

Whitepaper / Installation Guide

Wisenet AI Camera

31st 05, 2021

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Since the development of CCTVs, humans have been responsible for simultaneous monitoring of multiple cameras and event detection from each of them. However, the number of video a human can review at the same time is limited, leading to fatal human errors and lowering the efficiency of operation.

To overcome such limitations, AI (Artificial Intelligence) technology is widely incorporated in video surveillance, offering a range of video analytics. AI-enabled video analytics can identify persons and vehicles and alert meaningful events to operators through attributes extraction and Automatic Number Plate Detection (ANPD). This enabled effective monitoring of more number of cameras and maximized the efficiency of operation.

Hanwha Techwin is offering AI-enabled video analytics with its Wisenet AI cameras. The cameras with AI video analytics have “AI” menu in its configuration page. AI video analytics is used for various features of the cameras. The most notable features include “Object detection”, events of “IVA (Intelligent Video Analytics)”, "Statistics", and “Digital Autotracking.” IVA feature defines virtual lines and areas for persons and vehicles to detect crossing, intrusion, enter, exit, or loitering. Statistics feature provides statistical data of observed people by adopting various conditions for People Counting, Queue management and Heatmap. Digital Autotracking can track detected movements of persons and vehicles in the video.

- Detect persons, faces, vehicles, and license plates from the video
- Extract attributes from detected persons, faces and vehicles

This document is designed to help users better understand and conveniently use our products and features while installing and operating Hanwha Techwin’s AI cameras.

2.1. Object detection

Object Detection technology classifies the types of objects (person, face, vehicle, license plate) and identifies their location in the video. Object Detection adopts deep learning algorithms to learn images of objects (person, face, vehicle, license plate) and detect similar objects within an image.

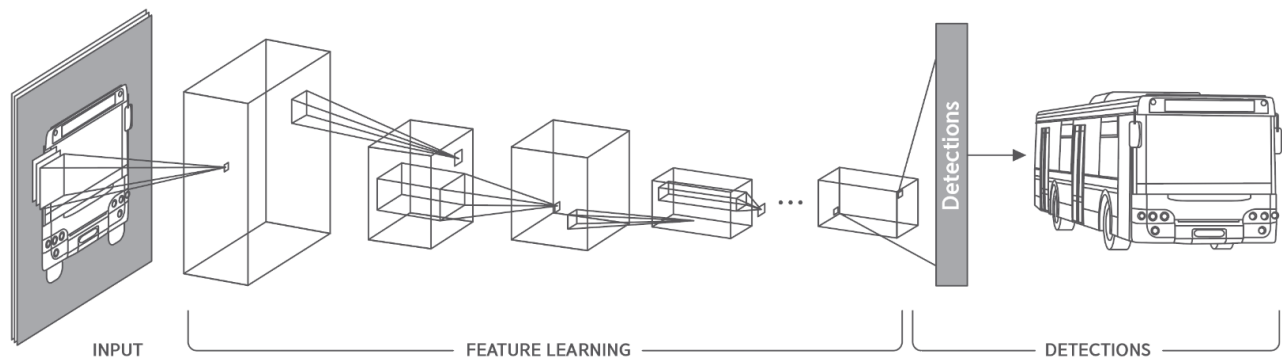


Image 1. Deep learning algorithm for detecting four types of AI objects

2.2. Attributes extraction

Attributes extraction technology utilizes deep learning algorithms to classify detected objects (person, face, vehicle) into detailed and meaningful categories for each object type. For instance, persons can be categorized by their gender, clothing color or bags, while face attributes are by age or glasses. Vehicle attributes are classified by color or vehicle types such as trucks, buses, or bikes. Users can utilize such attributes information to increase efficiency in searching objects from large sized data in video recorders.

2.3. BestShot capture

BestShot feature captures the best still cuts of the classified objects (persons, faces, vehicles, and license plates) which can be exported in maximum 4K resolutions. These still cuts also contain metadata of the objects' distinctive attributes, therefore, allowing operators to easily find specific objects in the video. BestShot search scenarios include facial recognition, license plate recognition, and re-identification of objects.

Users can go to “Object detection” > “BestShot” from the configuration tap and select BestShot options for persons, faces, vehicles, and license plates.

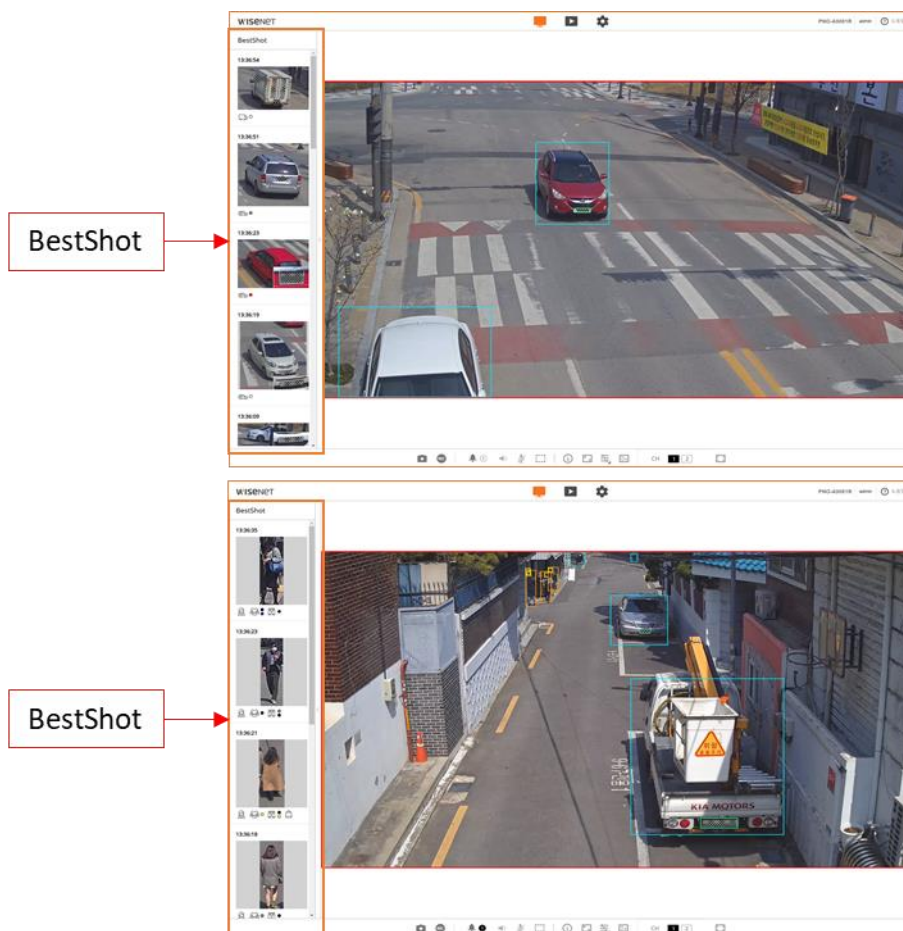


Image 2. BestShot images of AI camera

2.4. Face Mask Detection

As one of the AI based video analytics in Wisenet AI cameras, Face Mask Detection identifies people wearing face masks in the video in real time. It analyzes people’s faces to determine if people are wearing masks. For example, if people are detected not wearing masks, the feature not only sends notification to users immediately but also sends out broadcasting through connected audio speakers. It helps build efficient solutions as users can detect the use of face masks of multiple people simultaneously.

