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Technical Paper:
People Counting & Heatmap Technology

Introduction

The IP video surveillance industry is continuing its migration toward higher resolution images, wider areas of coverage and more advanced image processing. As these advancements take place, so are the types of data transmitted over legacy video surveillance systems. The technology for information gathering and video analysis is rapidly improving and evolving.

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Hanwha Techwin cameras transmit various types of information such as tampering, defocus, motion and audio detection. More recently, intelligent video analytics such as people counting and heatmap have become available on the edge device, allowing for a more sophisticated analysis of information beyond traditional security applications.

People counting function tracks the number of individuals entering and exiting a specific area, and provides this statistical information along a timeline according to the search parameters defined by the user. The heatmap function tracks people density and traffic for specific areas under surveillance. These advanced intelligent analytic filters allow users to manage their business more efficiently while reducing expenses, manpower and time.

This document will explain how to easily set-up and maximize the people counting and heatmap feature.

Camera Installation Instructions
Hanwha Techwin people counting and heatmap features provide optimized performance when set-up according to the instructions below.

The video analytics feature can be adversely affected by surroundings such as lighting and viewing angle. To optimize performance, carefully follow camera installation instructions below.

Direction of Camera
The camera should be mounted overhead and the lens should point 90°, straight down to optimize the performance of people counting and heatmap feature. If the camera is mounted overhead with the lens pointing diagonally, the performance is not guaranteed. The ideal installed height is approximately between 8.2ft to 14.7ft with no lens obstruction. See figure 1.
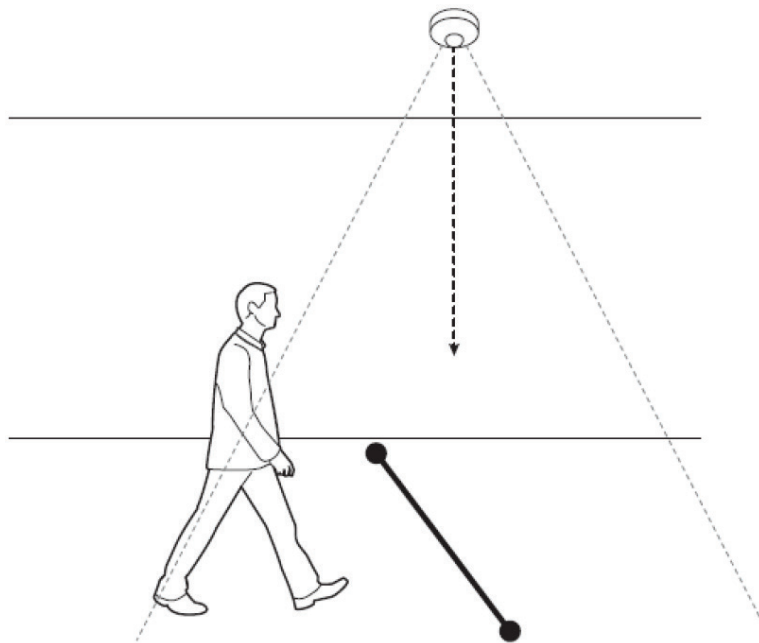

