Vzense UTool User Guide

Windows

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Vzense

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1 Overview

Welcome to the Vzense UTool User Guide. Vzense UTool (UTool) is a graphical Windows-based tool developed for Vzense TOF Cameras such as the DCAM710, DCAM800 or DCAM800LITE (herein referred to as a *camera module*).

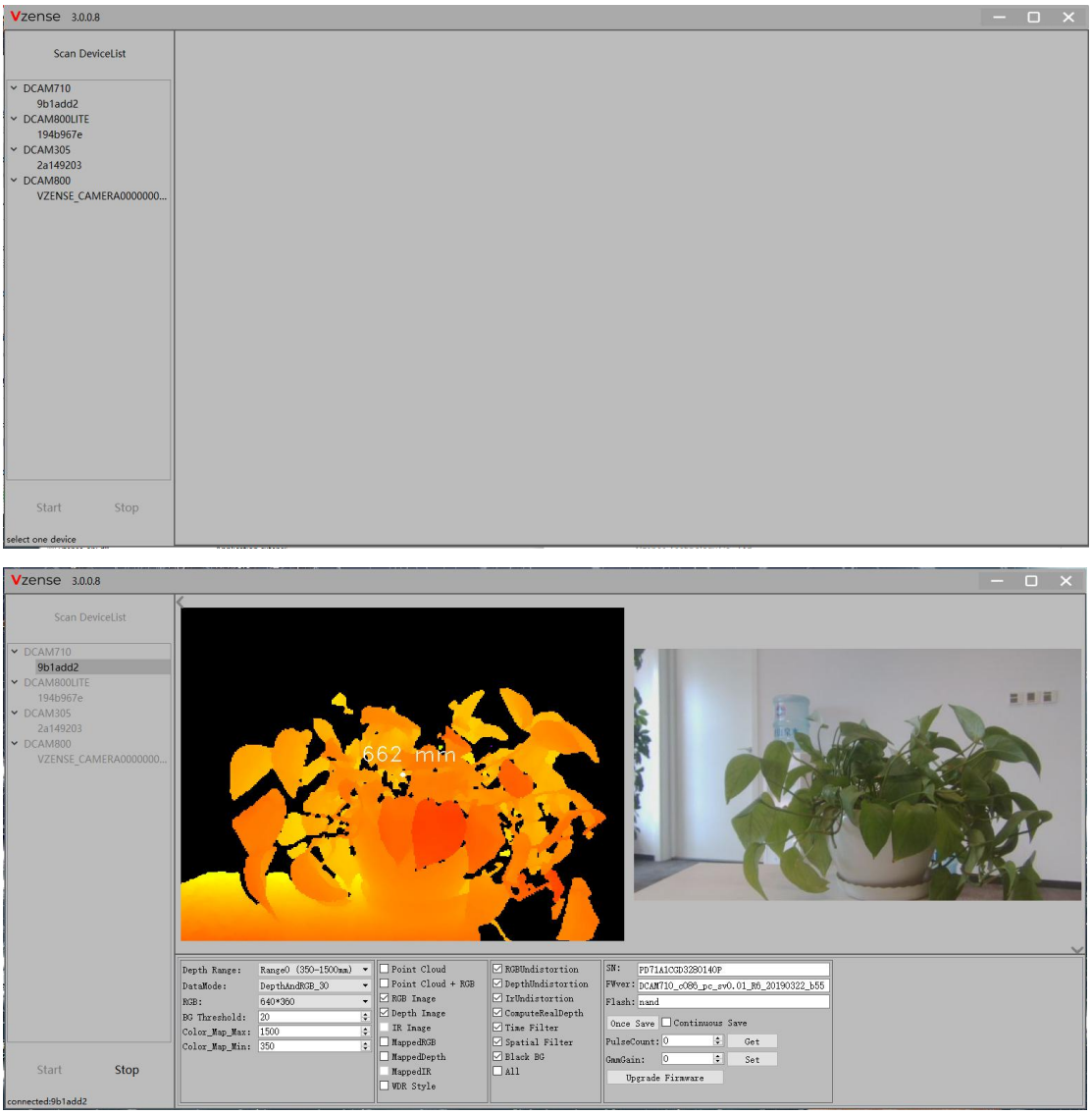


Figure 1 – Vzense UTool

The tool allows you to interact with the camera module to capture depth information and to control such functionality as camera modes, point clouds, anti-interference and anti-distortion, filter settings, and RGB mapping functions.

This document describes how to configure and use the Vzense UTool with the camera module.

2 Package Structure

2.1 SDK Structure on Windows

The Vzense UTool package for Windows contains the following notable directories and files:

- **opencv_world300.dll**: The OpenCV dependency DLL used by UTool.
- **Vzense_api.dll**: The Vzense DLL the enables UTool to interact with the camera.
- **VzenseUTool.exe**: The Vzense UTool Windows application.
- **Upgrade**: Driver and firmware images that can be used to upgrade the camera module (see Section 5.2.18 for more information).
- **UTool.ini**: Configuration file for UTool where settings are stored.

3 Requirements

UTool has the following requirements:

Supported Operating Systems: Windows 7 32/64 bit, Windows 10 32/64 bit

RAM: A minimum of 4GB

4 Setting up the Development Environment

4.1 Hardware Installation

Connect the camera module to a PC using a USB cable or a Network cable as shown in Figure 2:

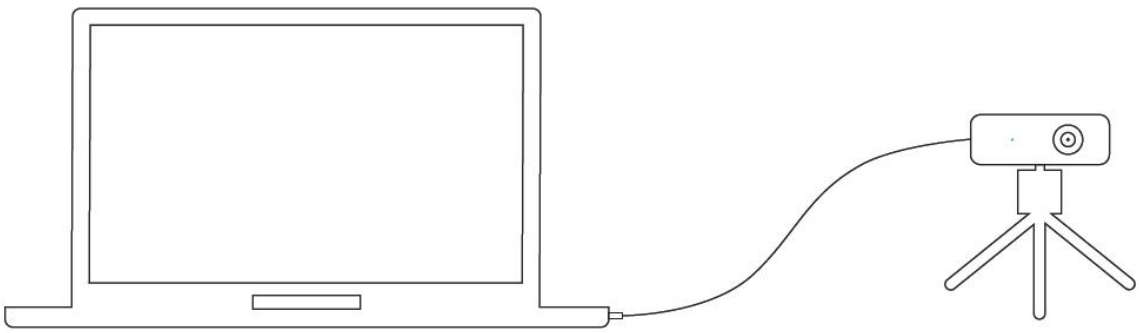


Figure 2 - Hardware installation.