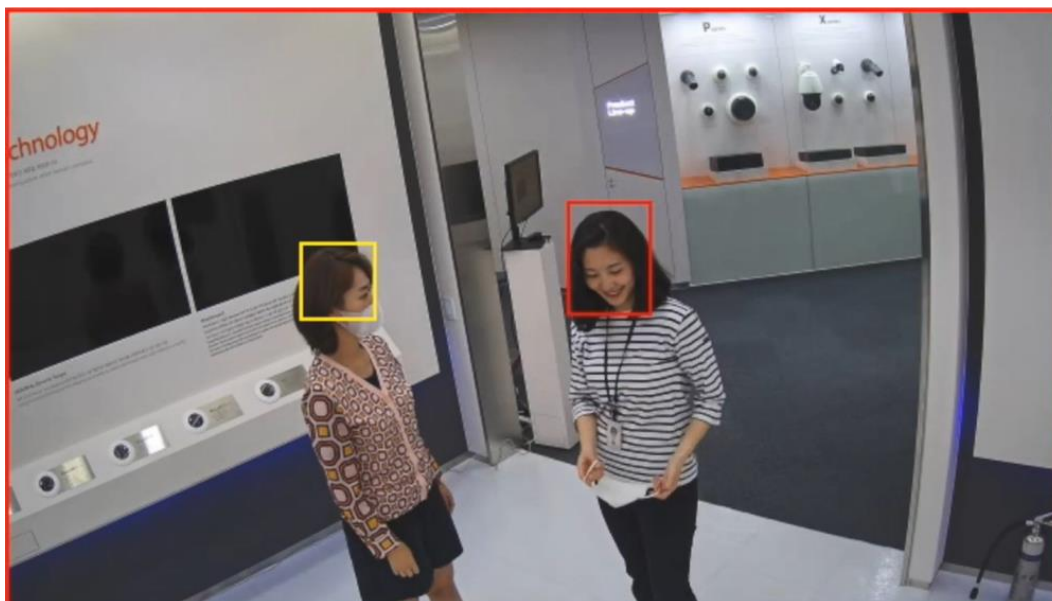


Image 3. Face mask detection setting screen

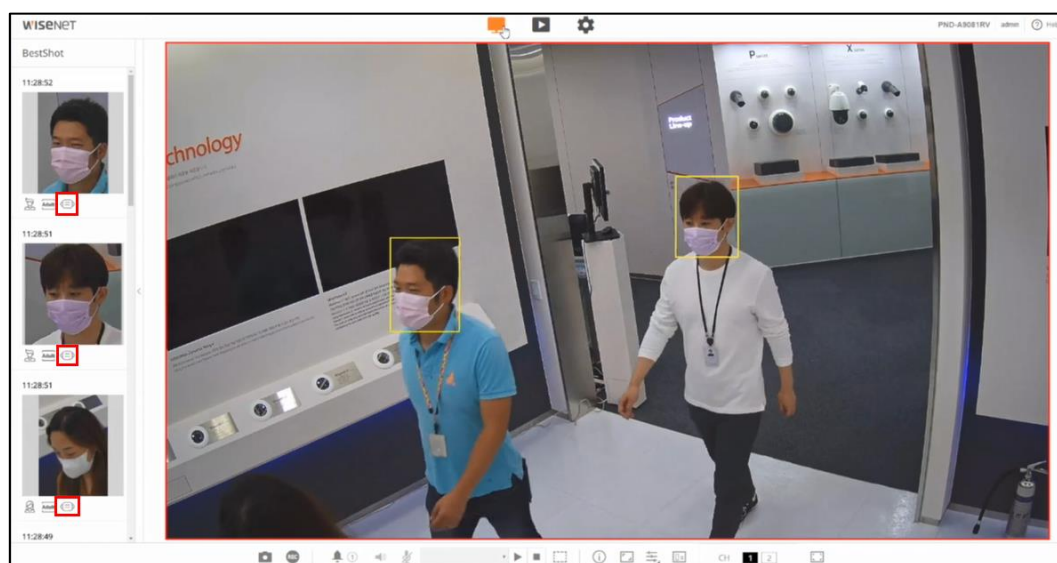


Image 4. Face mask detection live view (Face Mask attribute classification)

3. Camera installation guide

Hanwha Techwin's AI features can achieve the optimal performance when the cameras are installed and operated in accordance with this guide. For best results, please refer to the following instructions as the cameras' AI video analysis can be affected by lighting or camera field of view.

- This installation guide outlines minimum requirements and recommendations for using various AI features of the cameras. Performance of each feature cannot be guaranteed if the instructions are not followed properly.
- Video analysis can offer optimal performance under stable lighting conditions. Minimum 300 lux is suggested as suitable lighting level.

3.1. Recommendations for AI camera installation

This section illustrates recommendations for installing Wisenet AI cameras to ensure reliable AI performance. If a camera is installed at a height of minimum 3 meters (9.9ft) with a tilt of 45-degree angle, objects at least one meter away and higher than 170cm (5.58ft) can be recognized. Detection is possible until more than two-thirds of the object is visible up to a distance of 5.6m (18.4ft) from the camera. For reliable detection of AI cameras, it is recommended to install cameras at an angle of 45 degrees or larger, creating a side-view.