Figure 1. Ideal camera installation

Lighting Around Camera

Environments with stable lighting are optimal for video analytics. Recommended illuminance is 300 to 600 lux, and environments with a strong light source such as direct sunlight, sunrise, sunset or any direct lighting should be avoided. See Figure 2.
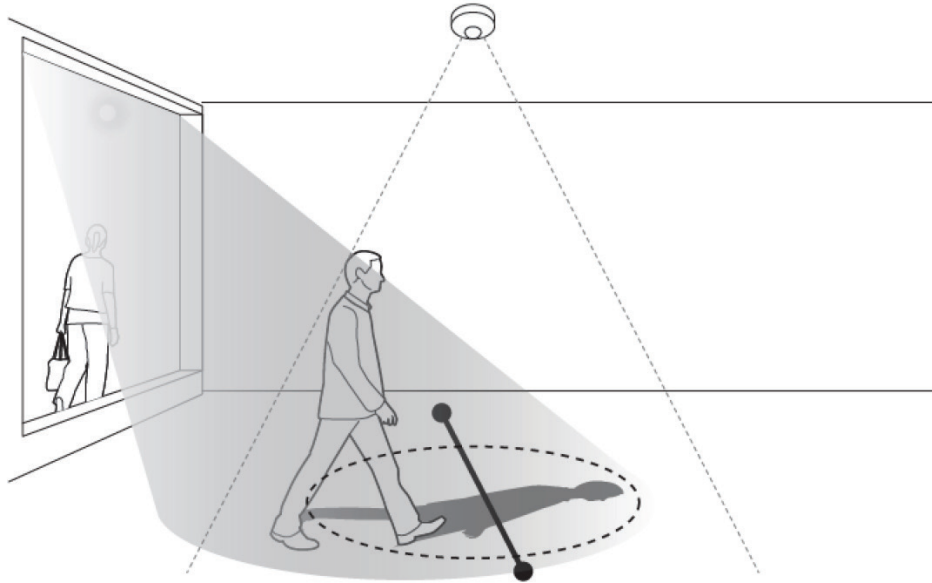

Figure 2. Avoid direct lighting on virtual line

Object Around Camera

People counting is based on recognition of a moving object. Therefore, performance can be affected if there is a revolving or automatic door (or any moving object at a fixed location) near counting rule (virtual line) or in camera's view. See figure 3.
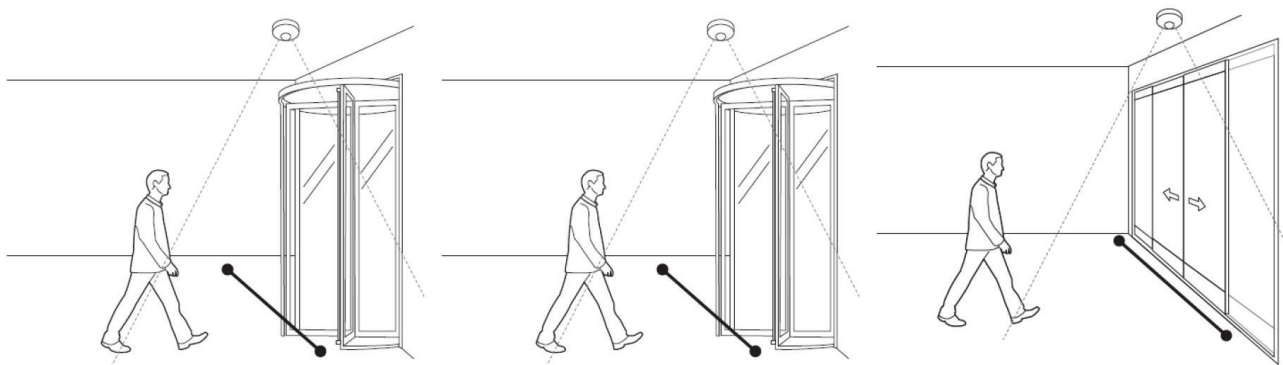

Figure 3. Avoid moving objects near virtual line

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People Counting

Hanwha Techwin's people counting feature detects people that enter/exit a designated area. Moving objects will be counted when it crosses a virtual line (counting rule) at a steady speed of 1.6ft to 4.9ft/sec and about 1.6ft intervals. The camera allows up to two virtual lines that can be intersected.

The instructions below are designed to enhance the user's understanding of proper heatmap and people counting set up. These instructions are also included in the user manual of Hanwha Techwin cameras that support these analytic functions.
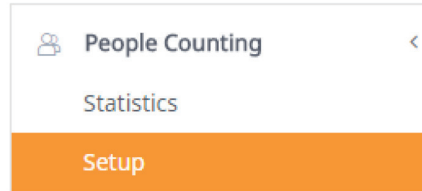
Figure 4. Setup menu location