4.1.1 USB

Connect the camera module to PC USB interface through USB cable.

In Windows, when the camera module is successfully connected, it will pop up the notice of the device driver installation. After the driver is auto-installed successfully, it will display the **`Vzense TOF Camera`** device in Windows Device Manger.

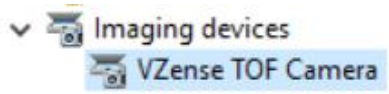


Figure 3 Vzense TOF Camera

4.1.2 Network

Network cable connection can be divided into fixed address direct connection and DHCP connection.

1. Fixed address

The fixed address connection can be directly connected to the camera and the computer, or it can be configured to be used in the switch of the same network segment.

Direct connection: one end is connected to the camera, and the other end is connected to the network cable interface of the PC host. The default IP of the camera is 192.168.1.101. On the PC side, set the subnet mask of "local connection" to 255.255.255.0, and the IP address to the same network segment (such as 192.168.1.100).

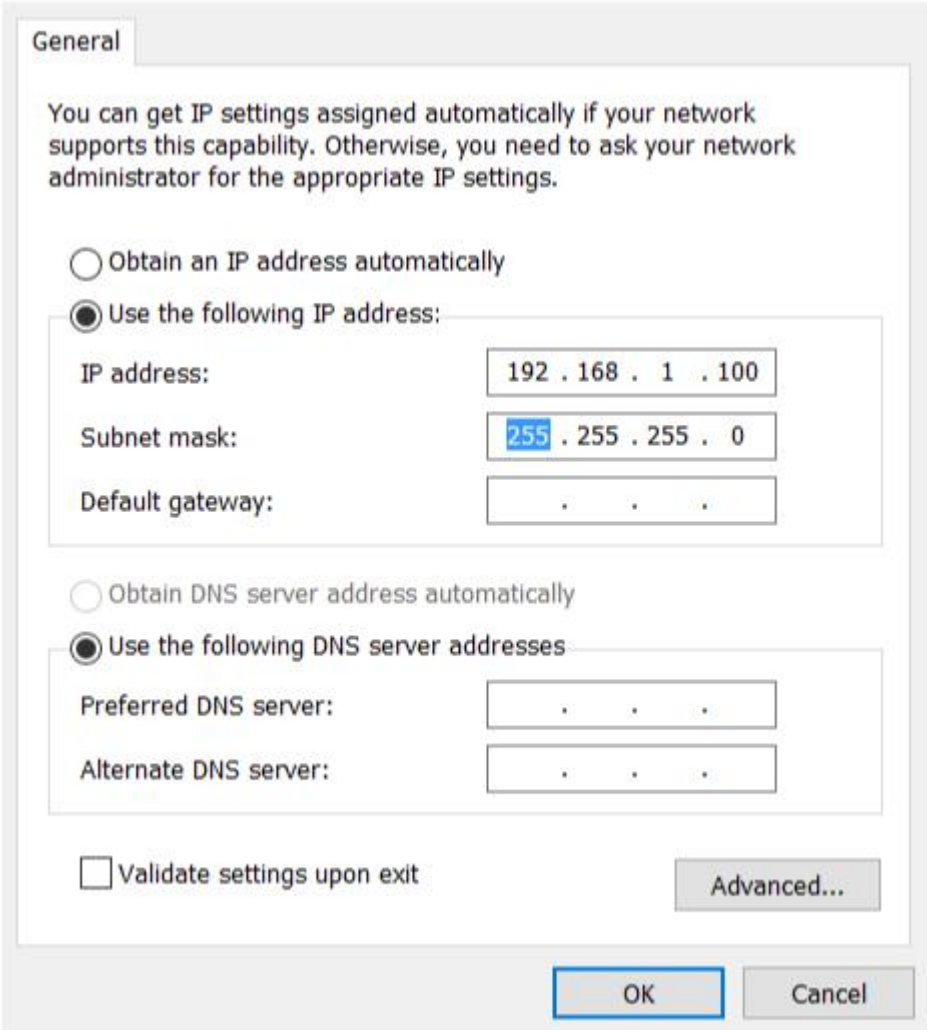


Figure 3.1 Direct connection

2. DHCP

For the DHCP connection mode, the camera needs to be connected to the router with DHCP enabled, and the PC in the same LAN is used for connection. It is recommended to set the "local connection" of the PC to obtain the IP address automatically.