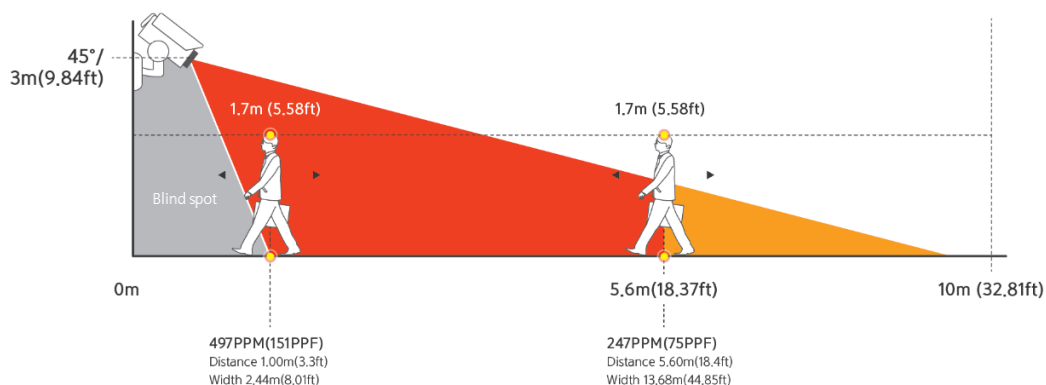


Image 5. Recommendations for AI camera installation (3m, 45 degrees)

- 4K (3840x2160) camera installed at 3m (9.9ft)/45 degrees (lens focal length: 4.5mm)
Resolution : 497 PPM (151 PPF) @ 1.0m (3.3ft)
247 PPM (75 PPF) @ 5.60m (18.4ft) (Over 2/3 of object)

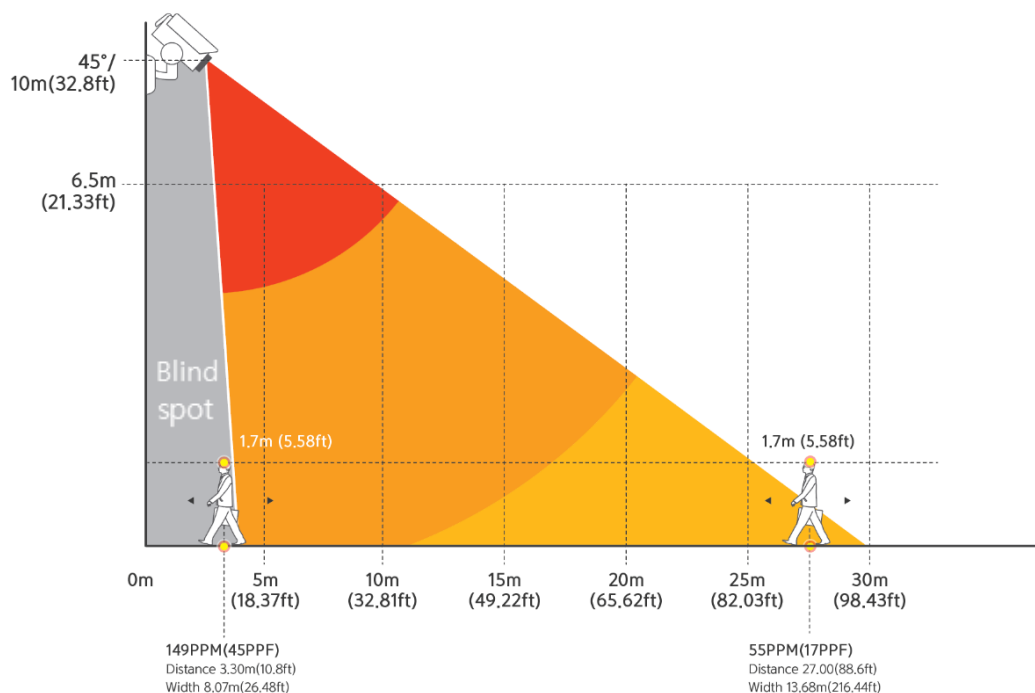


Image 6. Recommendations for AI camera installation (10m, 45 degrees)

- 4K (3840x2160) camera installed at 10m (32.8ft)/45 degrees (lens focal length: 4.5mm)
Resolution: 149 PPM (45 PPF) @ 3.30m (10.8ft)
55 PPM (17 PPF) @ 27.0m (88.6ft) (Over 2/3 of object)

※ For 2MP cameras' recommended installation condition, please check the Toolbox PLUS on our official website

	Recomm- endations	Install height	Focal length	Max. install distance (in day)
4K	Min	Over 3m (9.9ft)	4.5mm 10mm	28.4m 83.1m
	Max	Below 10m (32.8ft)	4.5mm 10mm	26.7m 82.6m
2MP	Min	Over 3m (9.9ft)	4.83mm 9.33mm	13.5m 42.6m
	Max	Below 10m (32.8ft)	4.38mm 9.33mm	9.6m 41.5m

Table 1. Recommended AI camera installation condition

[Distance between Camera-Object (m), **P 4K, W (4.5mm), in Day**]

PPM	Installation height (10m)	Installation height (3m)
250	-	5.5
125	7.6	12.2
63	22.9	24.8
55	26.7	28.4
25	62.0	62.7

(Unit=m)

※ In the case shaded grey, will result in installation angle below 45°

[Distance between Camera-Objects (m), **P 4K, T (10mm), in Day**]

PPM	Installation height (10m)	Installation height (3m)
250	15.3	18.1
125	35.2	36.5
63	72.0	72.6
55	82.6	83.1
25	182.7	183.0

(Unit=m)

[Distance between Camera-Objects (m), **P 2MP, W (4.38mm), in Day**]

PPM	Installation height (10m)	Installation height (3m)
250	-	0.5
125	-	5.3
63	6.8	11.7
55	9.6	13.5
25	28.8	30.4

(Unit=m)

※ In the case shaded grey, will result in installation angle below 45°

[Distance between Camera-Objects (m), **P 2MP, T (9.33mm), in Day**]

PPM	Installation height (10m)	Installation height (3m)
250	-	8.9
125	15.9	18.5
63	35.9	37.1
55	41.5	42.6
25	93.5	94.0

(Unit=m)

Criteria for PPM (Pixels per meter) / PPF (Pixels per foot)

※ Wisenet Toolbox: https://www.hanwha-security.com/wisenettoolbox_plus/index.html#!/en/home

- Pixels per meter is the number of pixels to represent one meter. With a greater number of PPM, the higher the resolution will be.

- Pixels per foot is the number of pixels to represent one foot. With a greater number of PPF, the higher the resolution will be.

- 1) 25 PPM (8 PPF) or higher for general video surveillance: Detect an object's shape, color, rough size, or gender.
Not sufficient to recognize facial features or letters.
- 2) 63 PPM (19 PPF) or higher for object detection: Observe human faces or license plates from the video analysis module.
- 3) 125 PPM (38 PPF) or higher for object recognition: Recognize facial features or letters on a license plate.
- 4) 250 PPM (76 PPF) or higher for identifying details: Sufficient picture quality to identify details. Identify facial scars, eye colors, or tattoos.