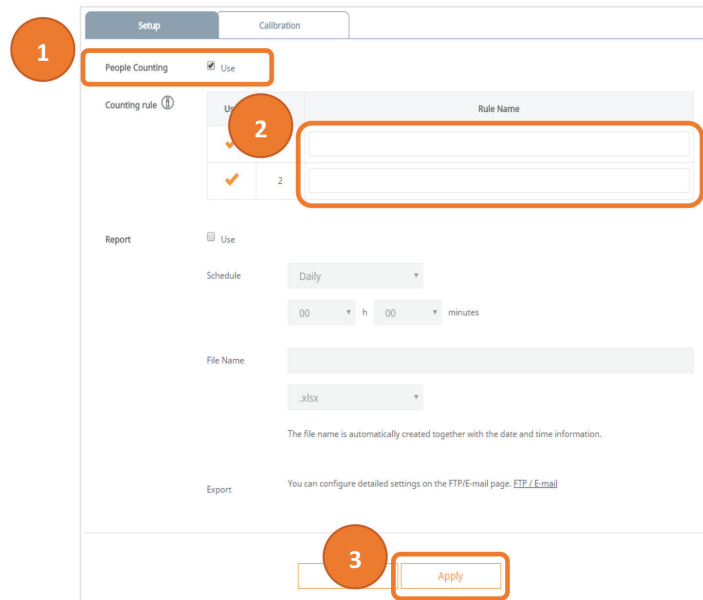- In web viewer, Setup > People Counting > Setup (Fig.4) > Setup (Fig.5)

Figure 5. People counting set up menu

- Check 'Use' box (1)
- Two virtual lines will be shown and you can adjust their location, direction and length. The rule name assignment and also be reordered. See Figure 6

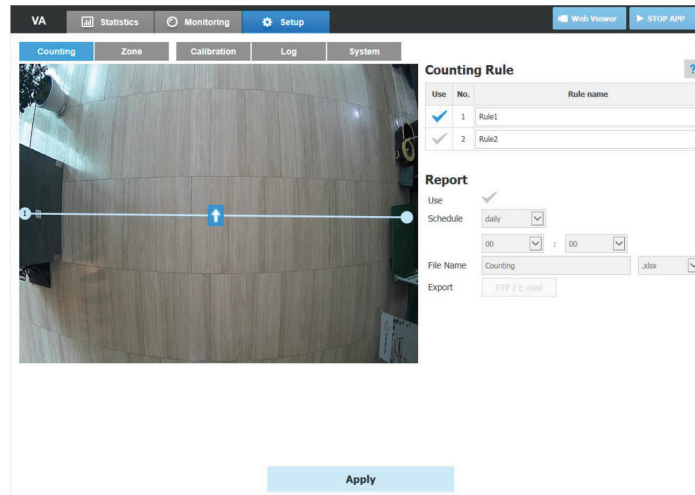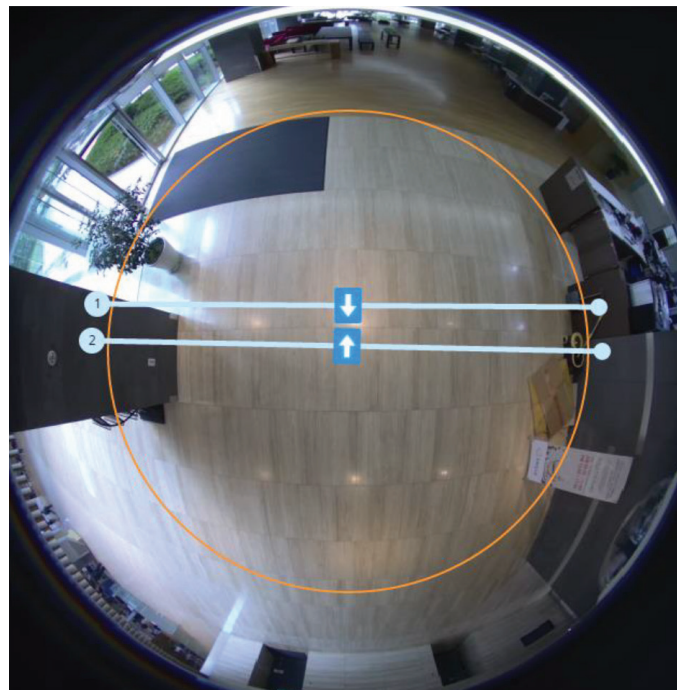
Figure 6. Counting rule draw guide

Figure 7. Normal camera counting rule (virtual line) setup

Please set the counting rule within the circle guide line

No.	Rule Name	IN	OUT
1	First Rule	748	586
2	Second Rule	687	549

Figure 8. Virtual lines must be set within orange guide line

Setting a virtual line for a traditional, non-fisheye camera can be set within the entire image, see figure 7. However, virtual lines for fisheye cameras must be drawn inside of orange guide line to avoid false counts due to the properties of the lens. See Figure 8.

