

Fisheye Camera Intelligent Analysis Algorithm Site Survey Guide



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Revision History

Revision Date	Revision Version	Revision Section	Author	Description
2026.6.16	V0.0.1	All sections	Z12630	Initial draft

Disclaimer

This document is published for internal employees of Uniview Group, with the purpose of providing a more intuitive and comprehensive introduction to the basic concepts, application scenarios, and usage methods of our self-developed algorithms, helping front-line and second-line colleagues such as technical service personnel and sales staff to present product effects more conveniently and accurately in actual project implementations.

This guide must be used in conjunction with the corresponding IPC Product Configuration Guide.

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1. Overview

This guide provides site survey, position selection, and commissioning guidance for Uniview fisheye intelligent cameras. The fisheye intelligent analysis algorithms mainly include two core algorithms: fisheye (corner) perimeter algorithm and fisheye people flow counting.

The fisheye (corner) perimeter algorithm supports two imaging modes for flexible installation in different scenarios: 1) The fisheye perimeter mode analyzes the original fisheye image, retaining the advantage of an omnidirectional field of view while enabling efficient protection of the central area and medium-to-short-range perimeter through AI analysis; 2) The corner perimeter mode is based on the dewarped panoramic image from the fisheye camera, designed for fisheye cameras installed at building corners, turns, and similar positions. Through geometric correction of the fisheye image and multi-zone configuration strategies, this mode overcomes the detection blind spots of conventional cameras and improves target detection rate and positioning accuracy. It is particularly suitable for security scenarios with complex fields of view and prone to monitoring blind spots, such as building corners, warehouse interior corners, and park fence turns. The fisheye (corner) perimeter algorithm supports three functions: intrusion detection, cross line detection, and motion detection. The fisheye perimeter mode supports detecting two target types: pedestrians and motor vehicles, while the corner perimeter mode supports detecting three target types: pedestrians, motor vehicles, and non-motor vehicles.

The fisheye people flow counting algorithm is designed for precise people flow analysis in high-density pedestrian scenarios, fully utilizing the 360° coverage capability of the fisheye lens to achieve real-time counting of people entering and exiting in all directions and determining the number of people within the area within the field of view of a single camera.

1. Fisheye (Corner) Perimeter Algorithm:

The fisheye perimeter mode includes four smart functions: intrusion detection, cross line detection, motion detection, and heat map detection, supporting the detection of two target types: pedestrians and motor vehicles. The corner perimeter mode includes three smart functions: intrusion detection, cross line detection, and motion detection, supporting the detection of three target types: pedestrians, motor vehicles, and non-motor vehicles. Both algorithms support visible light color mode and night infrared mode.

1. 1 Intrusion Detection

Intrusion detection involves defining one or more (up to 4) monitored areas in the fisheye image (supporting 3- to 6-sided polygon configuration). If pedestrian or motor vehicle targets enter the detection area and stay for the set time threshold, the targets are captured and an alarm is triggered.



Figure 1. Fisheye Intrusion Detection Example

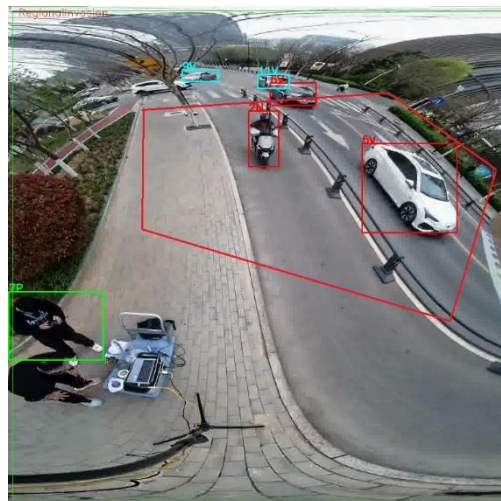


Figure 2. Corner Intrusion Detection Example

1. 2 Cross Line Detection

Cross line detection involves drawing one or more lines (up to four) in the image and drawing a trigger direction line (Trigger Direction). If pedestrian or motor vehicle targets cross the drawn tripwire, they are immediately captured and an alarm is triggered.



Figure 3. Fisheye Cross Line Detection Example

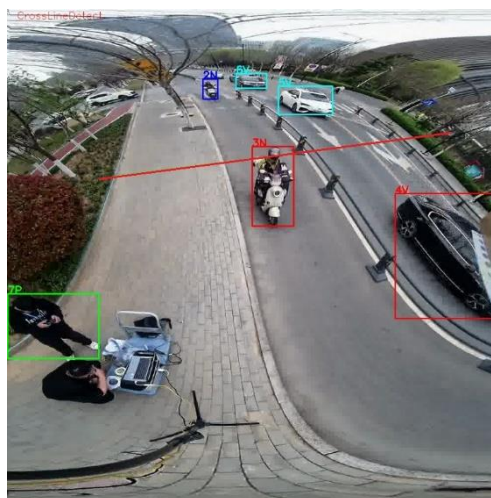


Figure 4. Corner Cross Line Detection Example

1. 3 Motion Detection

Motion detection involves defining one or more (up to 4) monitored areas in the fisheye image (supporting 3- to 6-sided polygon configuration). If pedestrian or motor vehicle targets enter the detection area and are in motion, AI immediately captures them and continuously triggers an alarm.



Figure 5. Fisheye Motion Detection Example

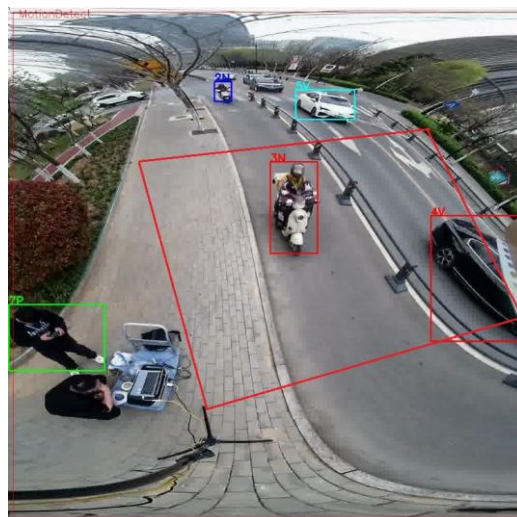


Figure 6. Corner Motion Detection Example

1. 4 Heat Map Detection

Heat map detection only supports personnel heat analysis in fisheye scenarios, with a maximum of 1 rule area (supporting 3- to 6-sided polygon configuration). Within this area, the algorithm continuously associates the movement trajectory based on the pedestrian target ID, and triggers a track alarm when the target leaves the area or the ID disappears. Heat data is reported based on two modes: movement trajectory and dwell time.