3.2. Recommended requirements for object detection and attributes

Wisenet AI cameras can detect persons, faces, vehicles and license plates. The number of objects that can be detected simultaneously is 256 (person, car, head, face, license plate information in total). This section illustrates recommended requirements for detecting each object type. The requirements can vary for each object. Even if all the requirements are met, the performance may vary according to different operating environments.

3.2.1. Recommended requirements for person detection

- The minimum size supported for detecting a person in an image is 15 pixels for the shorter axis. The recommended size is 30 pixels or higher.
- Detection might not be possible if a full body (face/body/leg) is occluded more than 50% from left to right.



Image 7. (Undesirable condition) When a full body (face/body/leg) is occluded more than 50% from left to right.

- Detection might not be possible if upper or lower body is occluded more than 50%.
- The following conditions can reduce the accuracy of detection.

Only parts of the body is captured in an image

A person moving faster than 0.5m~1.5m/sec

In high density crowds (e.g., standing shoulder to shoulder, large crowds)

3.2.2. Recommended requirements for person attributes

- The minimum size supported for classifying person attributes in an image is 112 pixels for the longer axis. The recommended size is 352 pixels or higher.
- Types of person attributes

Gender: Male, female

Top/bottom wear color: Black, blue, gray, green, orange, red, purple, white, yellow (1~2 colors can be extracted from each wear at a time)

Bag: Carrying, not carrying

- The following conditions can reduce the accuracy of attributes extraction.

Only parts of the body, not full body (face/body/leg) is captured in an image

In high density crowds (e.g., standing shoulder to shoulder, large crowds)

Persons riding two wheelers (motorcycle/bicycle)

Change of pose: Not standing straight (e.g., lying down, bending)

Unidentifiable to the naked eye due to poor quality or blurry images

3.2.3. Recommended requirements for head detection

- The minimum size supported for detecting head in an image is 12 pixels for the shorter axis. The recommended size is 20 pixels or higher.
- Detection might not be possible if the head is occluded more than 25% from left to right.
- Detection might not be possible if the face is occluded more than 15% from the eyes.
- Detection might not be possible if the face is occluded more than 50% from the mouth.



Image 8. (Undesirable condition) When a head is occluded more than 25% from left to right.

3.2.4. Recommended requirements for face attributes

- The minimum size supported for classifying face attributes in an image is 80 pixels for the shorter axis. The recommended size is 120 pixels or higher.
- Types of face attributes

Gender: Male, female

Glasses: Wearing, not wearing

Age: Young (~19), adult (20~44), middle (45~64), old (65~)

- The following conditions can reduce the accuracy of attributes extraction.

Parts of face (eye, nose, mouth) is occluded

Change of pose: Non-frontal faces (e.g., profile view, keeping the head down)

Unidentifiable to the naked eye due to poor quality and blurry images or nighttime conditions

3.2.5. Recommended requirements for vehicle detection

- If a vehicle is front-facing in an image, the minimum size supported for detection is 15 pixels for the shorter axis. The recommended size is 40 pixels or higher.
- If a vehicle is side-facing in an image, the minimum size supported for detection is 15 pixels for the shorter axis. The recommended size is 35 pixels or higher.
- Detection might not be possible if the front of a vehicle is occluded more than 75% from left to right.

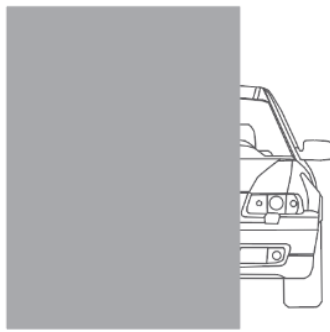


Image 9. (Undesirable condition) When the front of a vehicle is occluded more than 75% from left to right

- Detection might not be possible if the front of a vehicle is occluded more than 50% from top to bottom.
- Detection might not be possible if the side of a vehicle is occluded more than 25% from left to right.
- Detection might not be possible if the side of a vehicle is occluded more than 50% from top to bottom.

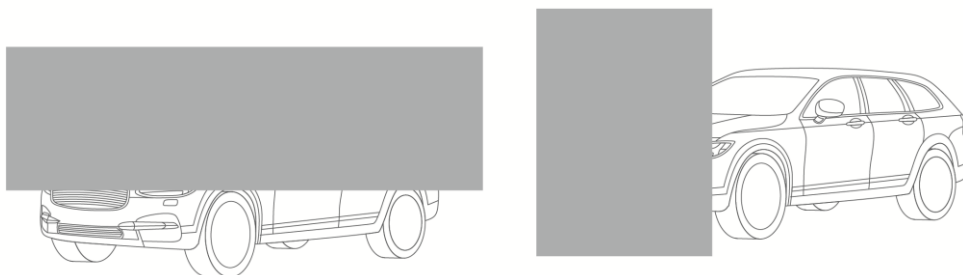


Image 10. (Undesirable condition) When the side of a vehicle is occluded more than 50% from top to bottom (left), 25% from left to right (right)

- Detection might not be possible if a vehicle is overturned.
- The following conditions can reduce the accuracy of object detection.
 - Only parts of a vehicle is captured in an image
 - If a camera is installed within 10m high at an angle of 45 degrees or higher or a vehicle is moving faster than 80Km/h
 - If a camera is installed at an angle of less than 30 degrees or a vehicle is moving faster than 40Km/h
 - In high density crowds (e.g., traffic congestion, waiting at red light)

3.2.6. Recommended requirements for vehicle attributes

- The minimum size supported for classifying vehicle attributes in an image is 50 pixels for the shorter axis for two-wheelers and 80 pixels for four-wheelers. The recommend size is 100 pixels or higher.
- Types of vehicle attributes
 - Vehicle type: Car, bus, truck, bicycle, motorcycle
 - Vehicle color: Black, blue, gray, green, orange, red, purple, white, yellow (1~2 colors can be extracted from each vehicle)
- The following conditions can reduce the accuracy of attributes extraction.
 - If a vehicle is occluded more than 50% or on the edges of the screen
 - If vehicles are overlapped by others
 - Vehicle color unidentifiable due to reflection
 - Unidentifiable to the naked eye due to poor quality and blurry images or nighttime conditions

3.2.7. Recommended requirements for license plate detection

- If a license plate is front-facing in an image, the minimum size supported for detection is 12 pixels for the shorter axis. The recommended size is 15 pixels or higher.
- Detection might not be possible if a license plate is not facing the front in the image.
- Detection might not be possible if a license plate is occluded more than 25% from left to right.