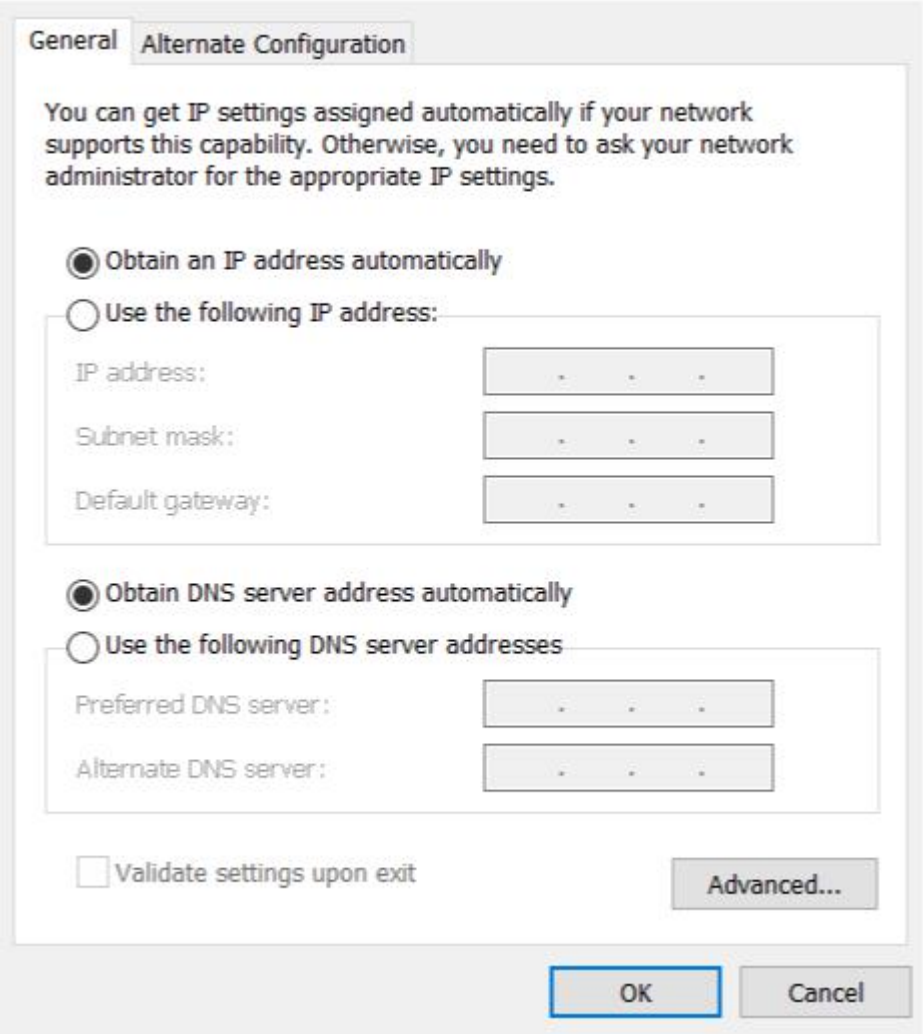


Figure 3.2 DHCP

Note:

1. The network card, router and switch used at the PC end shall meet the requirements of Gigabi
2. When you first run the SDK, set permissions for the SDK to pass through the system firewall.

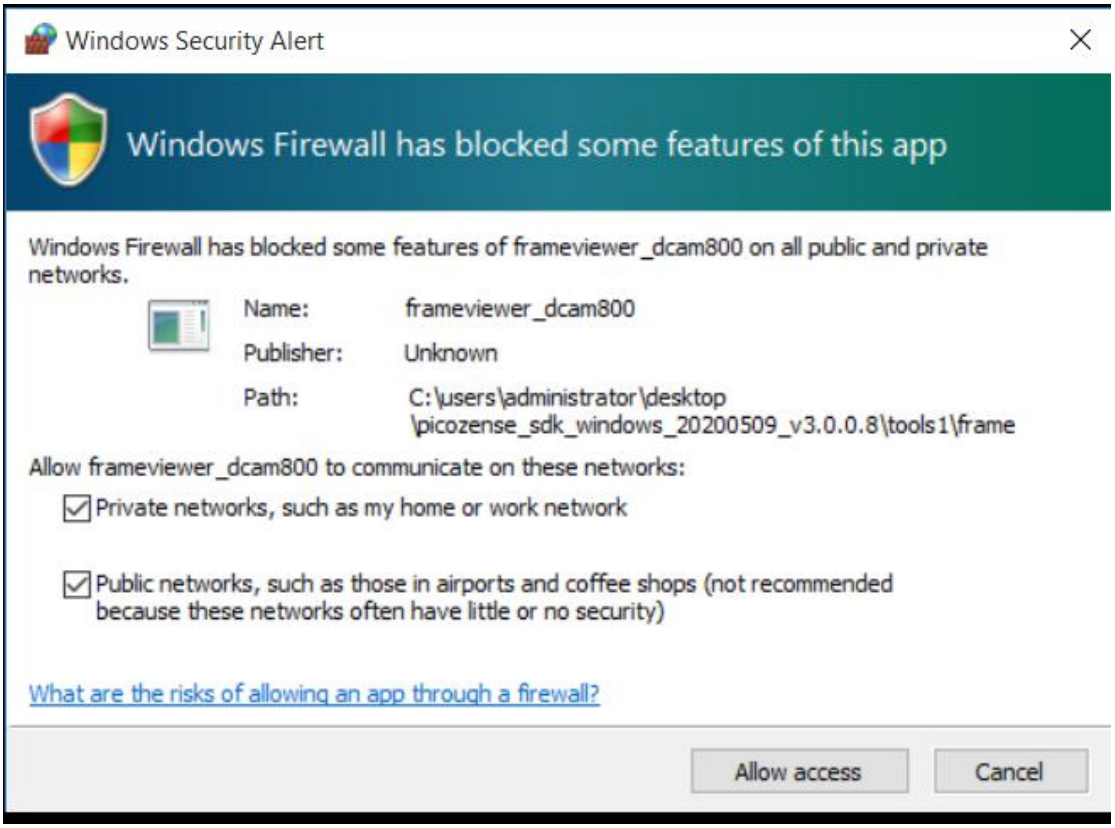


Figure 3.3 firewall setting

4.1.3 Running Single Camera Mode

Single camera mode allows you to capture and view information from a single camera module. Follow the steps below to use *single camera mode*:

1. Set up the camera module as described above in Section 4.1.
2. Wait for the front of the camera to light up.
3. Navigate to the root of the **Vzense UTool for Windows** package and run **VzenseUTool.exe**.
4. DoubleClick the Camera Mode in the devicelis or Click the Camera Mode first, then click **Start** in UTool to begin stream capture as shown in Figure 4

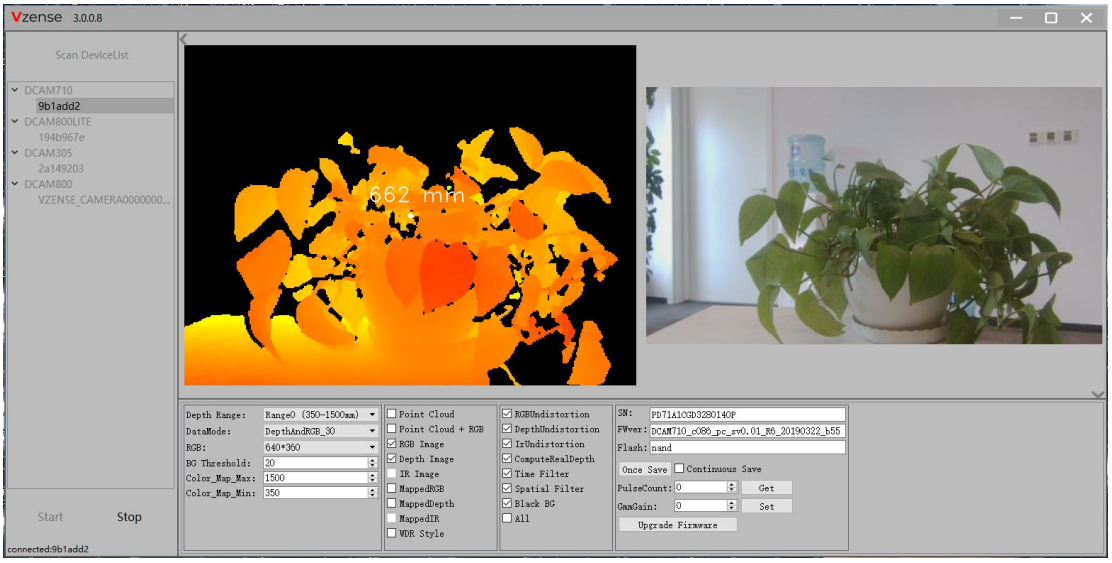


Figure 4 – Vzense UTool

5 UTool Settings and Functionality

The following subsections describe the settings and functionality of UTool.

