Administrator's Guide for

People Counting in Deep Learning NVR

Based on
Synology Surveillance Station 8.2.7
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Introduction

Overview

With its powerful AI Image Analysis, Synology Deep Video Analytics can instantly calculate millions of object attributes, filter out environmental interferences, and deliver accurate detection results. Backed with Smart Tag technology and a comprehensive management interface, it allows users to take control of events with ease and efficiency.

Among the supported algorithms, People Counting is designed for calculating footfall in targeted regions. Such data can help maximize management efficiency by assisting you in decision-making, space utilization, and long-term trend analysis.

For you to achieve optimal precision, this guide aims to introduce the key factors of setting up People Counting tasks. Please follow the listed points as closely as possible.

Quick Start

Camera Selection

• Select multi-stream cameras with 1280x720@20 FPS
• Select IR supported cameras if possible
• Use wired connections for stable streaming

Camera Mounting

• Position cameras 2.5 to 4 meters above the ground
• Position cameras right above entrances and face them straight down
• Make sure cameras can capture complete human heads
• Arrange lenses so that people pass through the camera view horizontally or vertically
• Make sure the surroundings can provide lighting with over 300 lux
• Avoid uneven illumination and tilted light sources that create shadows
• Adjust the color of the lighting to separate hair from clothing

Software Configuration

• Locate the detection line on the ground and near the center of the camera screen
• Keep the detection line thin
• Make sure the detection line covers the entire width of the passage
• Enable Crowd Detection to monitor the staying (entering minus exiting) people
• Fine-tune settings with the Parameter Adjuster to fit actual detection scenes

Accuracy Enhancement

• Keep the traffic near passageways clear and make sure visitors do not linger around the detection area
• Remove mobile objects and flickering lights
• Apply plain flooring that contrasts with the hair color of target visitors
• Use multiple cameras if passageways are over 4 meters wide

For more details, please refer to the following chapters.
Mount Cameras

As People Counting tasks identify characteristics of human heads and use them as the basis of calculation, big and clear images are key to accuracy. This chapter introduces how to mount cameras and arrange proper lighting.

Select and Position Cameras

Camera models, installation, and configurations directly influence the quality of recordings.

The following are some general guidelines:

- Select ceiling mount cameras that support multi-stream with 1280x720@20 FPS or above for a flexible stream quality.
- Do not use panoramic or fisheye cameras. The distortion of images may influence the detection results.
- Keep the camera signal as stable as possible. Wired connections are highly recommended.
- Keep the lenses clean so that dust, insects, or other stains do not block the sight.
- Keep the traffic near entrances clear. Make sure visitors do not linger around the detection and be counted multiple times.

- Position cameras directly above entrances and face them straight down.
- Make sure cameras can capture complete human heads.
- Arrange the lenses so that visitors can pass through the camera view horizontally or vertically.

- Remove mobile objects such as automatic doors, escalators, and cleaning robots.

<table>
<thead>
<tr>
<th>Focal length (mm/ft)</th>
<th>Height (m/ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.8 / 0.082</td>
<td>3.0 / 9.85</td>
</tr>
<tr>
<td>4.0 / 0.13</td>
<td>4.0 / 13.1</td>
</tr>
</tbody>
</table>

Depending on camera models and zoom settings, the height range and covered ground can be modified.
Prepare Suitable Lighting

Good lighting is crucial. If the surroundings are too dark, details might be lost; if there is excessive illumination, images may blur.

When setting up your cameras, please mind the following:

• Provide sufficient lighting, preferably with a light level of over 300 lux. Features of moving people are hard to recognize in dark images.

• Enable IR functions if possible. While IR helps capture clearer images, please note that it cannot compensate for poor lighting.

• Avoid direct sunlight in the detection areas. Direct light may leave streaks in the images or cause overexposure, affecting the picture quality.

• Do not point lights directly at the cameras and overexpose footage.

• Remove flickering or glowing objects, such as neon lights.

• Avoid uneven illumination. Movements in the darker areas might not be detected correctly.

• Remove tilted light sources that create shadows. Shadows may blur the shape of human features.