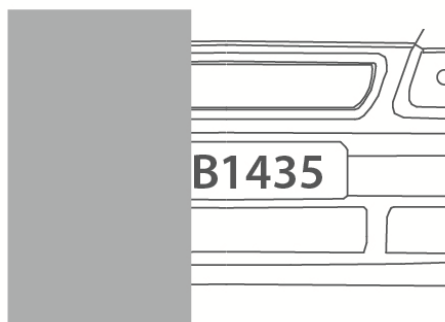


Image 11. (Undesirable condition) When a license plate is occluded more than 25% from left to right.

Object	Min. pixel for detection (Shorter axis) (@4K(3840x2160)), (@2MP(1920x1280))	Recommended speed for detection (@ Within 100m)
Person	30 pixels or above	0.5m ~ 1.5m/sec (Cannot guarantee accuracy for objects walking faster than the normal walking speed)
Head	20 pixels or above	-
Vehicle	(Front) 40 pixels or above (Side) 35 pixels or above	Below 80km/h (Installed at 45° or larger) Below 40km/h (Installed at 30° or smaller)
License plate	15 pixels or higher	-

Table 2. Recommended requirements for AI object detection

Object	Min. pixel for attributes extraction (@4K (3840x2160)), (@2MP (1920x1280))	Recommended pixels for attributes extraction (@4K (3840x2160)), (@2MP (1920x1280))
Person	112 pixels or above (Longer axis)	352 pixels or above (Longer axis)
Face	Over 80 pixels or above (Shorter axis)	120 pixels or above (Shorter axis)
Vehicle	50 pixels or above (Shorter axis/two- wheeled) 80 pixels or above (Shorter axis/four- wheeled)	100 pixels or above (Shorter axis)

Table 3. Recommended requirements for AI attributes extraction

3.3. Recommended requirements for BestShot

Wisenet AI cameras can detect best images (BestShot) for detected persons, faces, vehicles, and license plates. Users can go to “Object detection” > “BestShot” from the configuration tap and select BestShot options for person, face, vehicle, and license plate.

This section illustrates recommended requirements for detecting BestShot of each object type. The requirements can vary for each object to detect. Even if all the requirements are

met, the performance may vary according to different operating environments. As the feature is enabled by object detection, its performance can be impacted if the performance of person/face/vehicle/license plate detection degrades.

3.3.1. Recommended requirements for person BestShot

- The minimum size supported for a person BestShot in an image is 112 pixels in height and detection requires an aspect (width to height) ratio between 1.5 and 4.5. Detection is possible for objects existing in an image for more than one second.
- The following conditions can reduce the accuracy of person BestShot.
 - Only parts of the body, not full body (Face/body/leg) is captured in an image
 - In high density crowds (e.g., standing shoulder to shoulder, large crowds, or people standing close together)
 - Fast movement of an object
 - Change of pose: Not standing straight (e.g., sitting down, lying down, or bending)
 - Unidentifiable to the naked eye due to poor quality or blurry images

3.3.2. Recommended requirements for face BestShot

- The minimum size supported for face BestShot in an image is 80 x 80 pixels, while detection requires an aspect ratio of 1.5 or above. Detection is possible for objects existing in an image for more than one second.
- The following conditions can fail or reduce the accuracy of face BestShot.
 - Only parts of a face is captured in an image, not the entire face (including all of eyes, nose, mouth).
 - Multiple faces are overlapped in high density crowds
 - Fast movement of an object
 - Unidentifiable to the naked eye due to poor quality or blurry images

3.3.3. Recommended requirements for vehicle BestShot

- The minimum size supported for vehicle BestShot in an image is 80 x 80 pixels for four-wheelers and 50 x 50 pixels for two-wheelers. Detection is possible for objects existing in an image for more than 0.3 seconds.
- The following conditions can fail or reduce the accuracy of vehicle BestShot.
 - Only parts of a vehicle is captured in an image
 - Vehicles are overlapped in high density crowds
 - Fast movement of an object
 - Unidentifiable to the naked eye due to poor quality or blurry images

3.3.4. Recommended requirements for license plate BestShot

- The minimum size supported for license plate BestShot in an image is 80 pixels wide and 30 pixels high. Detection is possible for objects existing in an image for more than 0.3 seconds.
- The following conditions can fail or reduce the accuracy of license plate BestShot.
 - Only parts of a license plate is captured in the image
 - A license plate is occluded or overlapped in high density crowds
 - Fast movement of an object
 - Unidentifiable to the naked eye due to poor quality or blurry images

3.4. Recommended requirements for Face Mask Detection

To guarantee reliable performance of Face Mask Detection, the following requirements shall be met. The minimum requirements for camera installation is 2 to 3m in height at an angle of 45° or higher. Face Mask Detection feature can detect people from up to 5 to 6m away (for 4K), 1 to 2m away (for 2MP) from cameras. For secure detection using AI cameras, cameras shall be installed at angle of 45° or higher in side-view. It is recommended to install cameras where they can see the frontal face of people. If cameras are installed on walls or ceilings or the frontal face of people is not fully visible, it can reduce the performance of detection.

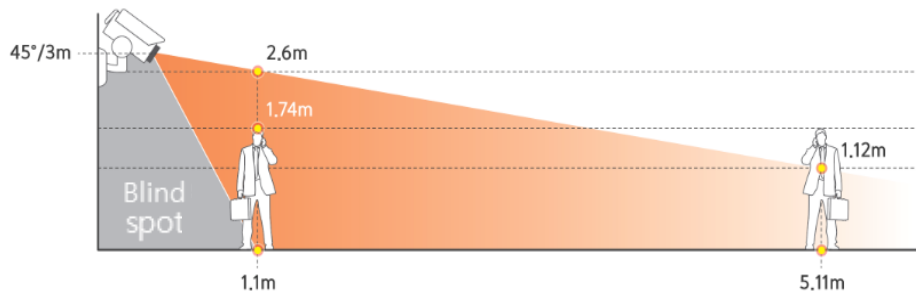


Image 12. Example of ceiling/wall mount installation

- When mounted on ceilings, recommended height for installation is 2~3m in height at a camera angle of 45° or higher.
- Using tripods: Recommended height for installation is at 1.6~2m with the camera distance at more than 1m.
- Minimum size of faces at 120x120 pixel
- If the conditions are met, up to 12 faces can be detected simultaneously.