NOTE: Heat map can only be configured independently. It does not support being configured simultaneously with perimeter or motion detection tasks.

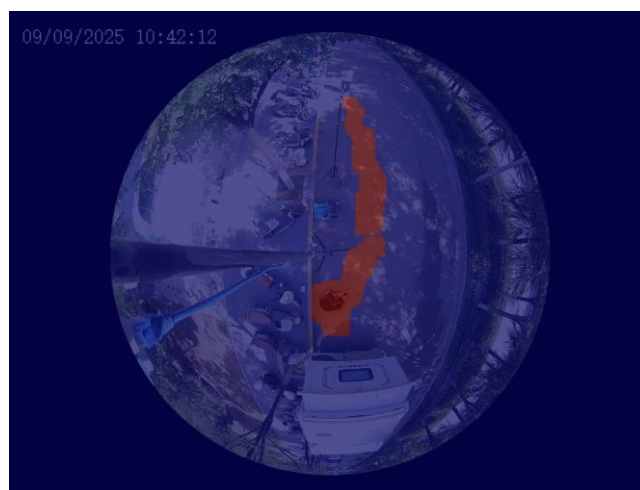


Figure 7. Heat Map Detection Example

2. Fisheye People Flow Counting Algorithm:

The fisheye people flow counting algorithm includes two functions: people flow counting and crowd density analysis, supporting recognition and capture of pedestrian targets, supporting visible

light color mode, and accurately identifying the number of people in the area and determining entry and exit directions to achieve high-accuracy real-time people counting.

NOTE: People flow counting and crowd density analysis only support independent configuration. They cannot be configured simultaneously, nor can they be configured simultaneously with perimeter or motion detection tasks.

2. 1 People Flow Counting

When using the people flow counting function, configure 1 rule line first (up to 1 line is supported) and draw a trigger direction line (Trigger Direction). The rule line must be drawn near the entrance and exit, perpendicular to the direction of people flow. When the algorithm detects a target crossing the detection rule line, it counts the number of people entered, people exited, and people present in real time according to the configured entry direction. When the people present alarm function is enabled and the number of people present exceeds the configured threshold, the camera can report an alarm and trigger related alarm actions.



Figure 8. People Flow Counting Example

2. 2 Crowd Density Analysis

Crowd density analysis supports a maximum of 1 rule area (supporting 3- to 6-sided polygon configuration). When the number of people in the rule area changes, the algorithm counts and reports the number of people in the rule area in real time.



Figure 9. Crowd Density Analysis Example

2.Smart Function Overview

Algorithm Category	Smart Function	Function Description	Application Scenario
Fisheye Perimeter Algorithm	Intrusion Detection	A target enters the detection area, and the dwell time exceeds the threshold, triggering an intrusion alarm.	Indoor scenarios such as convenience stores, supermarkets, office areas, and underground parking lots, as well as outdoor scenarios such as courtyards, squares, and parks; mainly suitable for close-range, low crowd density, and open field of view application scenarios, ensuring clear pedestrian and
	Cross Line Detection	A target touches the detection line, triggering a cross line alarm.	
	Motion Detection	A target is in the detection area and in motion, continuously triggering an alarm.	
	Heat Map	A target enters the detection area, and a track alarm is triggered when the target leaves the area or disappears due to occlusion	

			vehicle targets with minimal occlusion.
Fisheye People Flow Counting Algorithm	People Flow Counting	Based on the configured rule line and trigger direction line, the crossing direction of people is determined, and bidirectional or unidirectional tripwire counting results are reported accordingly.	Commonly used at passage entrances or gate entrances where people converge, such as hospitals, shopping malls, parks, stations, and airports.
	Crowd Density Analysis	When the number of people in the rule area changes, the number of people in the rule area is counted and reported in real time.	
Corner Perimeter Algorithm	Intrusion Detection	A target enters the detection area, and the dwell time exceeds the threshold, triggering an intrusion alarm.	Suitable for security scenarios with complex fields of view and prone to monitoring blind spots, such as building corners, warehouse interior corners, and park fence turns
	Cross Line Detection	A target touches the detection line, triggering a cross line alarm.	
	Motion Detection	A target is in the detection area and in motion, continuously triggering an alarm.	