People Counting Calibration

Calibration may be required to increase the accuracy of people counting and can be set by camera height or size of person.
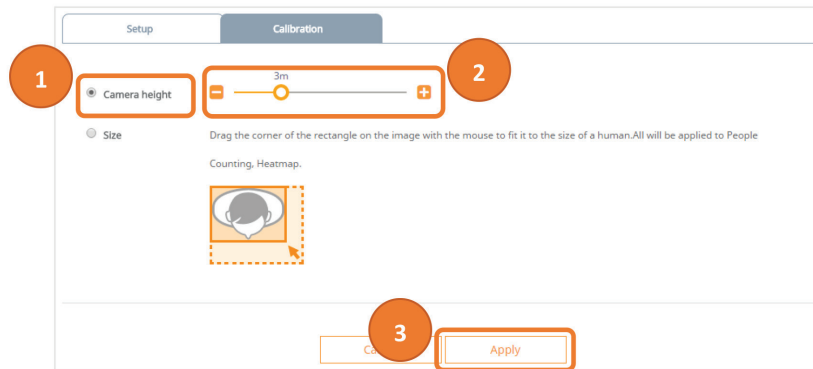

Figure 9. Calibration based camera height

• Option 1:
   In web viewer, Setup > People Counting > Setup (Fig. 4) > Calibration (Fig. 9) Choose the 'Camera height' option.
   Drag the point or click +, - button for camera height setting then apply.

• Option 2:
   Choose the 'Size' option.
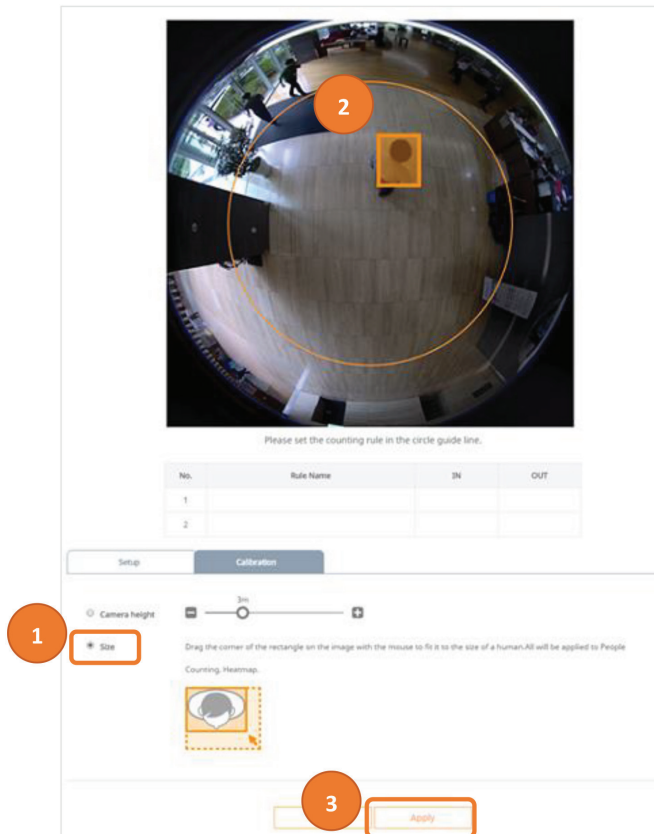   Drag and adjust the size of square on video.