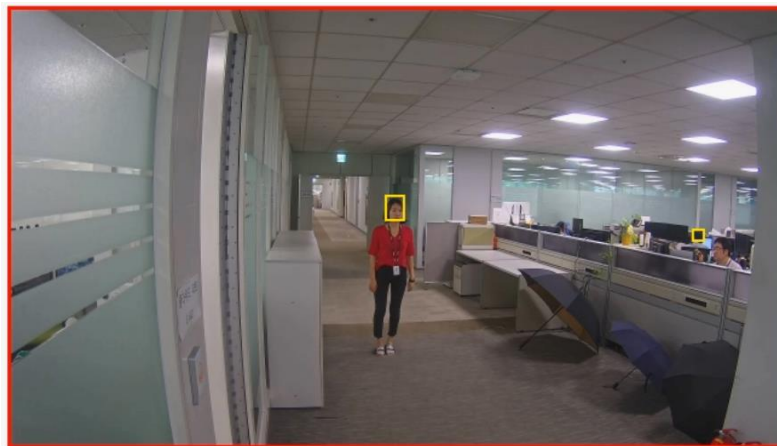


Image 13. Example of camera footage in maximum detection distance (4.5M)



Image 14. Example of maximum detection distance by resolution

By configuring sensitivity or minimum size in the settings, the accuracy of Face Mask Detection and Event alarm can be enhanced.

- Setting lower level of sensitivity will generate correct but smaller number of alarms. It can also cause missed detection.
- Setting lower level of minimum size can detect faces from far distance. It can reduce the performance of Face Mask Detection.

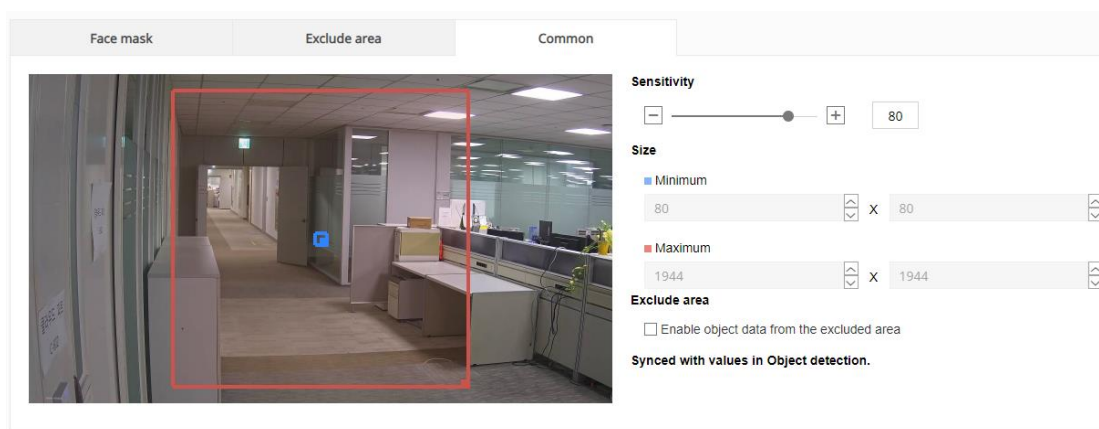


Image 15. Face Mask Detection setting menu

- The following conditions can cause false alarms in Face Mask Detection.
 - Objects, people, or hands covering parts of faces
 - When posture is changed (head facing side or down)
 - Multiple faces are overlapped in high density crowds
 - When detection is challenging to the naked eye due to poor quality image, defocus, or nighttime
 - People moving fast causing motion blur

3.5. Recommended requirements for People Counting

The following is the recommendations for camera installation to guarantee reliable detection using people counting.

* For the conditions of camera installation, please refer to 3. 1. Recommendations for AI

camera installation (Page 7).

* For the conditions of object detection, please refer to 3.2.1. Recommended requirements for person detection and 3.2.3. Recommended requirements for head detection in 3. 2. Object detection and attributes.

- To be counted, the speed of people shall be 0.5m/sec ~ 1.5m/sec. If people move at a speed faster than 1.5m/sec, it can reduce the performance of counting.
- Although counting is not limited when multiple people cross the line simultaneously, high density crowds in the video can cause missed detection.



Image 16. (Undesirable condition) High density crowds

- To enhance the accuracy, camera counting rules shall be configured correctly.
- The camera can detect counting when people and their heads cross the line at the same time.
- The following is the guidelines for counting.

Direction	Installation Angle			
↓				
↔				
↗ ↘ ↙ ↚				

- For secure operation, the margin rules shall be configured at around 1.5 times of the width of people passing by.

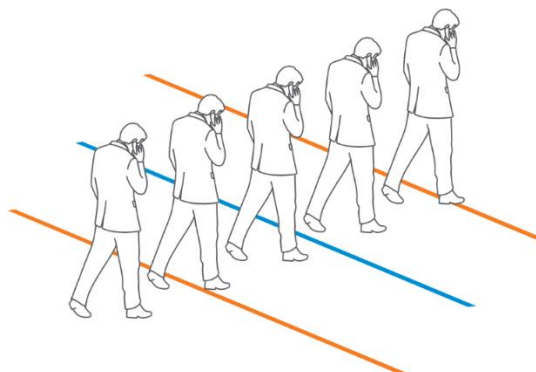


Image 17. The distance between the blue line and the orange one is 1.5 times of people's width.

3.6. Recommended requirements for Digital Autotracking

Wisenet AI cameras use Digital Autotracking to automatically track objects within the field of view appearing in restricted areas or at night-time, enabling efficient video surveillance monitoring.

Based on object detection information, users can configure different Digital Autotracking settings for certain objects (person or vehicle).

3.6.1. Recommended requirements for Digital Autotracking

- Areas with low volume of pedestrians or traffic (e.g., restricted areas, night-time)
- The following conditions can reduce the accuracy of Digital Autotracking.
 - As the feature is enabled by object detection, its performance can be impacted if the performance of person/vehicle detection degrades.
 - Fast movement of an object
 - In high density crowds

3.7. Social Distancing Detection

3.7.1. Recommendations for camera installation

We provide guidelines on how to best position cameras for Social Distancing Detection.

- Height for installing cameras
 - Install your cameras at a height of at least 3 meters to maximum 10 meters
- Angle for installing cameras
 - We recommend placing cameras at the vertical angle of between 45 and 60 degrees.
 - When camera lenses are facing the ground, the vertical angle is 0 degrees.
 - For the horizontal angle, cameras shall be installed in a direction parallel to the ground, with its angle at around 0 degrees.
- Environments for installing cameras
 - The ground a camera is facing shall have no slopes or tilted places.
 - Install cameras at where there is no vibration or shaking.

3.7.2. Recommendations for object detection

This section describes the recommendations for object detection to enable Social Distancing Detection.

- Conditions for people detection
 - The following conditions can reduce the performance of Social Distancing Detection.
 1. Bodies partially captured in the video
 2. Overlapped objects
 3. Failure in head to feet detection
 4. People in the distance detected too small
 5. People displayed at the edges of the screen
 6. Tilted objects
 7. Objects standing at different heights (e.g. Detected while standing on an overpass bridge or stairs)

8. Objects moving at an optical axis (The line connecting the centers of the lens)
(i.e. Only the size of objects change, while their location remaining the same)

- Number of objects
 - A camera can detect up to 80 people.