3.Scene Selection

3.1 Fisheye Camera Installation Requirements

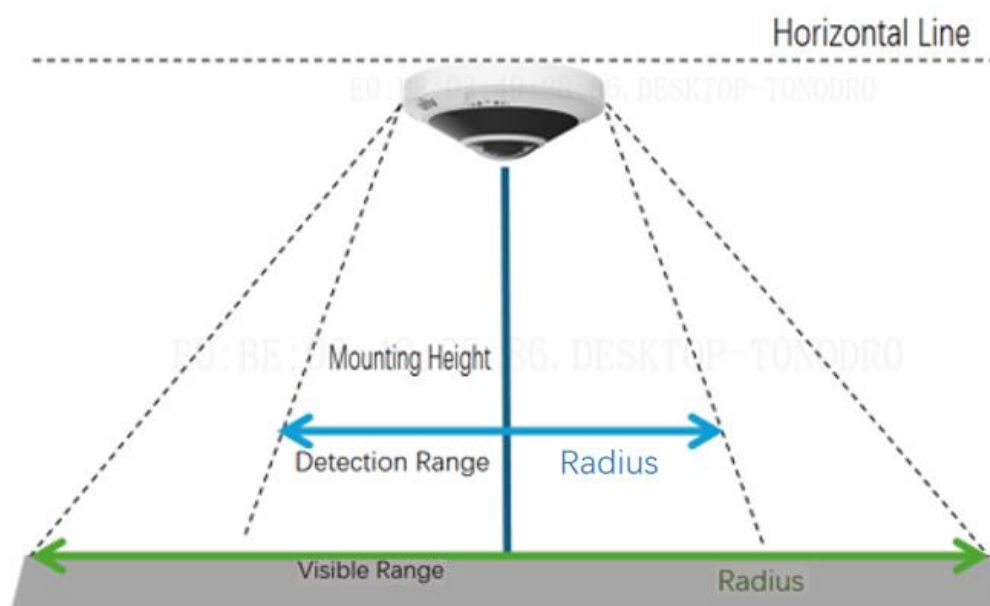


Figure 10 Fisheye Camera Ceiling Mount Installation Example

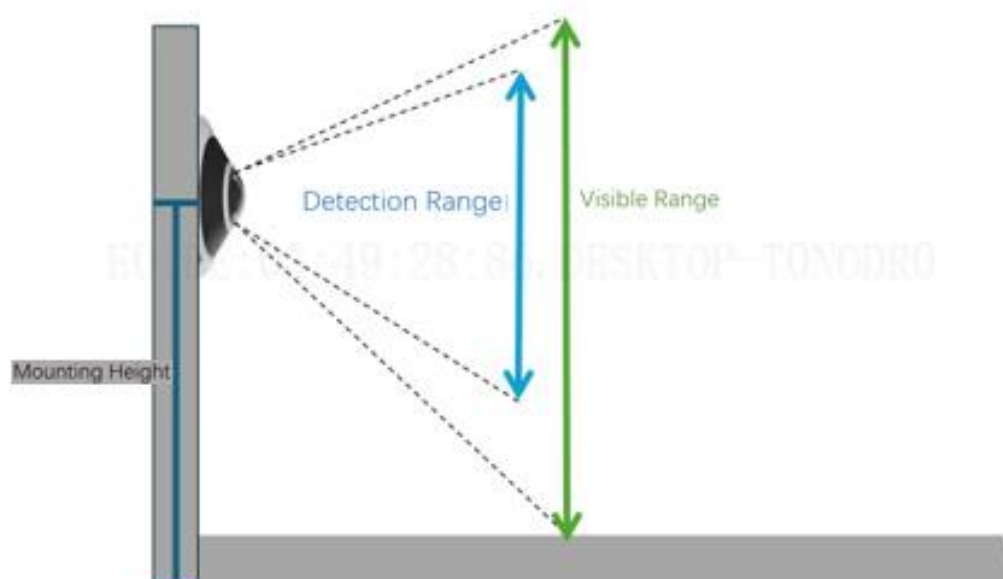


Figure 11 Fisheye Camera Side Mount Installation Example

Installation Height:

- Indoor recommended height: 3 m;
- Outdoor recommended height: 5 m;

NOTE: When using the corner perimeter algorithm, the camera must be side-mounted (installed at the wall corner);

When using the fisheye perimeter algorithm or fisheye people flow counting algorithm, the camera must be ceiling-mounted (installed vertically downward on the ceiling).

Detection Distance:

- Indoor: Targets at 5 m can be stably detected; at 5-7 m, detection is unstable; beyond 7 m, targets are in the camera distortion area and can hardly be detected;
- Outdoor: Targets at 7 m can be stably detected; at 7-10 m, detection is unstable; beyond 10 m, targets are in the camera distortion area and can hardly be detected.

3.2 Scene Requirements

Basic requirements are as follows:

- Comply with camera installation requirements;
- The camera must be securely fixed to avoid vibration, defocus, and other issues;
- Avoid debris occluding the lens, and avoid light interference such as backlight, reflection, and overexposure;
- Avoid oil stains adhering to the lens, which may cause the monitoring image to be blurred;

1) Recommended Scenarios

Camera height: 2.5-3 m, visible range radius: ≤ 10 m, detection range: ≤ 5 m, minimal target occlusion ($< 30\%$), and clearly visible features;

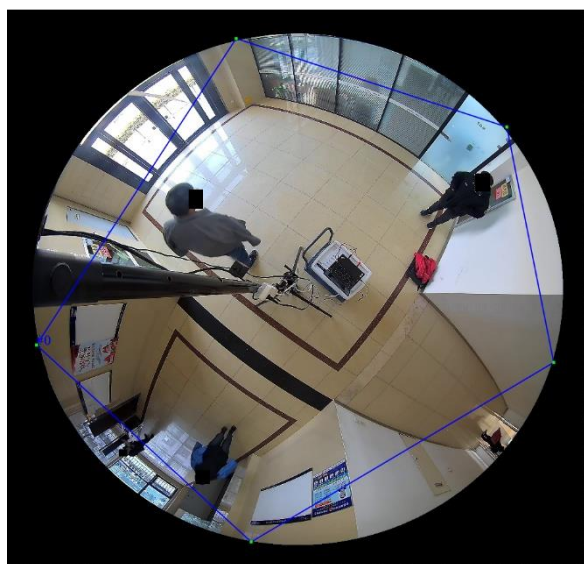


Figure 12 Daytime Visible Light Mode, Indoor Entrance Scenario Example

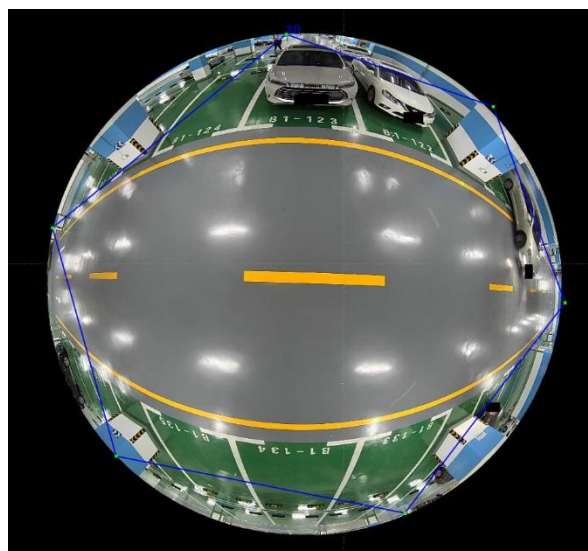


Figure 13 Visible Light Mode, Indoor Underground Parking Lot Scenario Example



Figure 14 Daytime Visible Light Mode, Outdoor Square Scenario Example

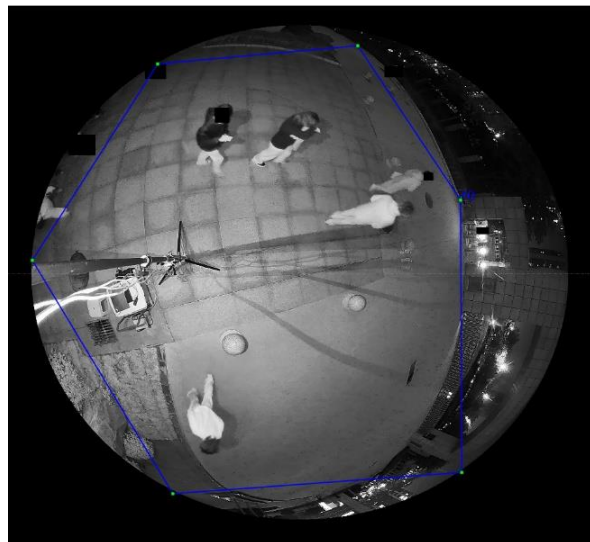


Figure 15 Night Infrared Mode, Outdoor Square Scenario Example

NOTE: The blue area in the figure indicates the detection range. Targets within the area can be stably detected. Targets outside the area have poor detection performance due to being in the edge distortion area or having indistinct features caused by blurring or occlusion.