Figure 10. Calibration based people size in video

People Counting Report
       • In web viewer, Setup > People Counting > Setup (Fig. 4) > Setup (Fig. 11)
       • Check 'Use' box for Report.
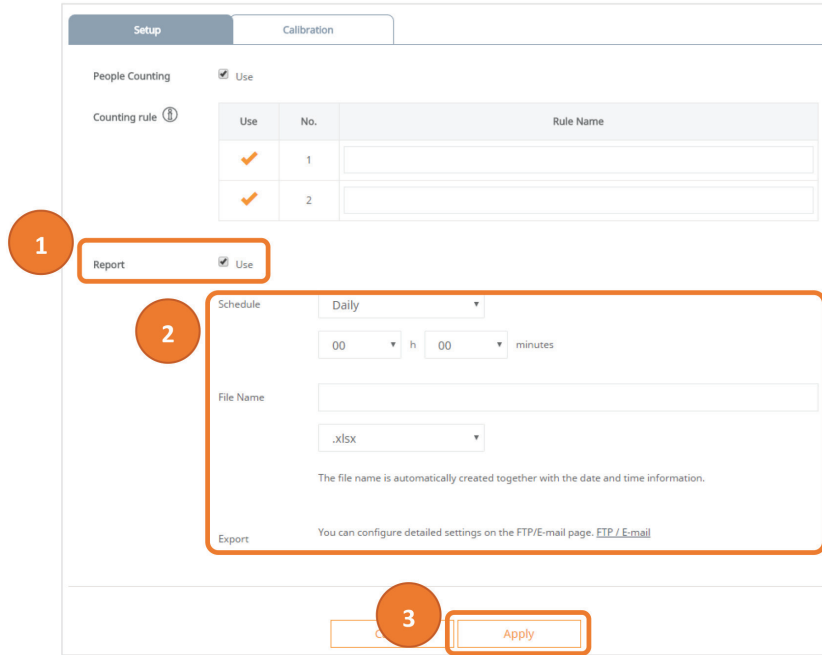An Excel file can be exported by FTP or email, either manually or on a schedule.

Figure 11. People count report setup

People Counting Statistics
       • In web viewer, Setup > People Counting > Statistics

The statistics page provides two ways to visually analyze the data as shown in the figure 12. The table format populates total number of counts analyzed within a day. The graph format depicts the data in two date range types, today and weekly. Both of these graphs are dynamically adjusted to show the user the selected legend's data. Left graph in the figure 12 ("Today" view), is representing number of people who exited out of Entrance as where the right graph ("Weekly" view) is representing number of people who entered the Entrance in the recent week.
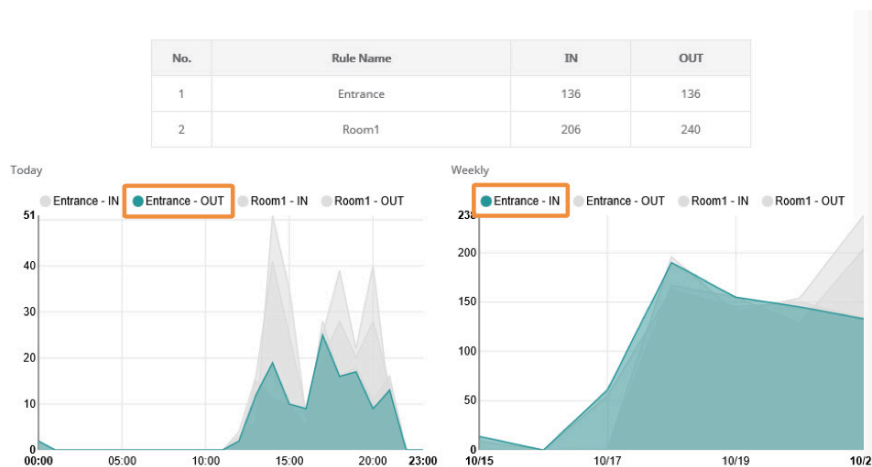