5.1 DeviceList

Figure 5 - DeviceList .

DeviceList shows one or more of the available devices.If connect the camera module to a PC using a USB cable,the text of the selected item is a field in the “Device instance path” which is one property of the ” `Vzense TOF Camera`” as shown in Figure 3. If connect the camera module to a PC using a Network cable,the text of the selected item is the module sn. Follow the steps to use the *DeviceList* :

1. DoubleClick the Camera Mode in the devicelis or Click the Camera Mode first, then click “**Start”** to begin stream capture.
2. Click “**Stop**” to stop steam capture and clear the devicelist.
3. Click “**Scan DeviceList**” to get the devicelist,then repeat the step 1 to operate another Camera Mode.

5.2 Image View

Image View displays a depth or IR image on the left side and a color image on the right side of UTool. In the *Depth Map* mode, the middle value in the left image represents the depth value of the site, in millimeters. Figure 6 shows an example where the depth value is 596 mm:

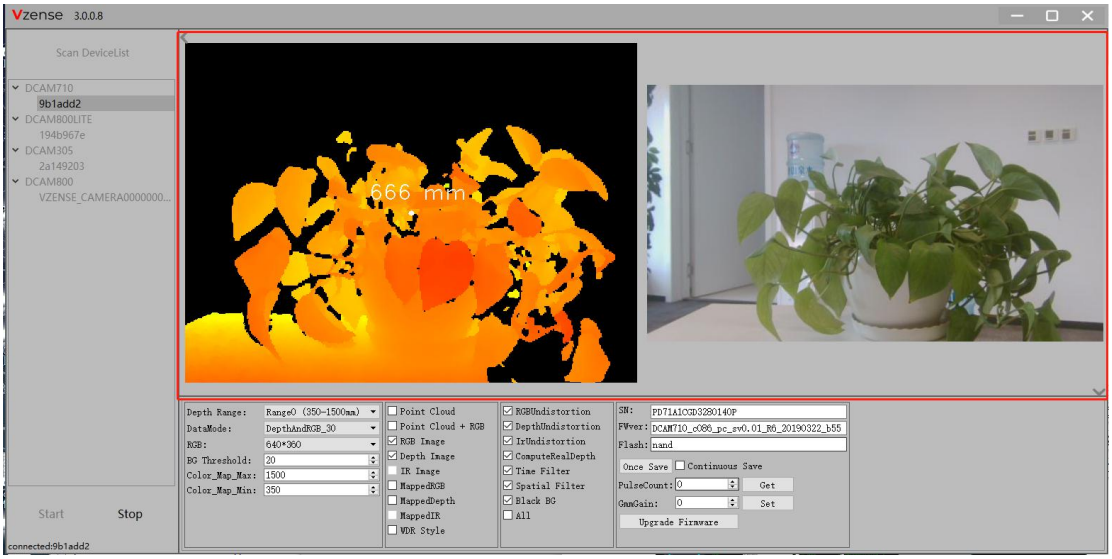


Figure 6 - Image View.

5.3 Settings View

Settings View allows you to modify view-specific settings as shown in Figure 7. These settings are described in the subsections below.

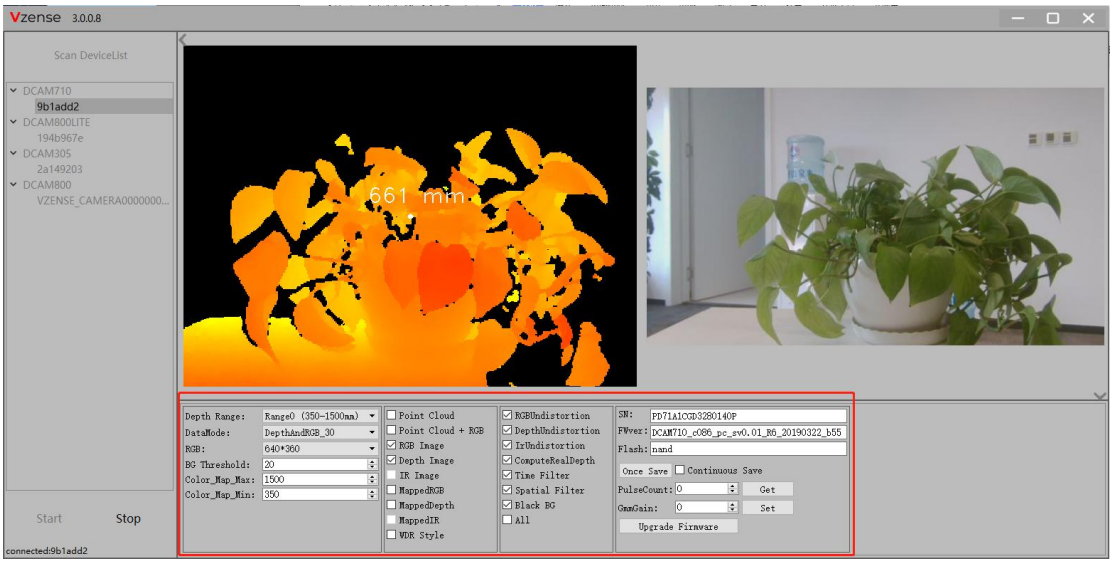


Figure 7 - Settings View.

5.3.1 Depth Range

Depth Range defines the effective depth range of the camera module, which can be switched according to the requirements of a given mode. Table 1 lists the maximum effective value ranges for each mode, in millimeters:

Table 1 – Maximum effective value ranges for each range mode, in millimeters.