2) General Scenarios

Camera height: 3-5 m, visible range radius: ≤ 10 m, people density: ≤ 15 , target occlusion between 30% and 50%;



Figure 16 Daytime Visible Light Mode, Outdoor Square Scenario Example

NOTE: Targets in the red area shown in the figure have poor detection performance due to mutual occlusion, being in the edge distortion area, and other reasons, resulting in indistinct features;

3) Unsupported Scenarios

High-complexity scenarios such as similar background and targets, multi-target overlapping occlusion, strong light, backlight, and diverse target postures.



Figure 17 Daytime Visible Light Mode, Outdoor Road Scenario Example

NOTE: Strong light or backlight environments: The image illumination is uneven, overexposure issues exist, target outlines are unclear, and detection performance is poor;



Figure 18 Daytime Visible Light Mode, Indoor Underground Parking Lot Scenario Example

NOTE: Low-light environments: The image quality is low in this scenario, lighting conditions are insufficient, target color features are indistinct, outlines are unclear, and detection performance is poor

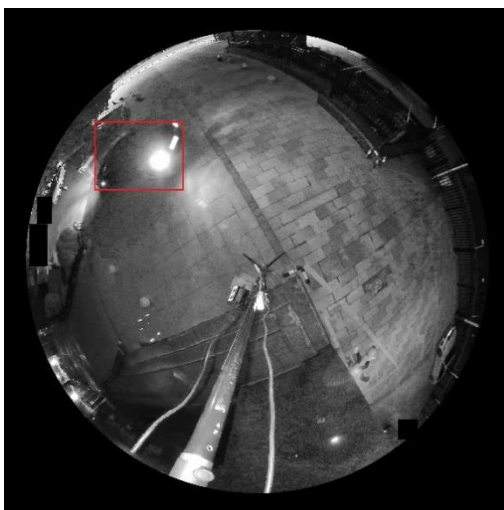


Figure 19 Night Infrared Mode, Outdoor Road Scenario Example

NOTE: Infrared low-light scenarios: In this scenario, foreground targets have few effective features, and detection performance is poor

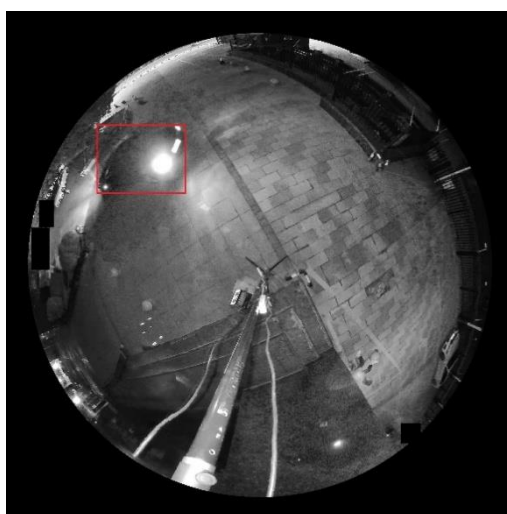


Figure 20 Night Infrared Mode, Outdoor Road Scenario Example

NOTE: At night, motor vehicle headlights cause overexposure, obscuring vehicle and

surrounding environment details. Motor vehicle target features are blurred, and detection performance is poor

4.Rule Configuration

➤ Intrusion Detection

- Intrusion detection monitors the detection area and triggers an alarm when pedestrian or motor vehicle targets enter the area and stay beyond the time threshold;
- On the Setup > Smart > Smart Function page, enable Intrusion Detection to enter the configuration page;