Figure 12. People counting statistics

The graph view provides further details into the data by hovering the mouse cursor over the graph as shown in the figure 13.
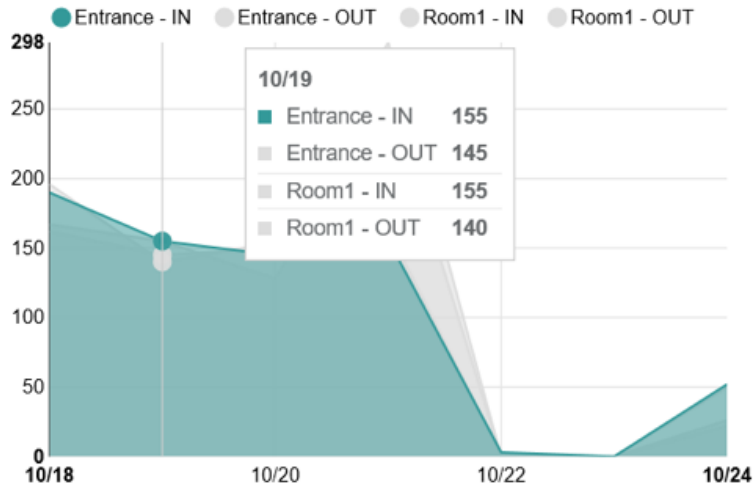

Figure 13. People counting graph detail

Date range can be set by the user to search for data of specific dates. Figure 14 illustrates a data search from 10/11/2016 to 10/20/2016 for all of the virtual lines.

Camera	Rule	10/11	10/12	10/13	10/14	10/15	10/16	10/17	10/18	10/19	10/20	SUM
Camera	Entrance - IN	195	139	206	115	14	0	61	190	155	145	1220
	Entrance - OUT	167	151	194	118	9	0	55	162	145	150	1151
	Room1 - IN	185	146	177	179	0	0	0	167	155	128	1137
	Room1 - OUT	200	178	196	202	0	0	1	196	140	154	1267

Figure 14. People Counting statistics search

The data can be downloaded in either Excel (.xlsx) or text (.txt) format for further integration with other systems. Example of a downloaded data in Excel format is shown below in figure 15.
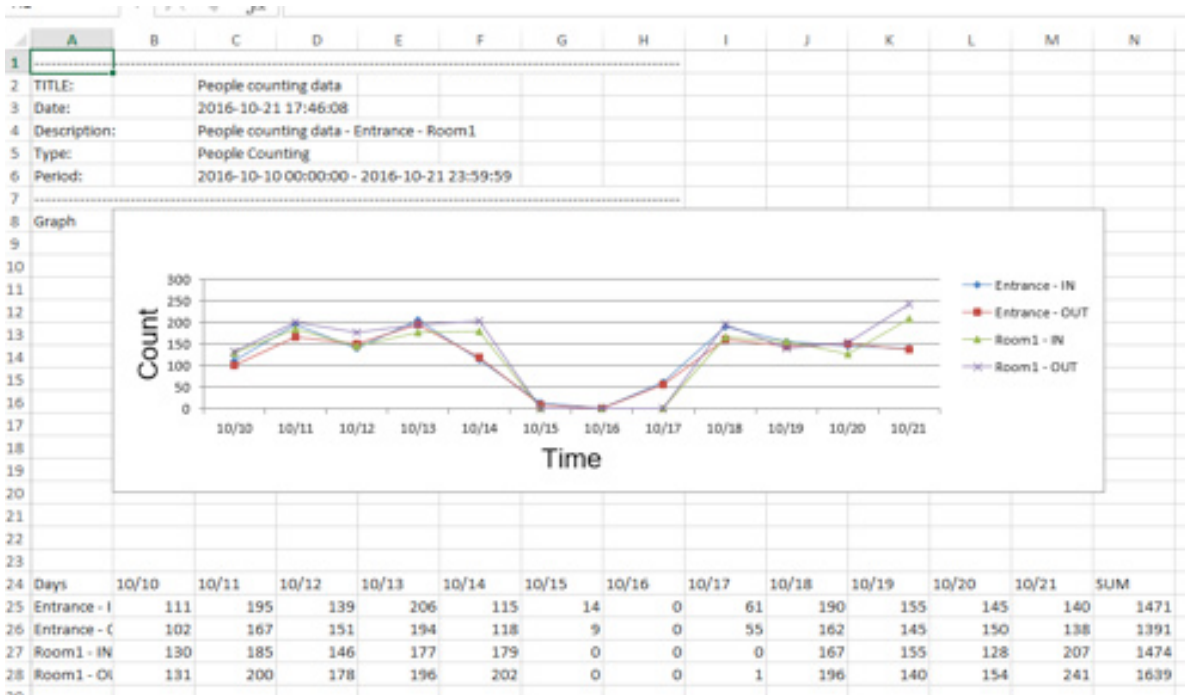