Range	Depth
Range0	1450
Range1	3000
Range2	4400
Range3	4800
Range4	5600
Range5	7500
Range6	9600
Range7	11200
Range8	15000

5.3.2 Data Mode

Data Mode specifies the type of images to display. The following data modes are available:

- **DepthAndRGB_30**: Output depth and RGB images simultaneously at 30 fps. The depth image resolution is 640x480. The RGB image can support resolutions of 1080p, 720p, 480p, and 360p.
- **IRAndRGB_30**: Output IR and RGB images at 30 fps. The resolution of an IR image is 640x480.
- **DepthAndIR_30**: Output depth and IR images simultaneously at 640*480, 30 fps. An example is shown in the left-hand image of Figure 8.
- **DepthAndIR_15_RGB_30**: Output depth and IR images at 640x480, 15 fps and RGB image at 30fps.
- **WDR_Depth**: (Wide Dynamic Range (WDR) mode): Depth maps for different depth ranges with multiple frames are synthesized according to the threshold set for the selected depth mode. WDR_Depth: Range0+Range2;
- Examples are shown in the following figures:

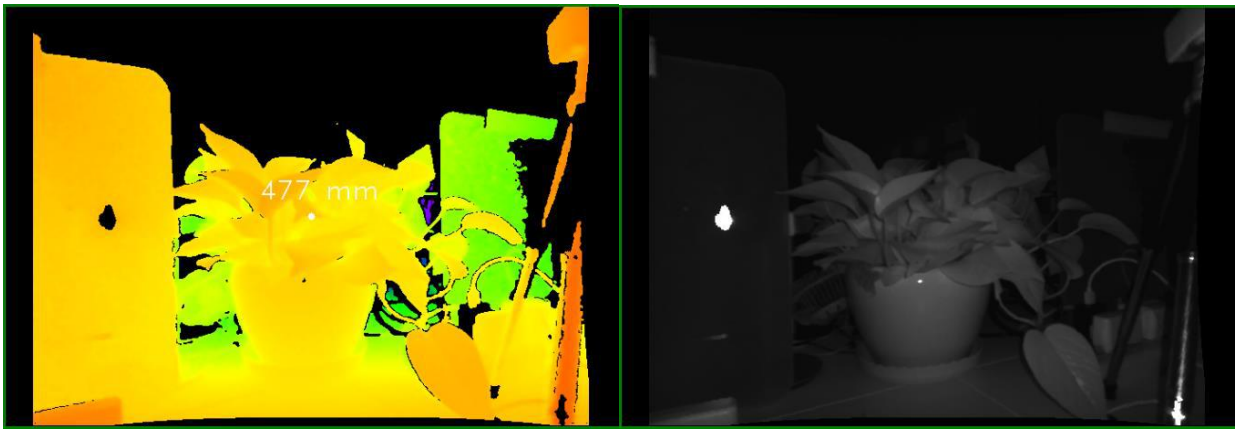


Figure 8 – DepthAndIR_30 Effects.

Figure 9 shows a WDR image:

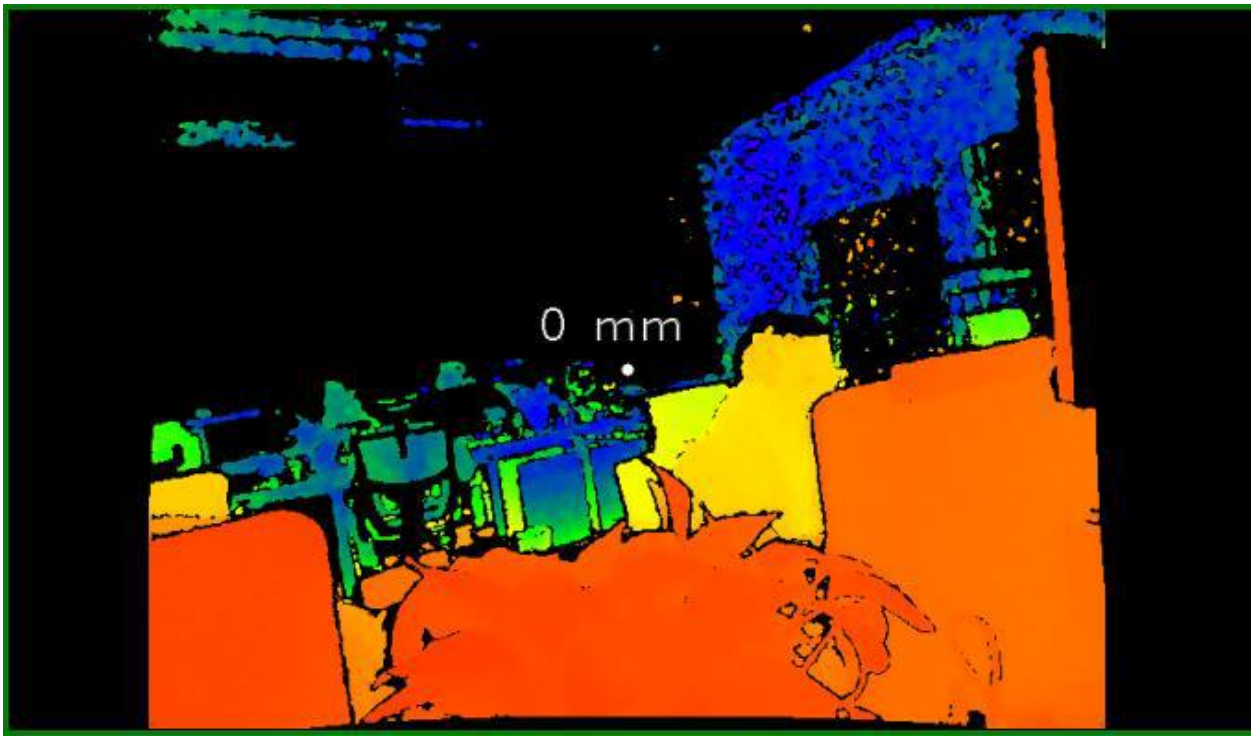


Figure 9 – WDR Image.

5.3.3 RGB Image Resolution

RGB switches RGB images between 4 resolutions: 1920x1080, 1280x720, 640x480, and 640x360.