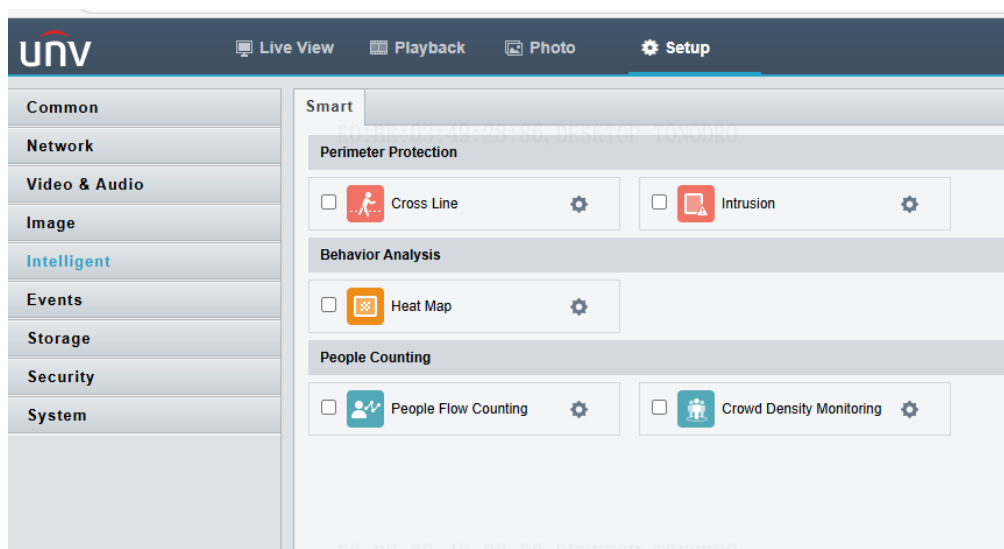


Figure 21 Interface Configuration Example

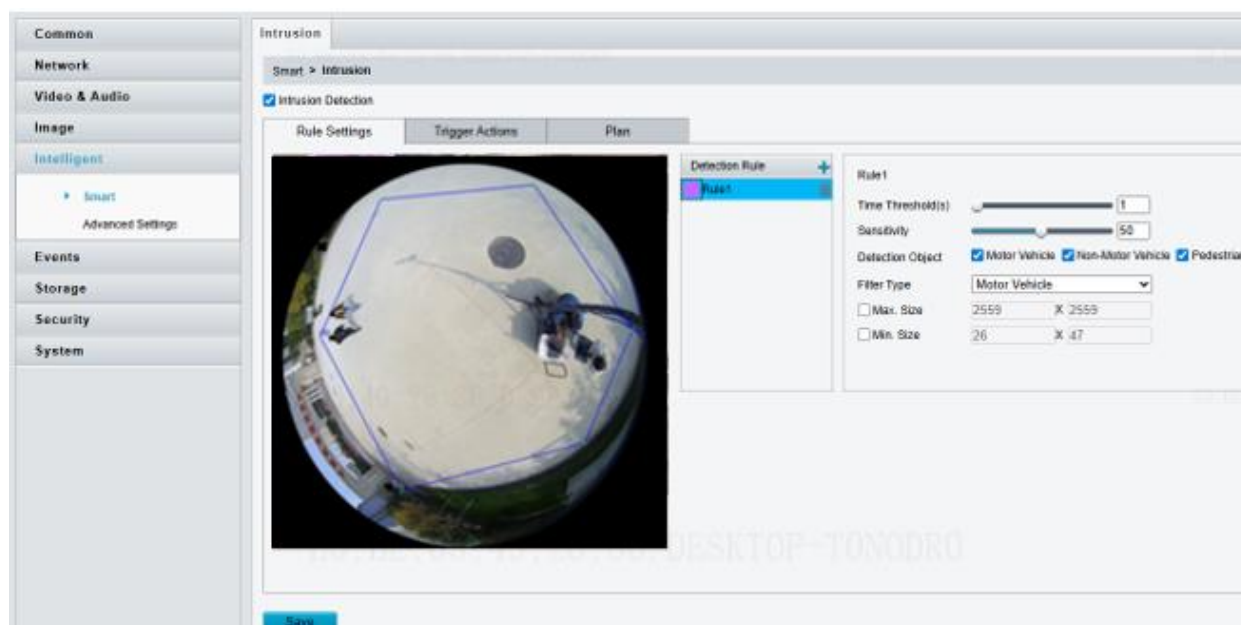


Figure 22 Intrusion Detection Software Interface Example

- Area configuration: Refer to the example. Avoid selecting edge areas. Indoor radius: 3-5 m; outdoor radius: 3-7 m;
- Parameter configuration: 1) Detection rule area: Default is full screen. Users can configure it manually. Up to 4 detection areas are supported, and 3- to 6-sided polygon configuration is supported; 2) Time threshold: Default is the minimum value of 1 second, and the maximum is 600 seconds; 3) Sensitivity: Default is 50, and users can adjust it from 1 to 100 as needed;
- Detection targets: Detection performance ranking in the same scenario: pedestrians > motor vehicles.
 - Pay attention to the traveling speed when testing motor vehicles and non-motor vehicles. Motor vehicles are recommended at <20 km/h, and non-motor vehicles at <10 km/h;
 - For motor vehicles, white small vehicles are recommended (as indicated by the red box in Figure 5). For non-motor vehicles, electric two-wheelers with unhelmeted riders and no windshields are recommended (as indicated by the red box in Figure 6).

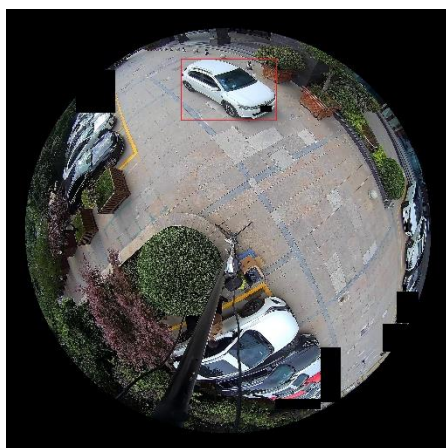


Figure 23 White Small Vehicle Example Figure 24 Electric Two-Wheeler Example

- Filter by Object Size: Default configuration, no modification required

➤ Cross Line Detection

- Cross line detection draws a detection rule line in the image and draws a trigger direction line. If pedestrian or motor vehicle targets cross the rule line, they are immediately captured and an alarm is triggered;

- On the Setup > Smart > Smart Function page, enable Cross Line Detection to enter the configuration page;

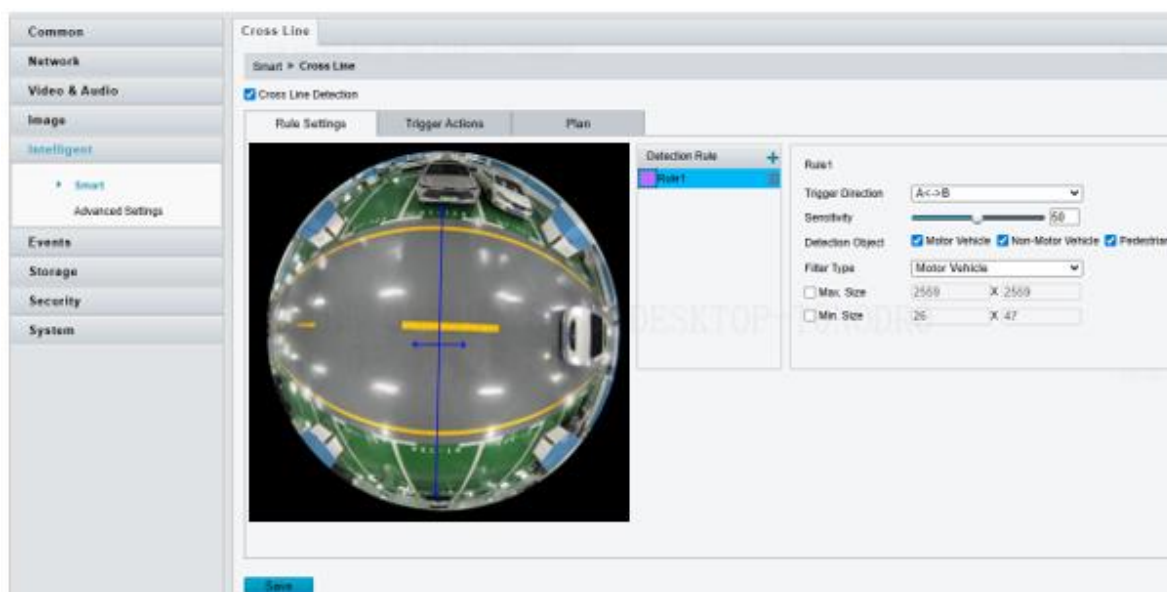


Figure 25 Cross Line Detection Software Interface Example

- Detection line configuration: Refer to the example. The tripwire must be in the center area of the image. Avoid drawing in the edge area of the image;
 - Parameter configuration: 1) Detection rule line: Up to 4 detection rule lines are supported; 2) Trigger direction: Supports three directions — bidirectional (A<—>B), forward (A—>B), and reverse (B—>A), and users can configure them manually; 3) Sensitivity: Default is 50, and users can adjust it from 1 to 100 as needed;
 - For detection targets, refer to Intrusion Detection.
- **Motion Detection**
- Motion detection sets monitored areas in the image. When pedestrian or motor vehicle targets enter the detection area and are in motion, they are immediately captured and an alarm is triggered;
 - On the Setup > Alarm > Common Alarm page, enable Motion Detection to enter the configuration page, and select the smart detection mode;