Figure 15. People Counting data in Excel format

People counting accuracy is about 90% for a normal camera and 85% for a fisheye camera when properly installed and configured in accordance with instructions and notice. (In '2. Camera Installation Instructions' and '5. Notice')

Heatmap

Hanwha Techwin heatmap feature reflects the index of moving people on video and it helps users to recognize patterns of moving people intuitively.

Heatmap Setup

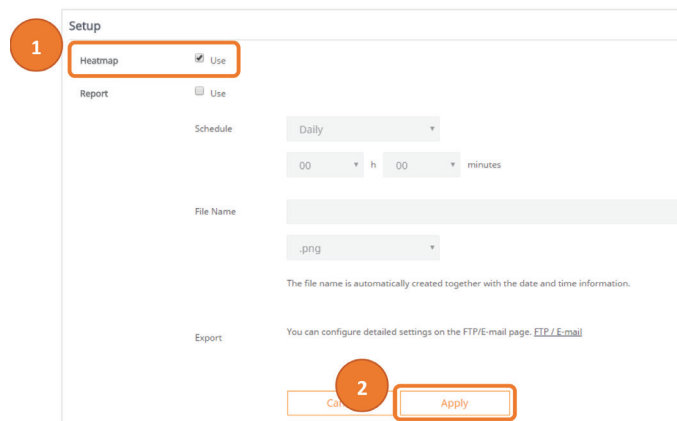It is easy to setup heatmap. Please refer to below figure. 16.

Figure 16. Heatmap setup

In the statistics page, users are able to view how the heatmap is displayed on video, see figure 17.
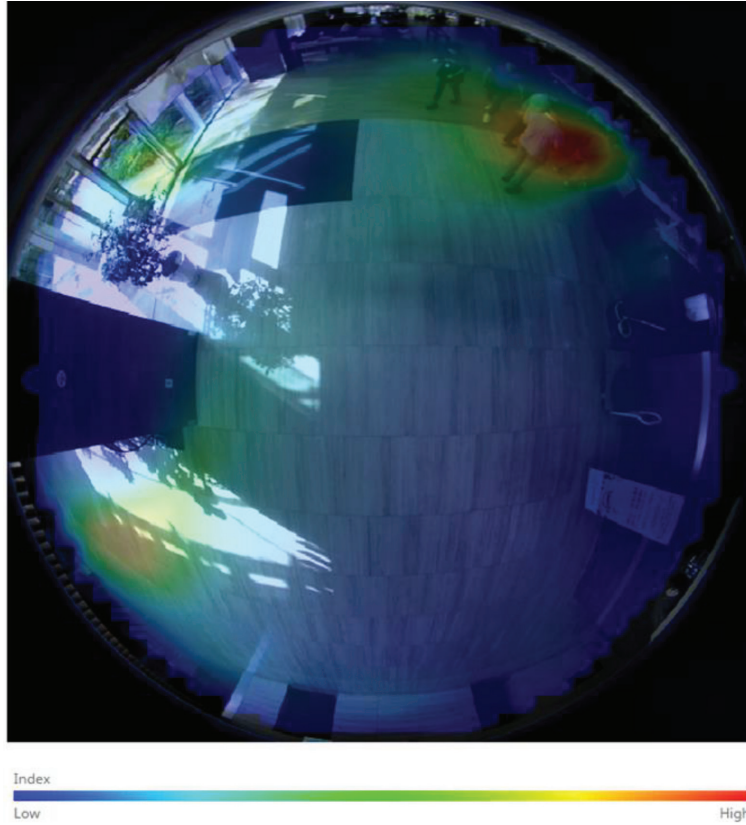

Figure 17. Example of heatmap with fisheye camera

Heatmap Report

Heatmap statistics data and search function instruction is contained in the user manual. The following are additional instructions to help further your understanding of the set up function.