3.7.3. Camera setting

The following section describes how to configure the right values to ensure the performance of Social Distancing Detection. Setting the right value for grids in the setting window is important to use Social Distancing Detection properly.

- Variables for camera setting
 - Users can configure lens distortion correction, camera height, focal length, tilt, and rotation.
 - Users can reconfigure variables if a camera is repositioned.
 - Users can adjust the setting value so the grids from the setting window match their actual size.
 - A grid in a square represents 1 meter in length.

(1) Lens distortion correction (LDC)

- We recommend setting LDC at manual and Level 5.
- LDC can be configured from [Menu] - [Video and Audio] - [Special].

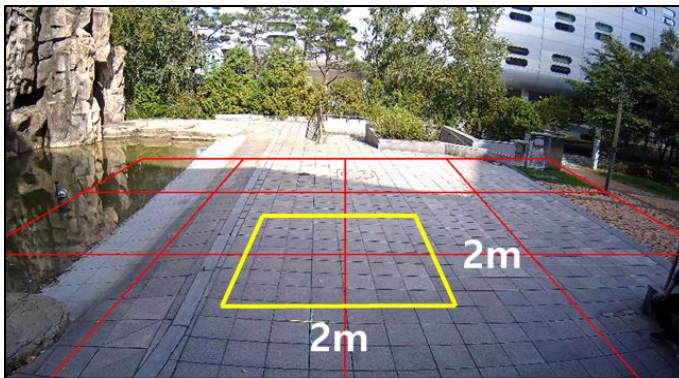
(2) Camera height

- Camera height is the vertical length measured from the ground where an object is placed to the camera.
- An install height can be adjusted by 0.1 meter between 3 and 10 meters
- By adjusting the camera height, users can change the size of grids while keeping the

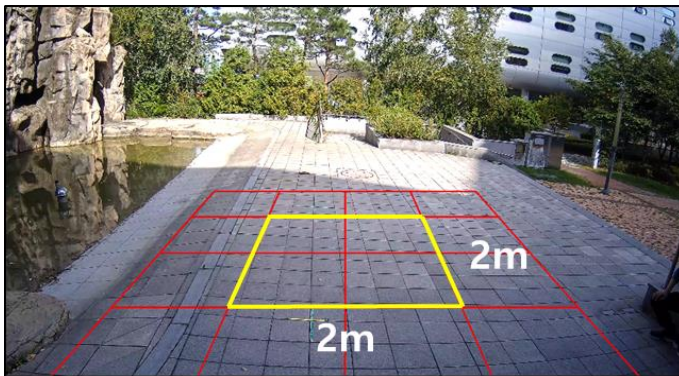
proportion of them in the video. The size of one grid in the video equals to 1 meter in actual objects.

– Examples:

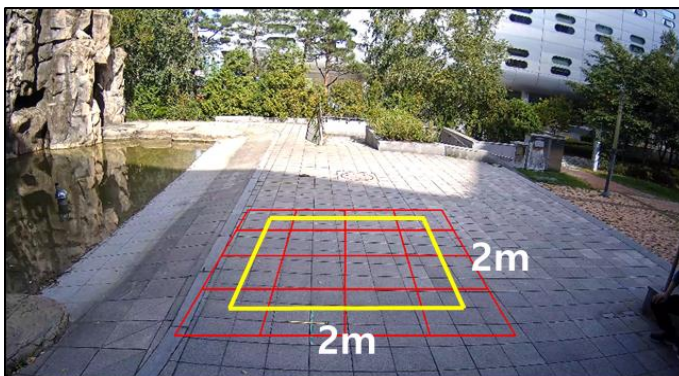
Below images show how camera heights can change the size of grids. The grids in red lines are provided for illustration purpose and may vary in the setting page. The square in yellow lines represents the actual size of objects.



① [Camera height] The value is set up lower than the actual camera height.



② [Camera height] The value is set up properly.

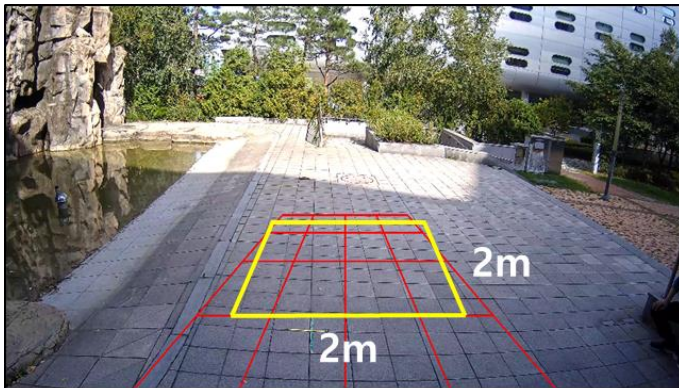


③ [Camera height] The value is set up higher than the actual camera height.

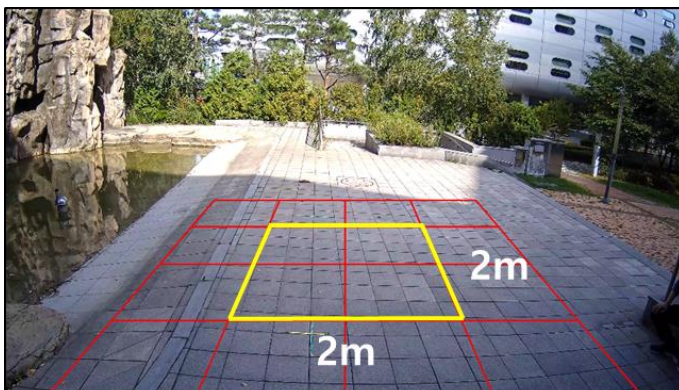
(3) Focal length

- Enter the focal length of a camera.
- To enter current focal length value, please refer to 'Current focal length' from the web page. (For box type cameras, enter actual focal length value of a lens, not 'current focal length'.)
- The focal length of a camera can be adjusted by 0.1mm from 3.9mm to 10mm.
- The perspective of grids in the video can be adjusted by changing the focal length of a camera. The size of one grid in the video equals to 1m in actual objects.
- Examples:

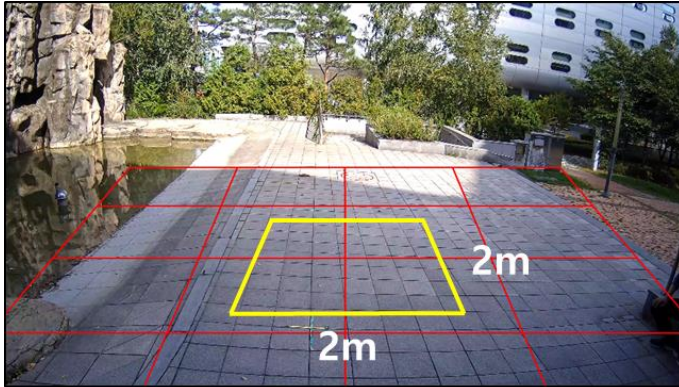
Below images show how camera's focal length can change the size of grids. The grids in red lines are provided for illustration purpose and may vary in the setting page. The square in yellow lines represents the actual size of objects.