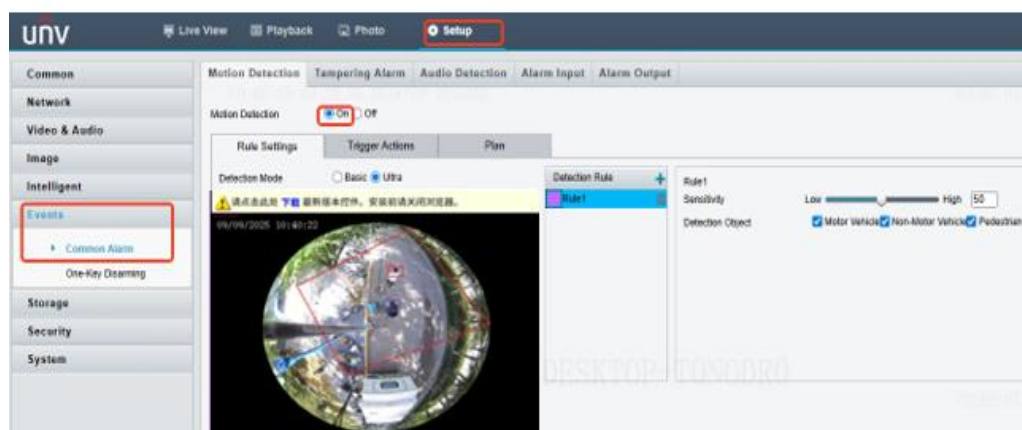


Figure 26 Interface Configuration Example

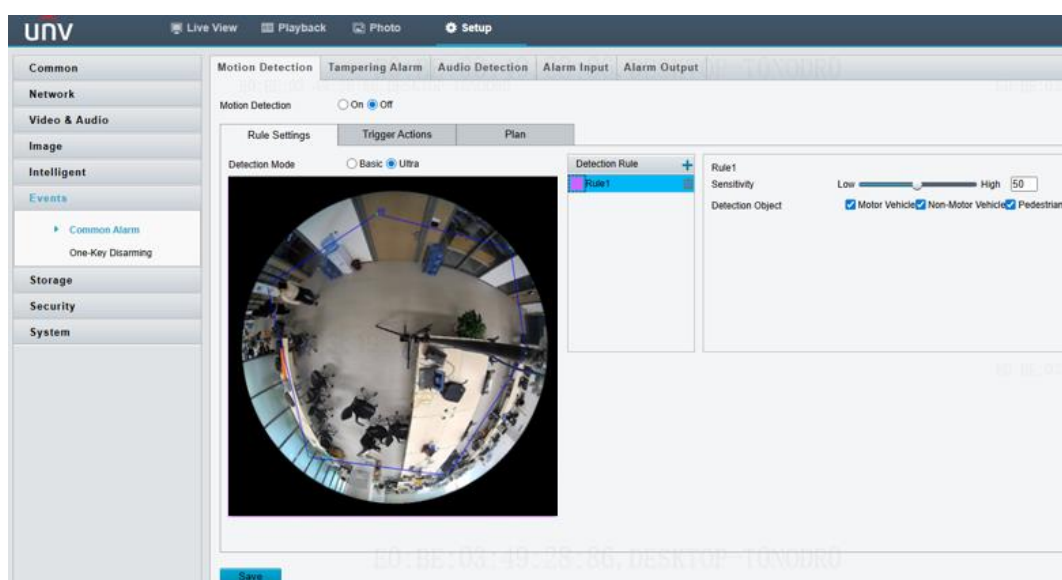


Figure 27 Motion Detection Software Interface Example

- Area configuration: Refer to the example. Avoid selecting edge areas. Indoor radius: 3-5 m; outdoor radius: 3-7 m;
 - Parameter configuration: 1) Detection rule area: Default is full screen. Users can configure it manually. Up to 4 detection areas are supported, and 3- to 6-sided polygon configuration is supported; 2) Sensitivity: Default is 50, and users can adjust it from 1 to 100 as needed;
 - For detection targets, refer to Intrusion Detection.
- **Heat Map**
- Heat map detection monitors the detection area and reports data based on the movement trajectory and dwell time of the pedestrian head-and-shoulders detection box from the time a pedestrian head-and-shoulders target is detected until it disappears;

- On the Setup > Smart > Smart Function page, enable Heat Map to enter the configuration page;

