press the `M` key to start the `OPERATOR` mode. In `OPERATOR` mode you can then switch to the RTSP Client and use the built in PTZ controls in order to visualize the LensFrame stitched scene.

Presets are automatically created for each camera in the scene.

LensFrame also supports creation of new presets. To do so, simply navigate to the desired position and add a preset using the presets menu.