5.3.4 Background Filtering

BG Threshold is a background filter adjusts the degree to which the background is filtered out. Set the background filter to 0 to turn off filtering, or to a larger value to set the filtering level as shown in Figure 10:

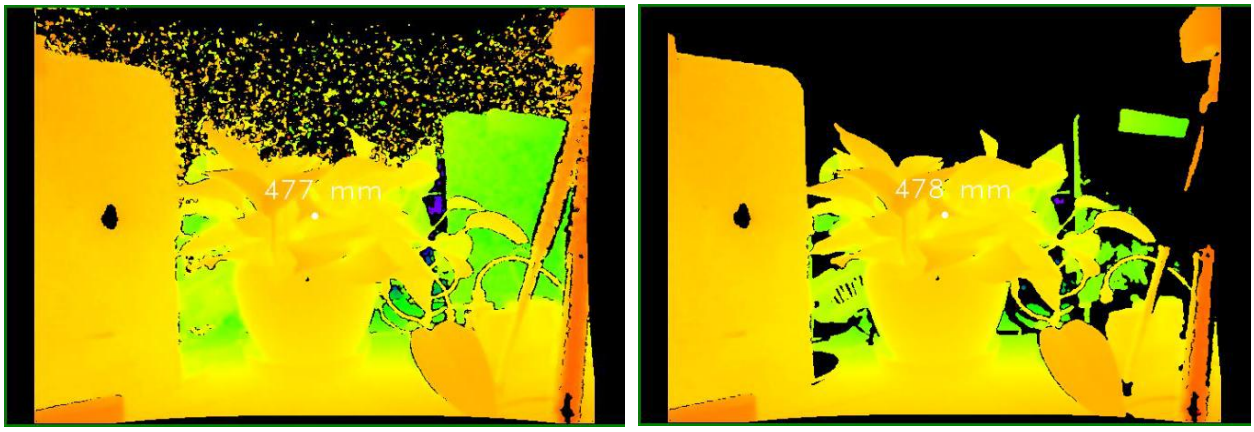


Figure 10 – Left: Background Filtering Disabled; Right: Background Filtering set to 30.

5.3.5 Color Map

Color_Map_Min and **Color_Map_Max** set the minimum and maximum color mapping values respectively.

For displaying the depth image intuitively, we map 16-bit depth image to 8-bit gray image. When mapping, we intercept the depth value in a given range: **Color_Map_Min** to **Color_Map_Max**, and then map it to 0-255 range. Finally, the gray image is transformed into a color image by using pseudo-color mapping, as shown in Figure 11.

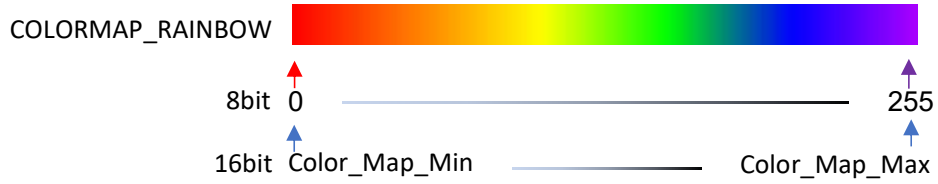


Figure 11 - Color Mapping

Figure 12 shows an example with color mapping maximum values set to `1300` and `2300` respectively:

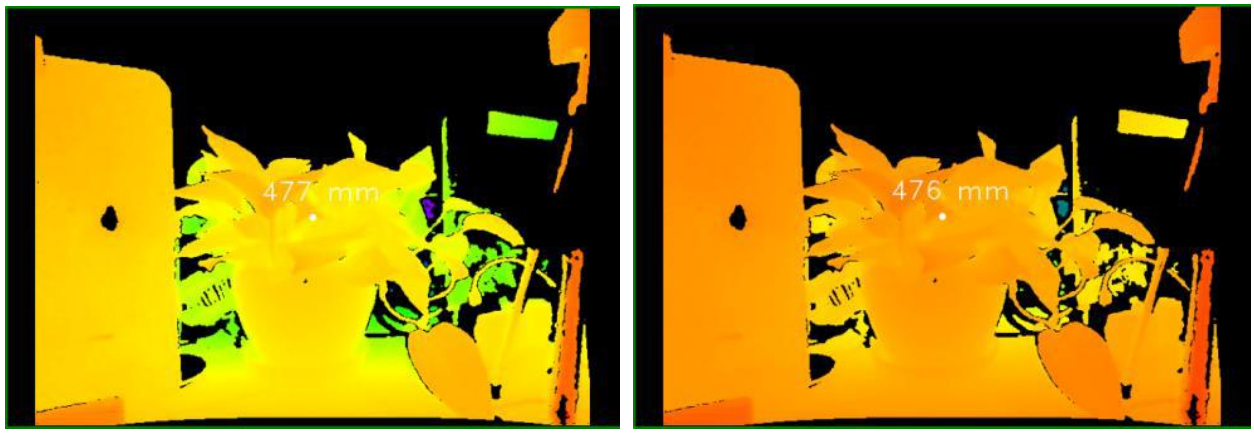


Figure 12 - Left: Color Mapping Maximum set to 1300; Right: Color Mapping Maximum set to 2300.

5.3.6 WDR Mode

In **WDR Mode**, the depth maps of different Depth Ranges of multiple frames (2 frames or 3 frames) are synthesized by algorithm. For example, a WDR_Depth image is fused by Range 0 and Range 2 depth images. as shown in the following schematic diagram.

Figure 13 shows two depth images and one WDR depth maps in the same scene:

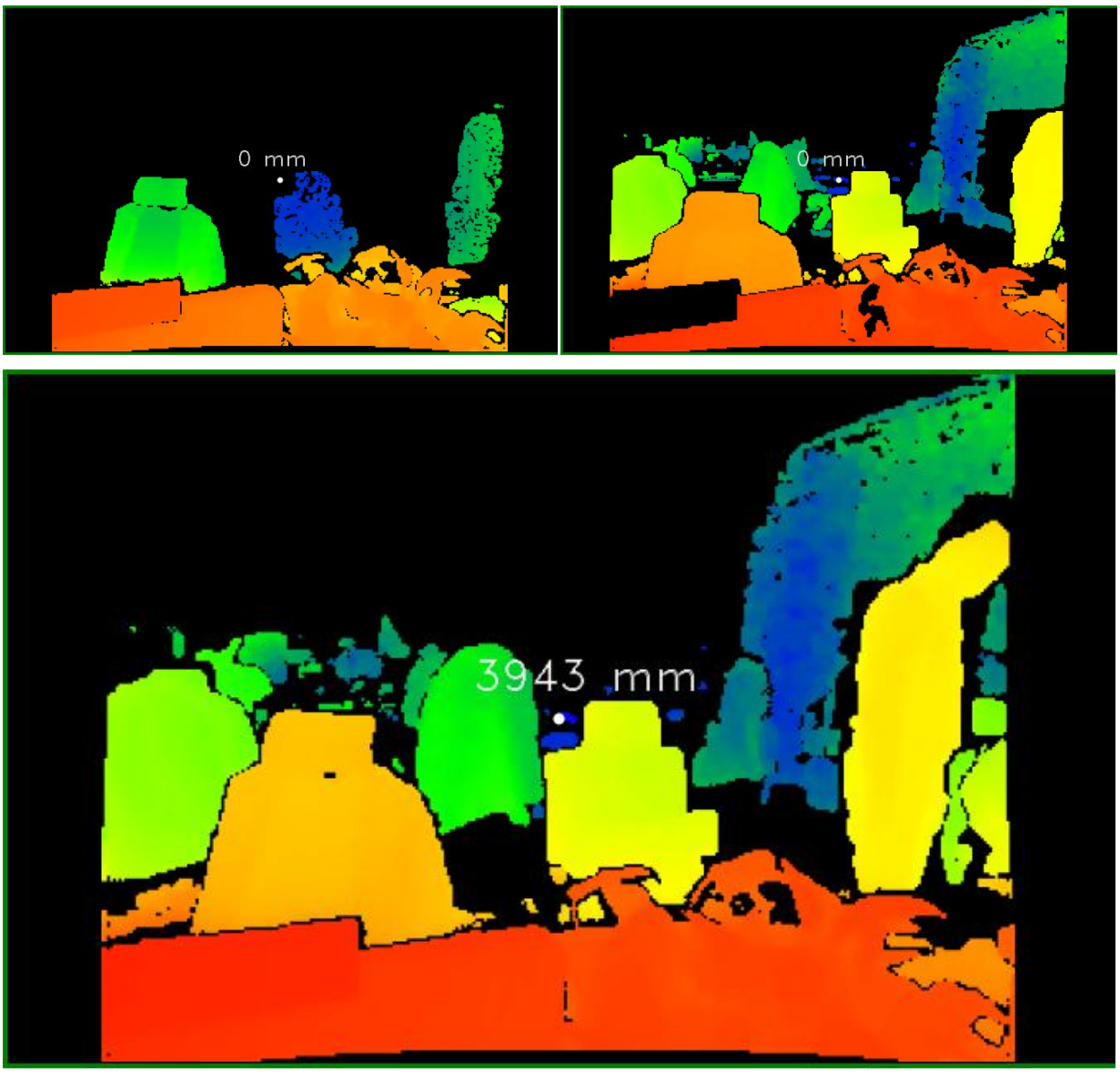


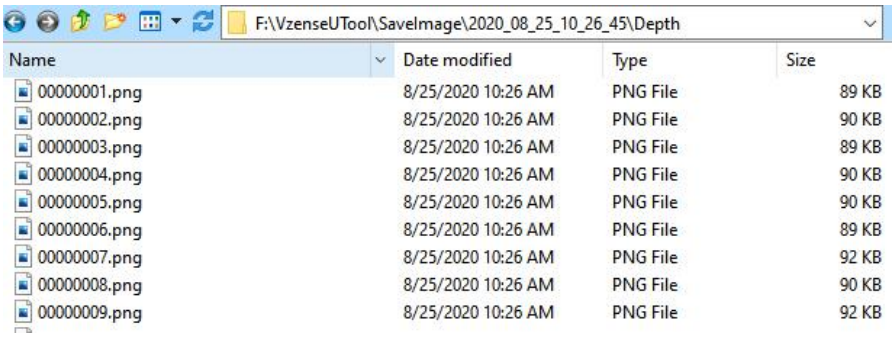
Figure 13 -Top- Left: Range0 depth image; Top- Right: Range2 depth image; Bottom: WDR_Depth image.

5.3.7 Save Image

Saves image data and point cloud data captured from the camera module using in the current mode.

The saved file is named in the following format:

xxxxxxxx.<format> (e.g., 00000001.png)



These images or point cloud files will be saved in a folder:

`VzenseUTool/SaveImage/<time>/Frame Type/`

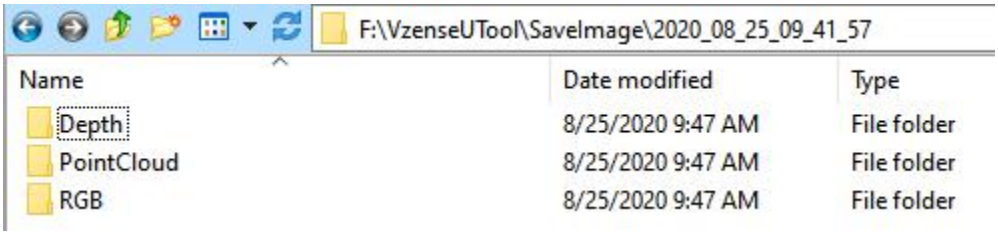


Table 2 lists the file format for each frame type:

Table 2 – File format.

Frame Type	File Format
Depth	png
IR	png
MappedDepth	png
WDRDepth	png
RGB	jpg
MappedRGB	jpg
PointCloud	txt

"Continuous Save" can not save point cloud data.

5.3.8 Point Cloud

Enable **Point Cloud** to display the point cloud diagram as shown in Figure 14:

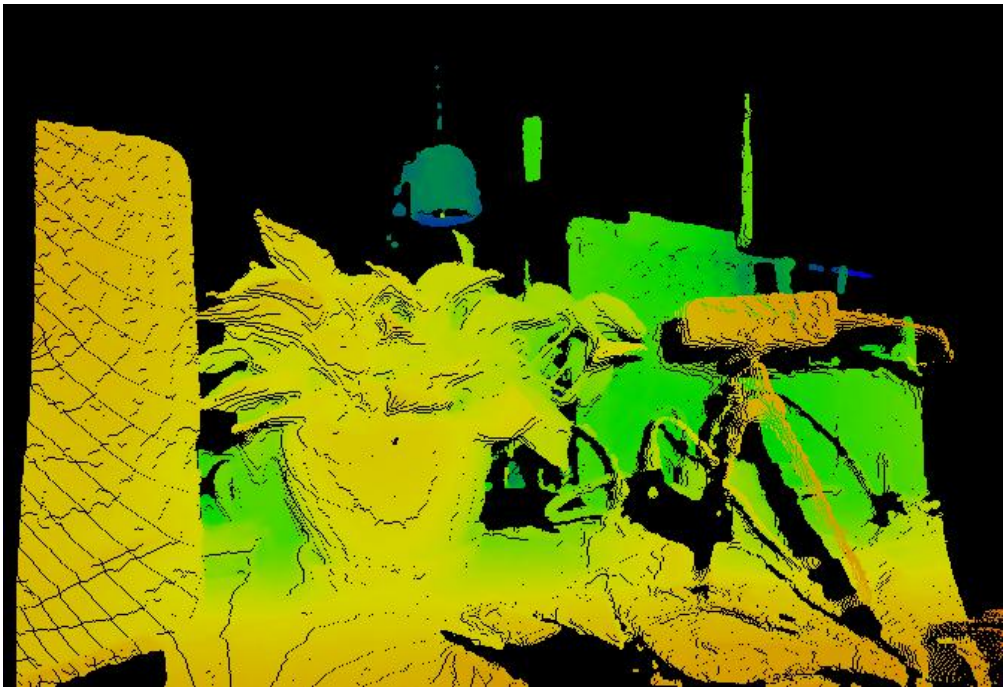


Figure 14 - Point Cloud.