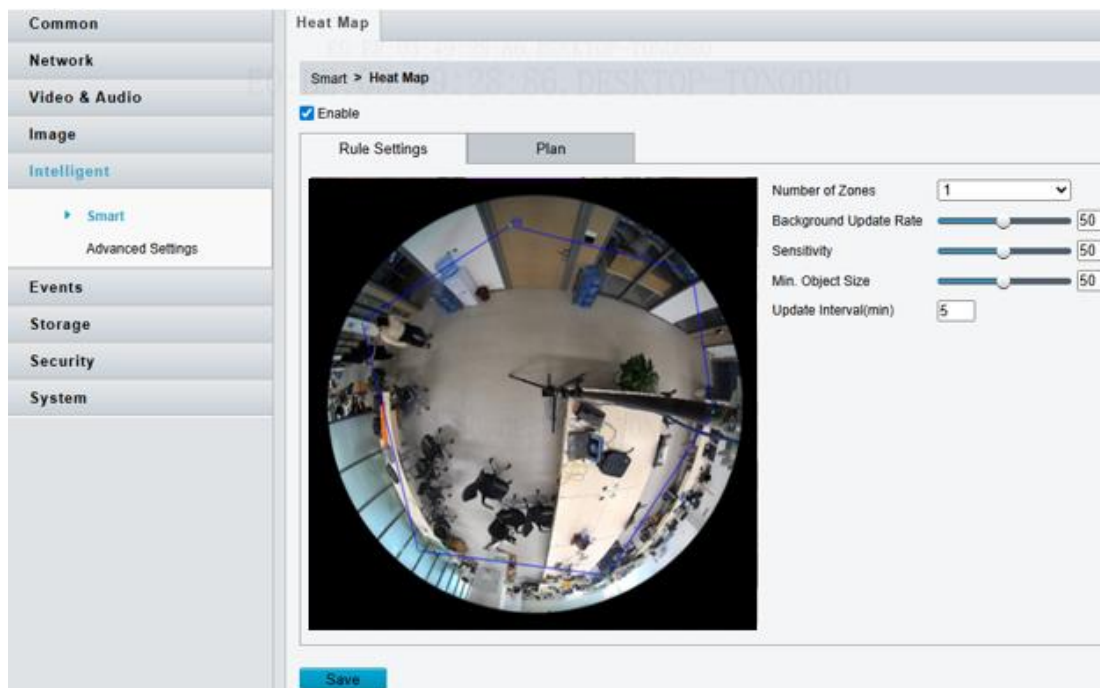


Figure 28 Heat Map Software Interface Example

- Area configuration: Refer to the example. Avoid selecting edge areas. Indoor radius: 3-5 m; outdoor radius: 3-7 m;
 - Parameter configuration: 1) Detection rule area: Default is full screen. Users can configure it manually. Up to 4 detection areas are supported, and 3- to 6-sided polygon configuration is supported; 2) Sensitivity: Default is 50, and users can adjust it from 1 to 100 as needed;
 - For detection targets, refer to Intrusion Detection.
- **People Flow Counting**
- People flow counting determines the crossing direction of people based on the configured rule line and trigger direction line, and reports bidirectional or unidirectional tripwire counting results accordingly.
 - On the Setup > Smart > Smart Function page, enable People Flow Counting to enter the configuration page;
 - On the Setup > General > OSD page, select People Counting from the Overlay OSD Content dropdown list to view the number of people entered and people exited in the live view in real time.

Enable	No.	Overlay OSD Content
☒	1	<Date & Time>
☒	2	
☐	3	<Custom>
☐	4	<Date & Time>
☐	5	<People Counting>
☐	6	<Time>
☐	7	<Date>
☐	8	<Picture Overlay>
☐	8	<Device Latitude and Longitude Coordinates>
☐	Display Style	<Network Port>

Figure 29 OSD Configuration Interface Example

- Detection line configuration: Refer to the example. The tripwire must be in the center area of the image. Avoid drawing in the edge area of the image;

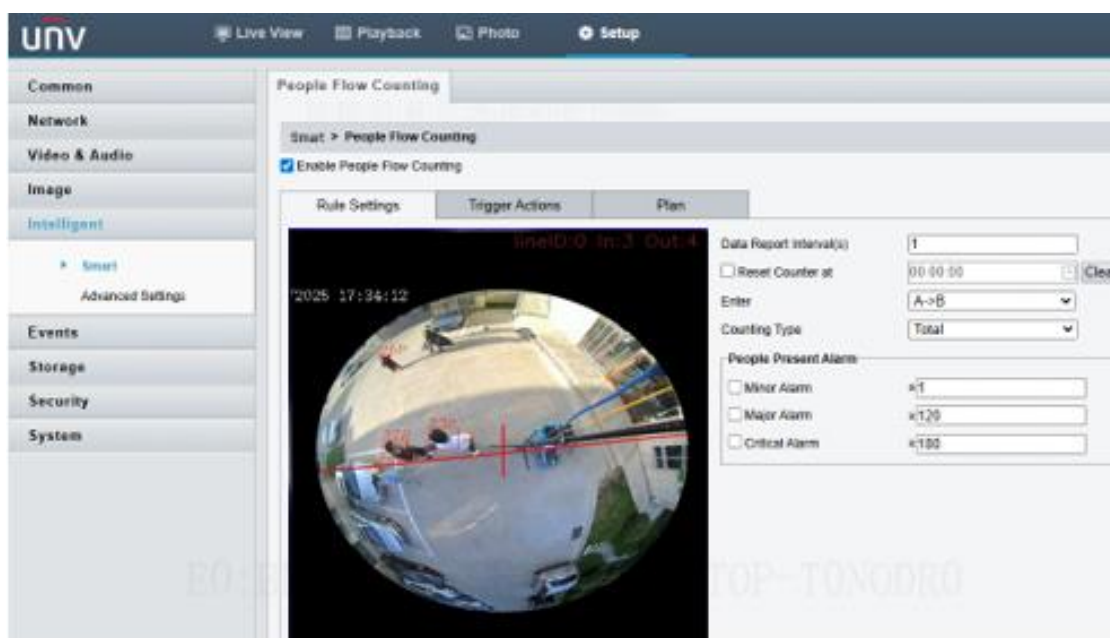


Figure 30 People Flow Counting Software Interface Example

- Parameter configuration: 1) Detection rule line: Up to 1 detection rule line is supported; 2) Data report interval refers to the minimum interval between two consecutive data uploads from the camera to the platform, with a default of 1 second. A reset counter at time can be set. When enabled, the camera automatically resets the number of people entered, people exited, and people present at the configured time; 3) Trigger direction: Supports three directions — bidirectional (A<—>B), forward (A—>B), and reverse (B—>A), and users can configure them manually; 4) Counting type is divided into total number, people entered, and people exited. When the people present alarm is not enabled, if configured as total number, the people counting OSD simultaneously displays the number of people entered and people exited; if configured as people entered, the people counting OSD only displays the number of people entered; if configured as people exited, the people counting OSD only displays the number of people exited. 5) People present alarm: When the people present alarm is

enabled, the counting type configuration is grayed out and cannot be configured. The people counting OSD simultaneously displays the number of people entered, people exited, and people present by default. 6) On the people flow counting trigger actions configuration page, parameters for different alarm trigger actions can be configured according to actual needs.