- In web viewer Setup > Heatmap > Setup
- Check 'Use' box for Report > Click 'Apply' (2)

Figure 18. Heatmap report setup

Heatmap result image export is available through FTP and E-mail on a schedule. An export schedule is available daily or by days of the week. Please refer to the user manual for more instructions of FTP and E-mail setup.

Notice

The people counting and heatmap features provide statistical data rather than real-time data and any other moving object can be detected and included in the data. Please refer to the below cases which may cause measurement error.

- People that move in a group (It can be counted as one person)
- People or person staying around virtual line (counting rule)
- Virtual line that set outside of guide line (Fig. 7, orange line)
- Too much difference in object size between actual and configured size
  - Actual size > Configured size : Possibility of higher measurement
  - Actual size < Configured size : Possibility of lower measurement
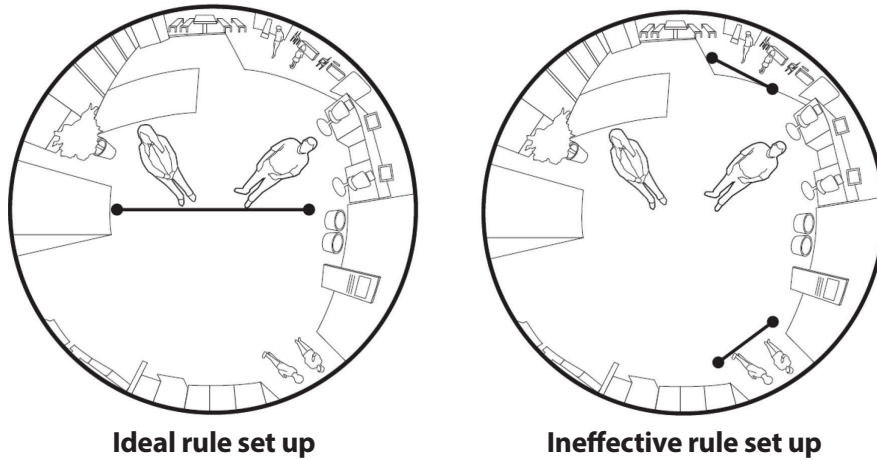- Too much difference in camera height between actual and configured value

Ideal rule set up   **Ineffective rule set up**

Figure 19. Examples of fisheye camera counting rule

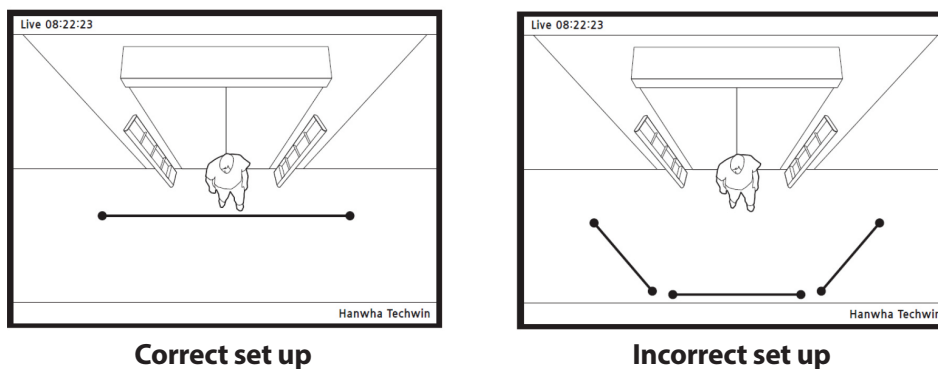**Correct set up**   **Incorrect set up**

Figure 20. Examples of normal camera counting rule

Conclusion

Hanwha Techwin people counting and heatmap features provides added benefit for users seeking to employ an IP camera's intelligent video analytic capability for uses beyond traditional video surveillance, including the reporting of statistical information on density, traffic and counting of people.

When used properly, these intelligent analytic features can help a user manage a business more efficiently by potentially reducing expenses, manpower and time.

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