• Adjust the color of the lighting according to actual environments to clearly separate hair from clothing. People may not be easily detected if the color of their hair and body are too similar.
Configure Software Settings

Once your cameras are mounted successfully, software configurations must be set up for DVA to suit your needs fittingly. This chapter covers the crucial settings.

Begin with People Counting

People Counting works by tracking movements of heads. When a person passes by and the center of their head crosses the detection line, the number on the counter will increase.

Select a Stream Profile

For optimal detection accuracy, select a resolution of at least 1280x720@20FPS.

Define the Detection Line

The detection line defines the entrance as well as the enter/exit directions. You can drag the nodes and the arrow around to make adjustments.

When setting up, please mind the following:

• Locate the detection line on the ground and in the center of camera screens.
• Keep the line thin so that objects other than human heads will not be wrongly identified.
• Cover the entire width of the passage. If the detection line is drawn too short, people might pass by without crossing over the line and be missed by the detection. The maximum length is 4 meters long.
Improve Detection Accuracy

After adjusting software parameter settings, there are still some factors that may affect the accuracy of People Counting. This chapter lists some possible solutions, causes, and provides a setup example.

Select Proper Flooring

The simpler the surroundings are, the more easily People Counting can analyze human features and provide accurate reports.

Here are some tips for arranging the flooring:

• If your flooring has light reflections or if sharp shadows may appear, place a mat or carpet on the detection area.
• Apply flooring that contrasts with the hair color of your target visitors. For instance, use light carpets for black hair and dark carpets for blonde hair.
• Apply plain flooring so that complex patterns do not affect the analysis.

Note Possible Interferences

Even with thorough planning of the camera installation, it is still possible that people are not detected or wrongly identified.

Please note and try to avoid the situations below:

• The heads of people under 120 cm might be too small to be identified and filtered out.
• Weather sometimes affects the accuracy of outdoor cameras. Rain and snow, changes of shadows, or differences between day and night are all possible influences.
• People walking closely side by side might not be recognized correctly.
• People running pass too quickly might not be detected.
• People with hats, in costumes, holding umbrellas, or wearing accessories that cover their heads might be missed, or affect the detection of others.
• Pets passing by might affect the calculation.

Setup Example

The following are some do and don'ts of installing cameras:

• Human heads need to be complete to achieve high accuracy. If they always appear in the edges of the screen, please adjust the camera height or use cameras with a larger angle of view.

• Keep passing people in the middle of the camera frame for better precision.
• If the passageways are over 4 meters wide, please set up two cameras to keep the head images complete and try not to let the sizes vary too much.
Collect Footfall Data

Once People Counting tasks are set up, you can start collecting and tracking footfall data. This chapter introduces how to work with People Counting.

Enable Crowd Detection

Crowd Detection can send notifications and trigger alerts in Live View when the number of people in a space exceeds the set number. It is thus suitable for places where footfall must be limited for safety concerns, such as stadiums or malls. The calculation is highly dynamic: the crowd number is generated by subtracting the exiting people from the entering people.

Generate Reports

After collecting footfall data, you can go to the Detection Results page to check the People Counting Report.

Reset the People Counter

As shown in the figure below, the counter provides simultaneous two-way counting of people moving in and out of passageways. You can set a schedule to reset the counter.

The reports list the number of entering and exiting people within a given date and time. With the flexible display design, you can easily adjust the time unit from hour, month, to year. Also, to accommodate spaces with multiple entrances, data of different tasks can be displayed simultaneously.

If you wish to download a report, click Export and select either HTML or XLSX format.
Merge Counting Numbers

If you wish to add up the numbers of two or more People Counting tasks, you can use the Merge Counting tool from Counting Tools > Merge Counting. This function is suitable for sites with multiple entrances or situations where you need to sum up the headcount of different locations.

Each Merge Counting task can have its own counter reset time and Crowd Detection settings.

In Live View, details of Merge Counting tasks will be shown alongside the camera information of the original People Counting tasks.

Optimize Parameter Settings

The Parameter Adjuster allows you to use previous camera recordings or DVA detection results to fine-tune task parameters. This helps fit your actual usage scenarios.

Select a clip from the Video Source panel and drag the nodes and arrow to adjust the detection line. Basic settings and parameters in the left panel can be edited as well.