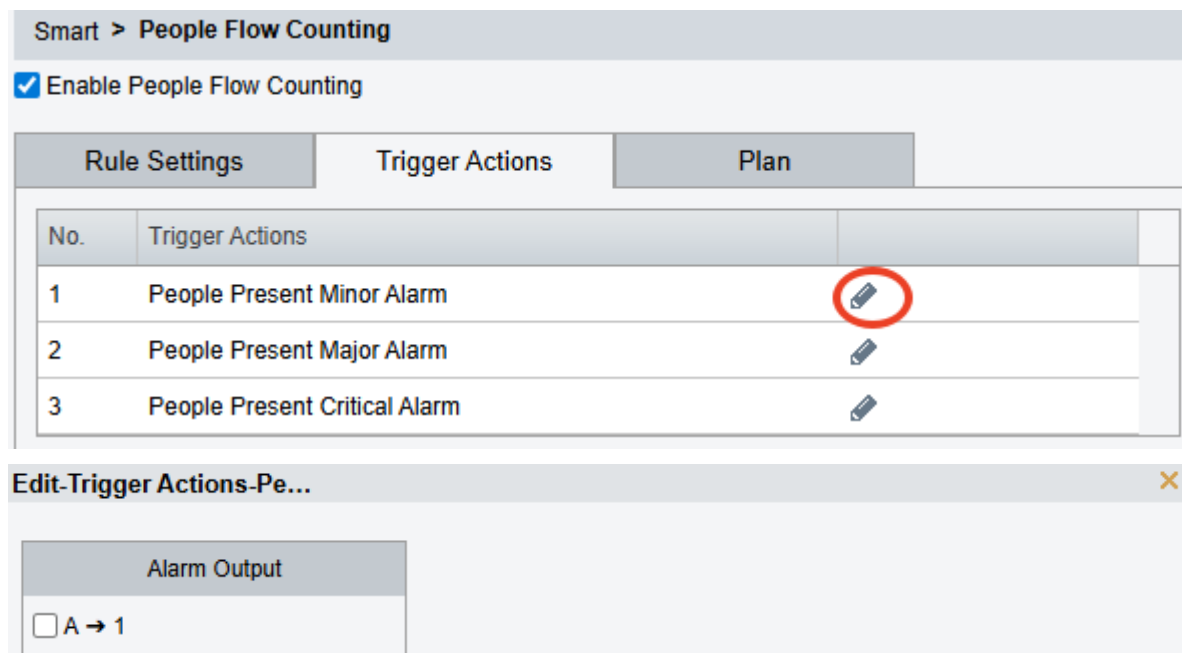


Figure 31 Alarm Linkage Configuration Example

- Detection target: Pedestrians
- Filter by Object Size: Default configuration, no modification required
- **Crowd Density Detection**
 - Crowd density detection counts and reports the number of people in the rule area in real time when the number of people in the rule area changes.
 - On the Setup > Smart > Smart Function page, enable Crowd Density Detection to enter the configuration page;
 - On the Setup > General > OSD page, select People Counting. The web interface can overlay the people counting OSD to display the number of people in real time (refer to Figure 29);
 - Area configuration: Refer to the example. Avoid selecting edge areas. Indoor radius: 3-5 m; outdoor radius: 3-7 m;

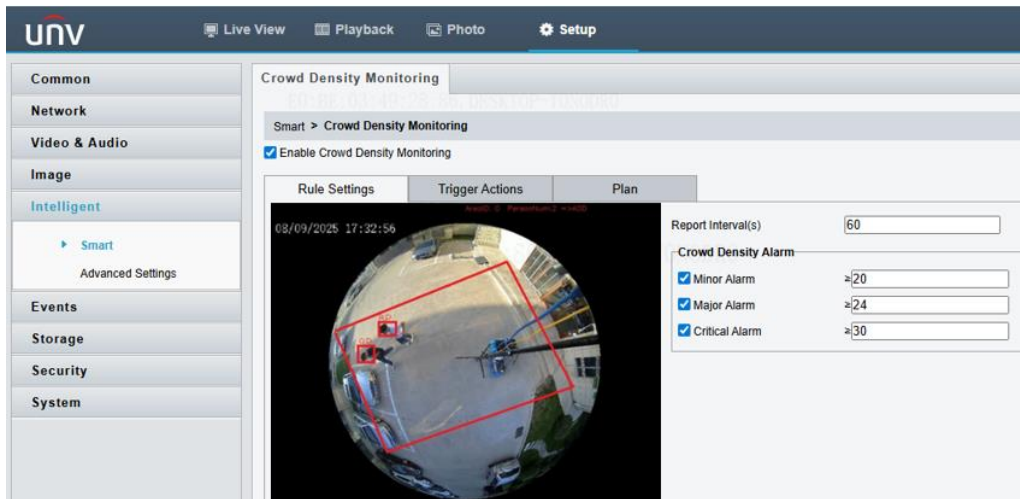


Figure 32 Crowd Density Detection Software Interface Example

- Parameter configuration: 1) Detection rule area: Default is full screen. Users can configure it manually. Up to 1 detection area is supported, and 3- to 6-sided polygon configuration is supported; 2) Data report interval refers to the minimum interval between two consecutive data uploads from the camera to the platform, with a default of 1 second. A reset counter at time can be set. When enabled, the camera resets the OSD counted target number at the configured time; (for alarm linkage, refer to Figure 31)
- Detection target: Pedestrians
- Filter by Object Size: Default configuration, no modification required
- **Corner Intrusion Detection, Cross Line Detection, and Motion Detection**
 - Rule configuration is the same as above
 - Switch Mode on the Live View Page

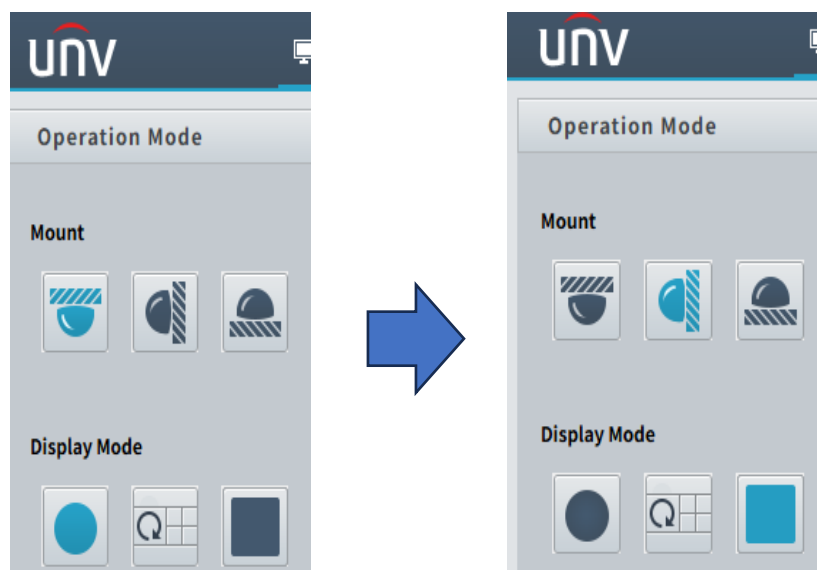


Figure 33 Example of Switching from Ceiling-Mount Fisheye Mode to Side-Mount Corner Mode

NOTE: When using the corner perimeter algorithm, the camera must be side-mounted;

V. Special Notes

This document integrates algorithm capabilities and extensive project experience. Its main purpose is to help colleagues across departments better understand and become familiar with the intelligent algorithms, in order to deliver the best user experience to customers.

For exceptions not mentioned in this document, colleagues should exercise flexible judgment and contact the responsible person for support. Thank you.