5.3.9 Point Cloud and RGB

Enable **Point Cloud + RGB** to map the color image to the point cloud as shown in Figure 15:

Figure 15 - Point Cloud + RGB

5.3.10 Image Display

One more images types can be enabled for display: **IR Image**, **RGB Image**, **Depth Image**.

5.3.11 Alignment Mapper

Enable **MappedRGB, MappedDepth** and **MappedIR** to turn on corresponding alignment mapping functions and the following images are available:

- **MappedRG**B: RGB frame with 24bits per pixel in RGB/BGR format that is mapped to depth camera space and resolution is same as depth frame.
- **MappedDepth:** Depth frame with 16bits per pixel in millimeters that is mapped to RGB camera space and resolution is same as RGB frame.
- **MappedIR:** IR frame with 16bits per pixel that is mapped to RGB camera space and resolution is same as RGB frame.

Figure 16 - Mapped RGB Image.

5.3.12 Distortion Correction

Distortion correction can be enabled for dept, IR, and RGB images using **DepthUndistortion**, **IrUndistortion**, and **RGBUndistortion** respectively.

5.3.13 Filters

Enable **Time Filter** or **Spatial Filter** to turn on the filter contrast effect. Figure 16 shows the effect enabling the spatial filter:

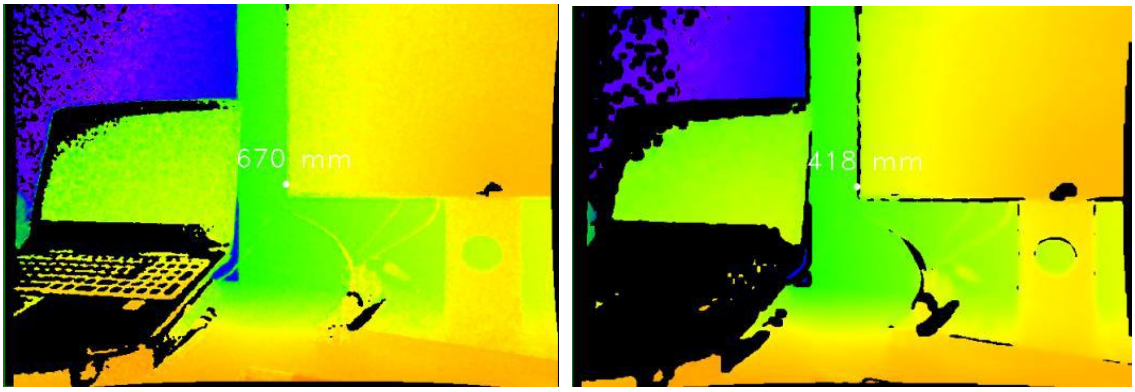


Figure 17 - Left: spatial Filter Disabled; Right: spatial Filter Enabled.

5.3.14 Black Background

Enable **Black BG** to set a black background. Figure 18 shows the effect of enabling the black background setting:

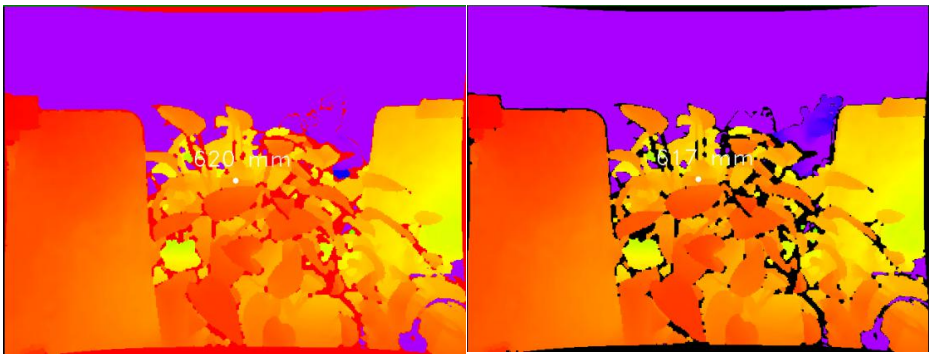


Figure 18 - Left: Black Background Disabled; Right: Black Background Enabled.

5.3.15 Device Information

The following information is displayed for the camera module:

- **SN**: Serial number.
- **FWver**: Firmware version number.
- **Flash**: Flash type.

6 FAQ

Q1: Why does Depth Range switch to Range 2 or Data Mode switch to WDR mode and the camera stops working?

A1: The reason why the camera stops working may be the lack of USB power supply, which needs to be solved by connecting DC adapter. Explanation: The Range 2 and wider range modes and WDR modes of the camera require more power. Tip: After power connection, the camera indicator will turn red.

Q2: About “Not find Camera!”

A2: When the "Not find Camera!" prompt appeared, the program did not detect the camera connection. Make sure the camera is connected correctly, and then run UTool after the camera indicator lights up.

Q3: About “The Other Instance is Running!”

A3: “The Other Instance is Running!” represents that the existing UTool program is running. You can restart the UTool after closing the program. If this prompt still appears after closing, check the background process to close VzenseUTool.exe directly.

Q4: How to deal with the situation of picture stop?

A4: You can check the USB connection status of the camera to ensure the correct connection; check the power connection to ensure the normal power supply; observe the camera indicator lights to ensure the normal working status of the camera. If the screen is still not updated, after closing UTool, try to re-connect the camera and restart UTool.

Q5: How to deal with the camera indicator not on?

A5: You can check the connection status between the camera and the host to ensure that the connection is correct; after the connection is completed, wait a few seconds to check the status of the indicator.

Q6: Do We need to install a driver to drive the camera?

A6: Vzense DCAM710 cameras support standard USB communication protocols and do not require specific drivers to be installed before use.

Q7: Driver Install.exe cannot install the driver properly.

A7: Try to run DriverInstall.exe with administrator privileges.