① [Focal length] The setting value is lower than the actual focal length of a camera.



② [Focal length] The value is set up properly.

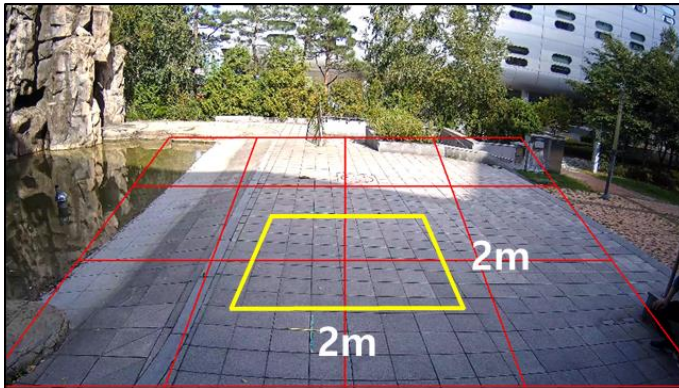


③ [Focal length] The setting value is higher than the actual focal length of a camera.

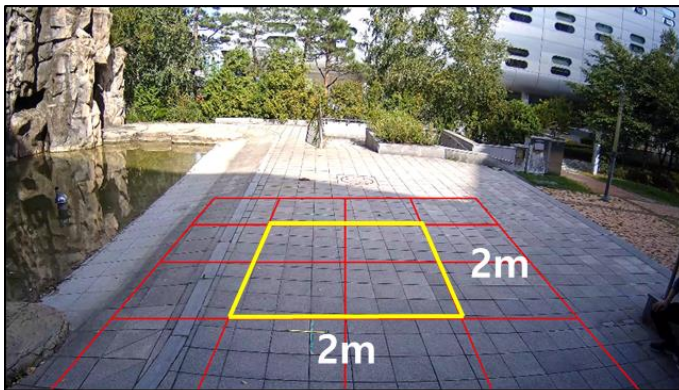
(4) Tilt

- Enter the vertical tilt angle of a camera lens.
- The direction a camera lens is facing the ground is 0 degrees.
- Tilt can be adjusted by 0.1 degrees from 0 to 85 degrees.
- If the tilt angle is configured smaller than the actual angle, the grid is unparallelled to the ground and tilted upward (sky).
- If the tilt angle is configured larger than the actual angle, the grid is unparallelled to the ground and tilted downward (ground).
- Adjust the tilt angle to keep the grid parallel to the ground. The size of one grid in the video equals to 1 meter in actual subjects.
- Examples:

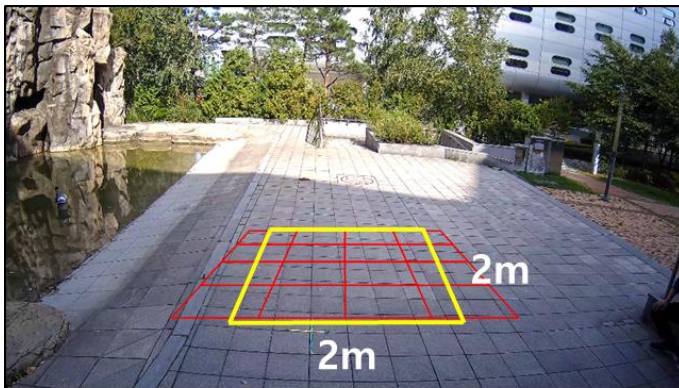
Below images show how tilt angle can change the size of grids. The grids in red lines are provided for illustration purpose and may vary in the setting page. The square in yellow lines represents the actual size of objects.



① [Tilt] The setting value is lower than actual tilt angle of a camera.



② [Tilt] The value is set up properly.



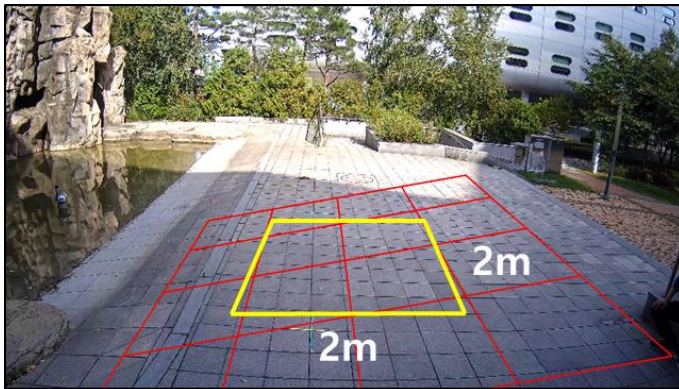
③ [Tilt] The setting value is higher than actual tilt angle of a camera.

(5) Rotation

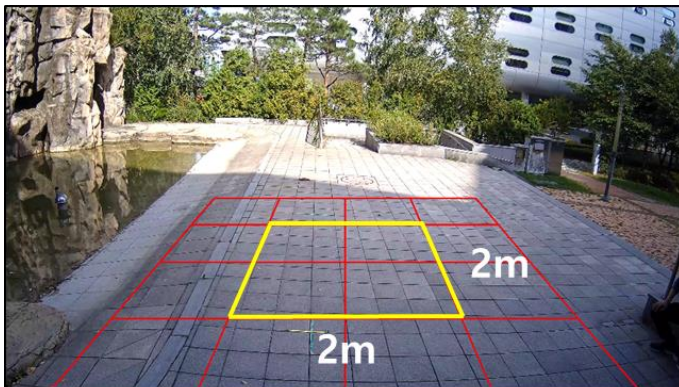
- Enter the horizontal tilt angle of a camera lens.
- Rotation angle can be adjusted by 0.1 degrees from -20 to 20 degrees.
- If the rotation angle is configured larger than the actual angle, the grid is tilted to the right.

- If the rotation angle is configured smaller than the actual angle, the grid is tilted to the left.
- Adjust the rotation angle to keep the grid parallel to the ground. The size of one grid in the video equals to 1 meter in actual subjects.
- Examples:

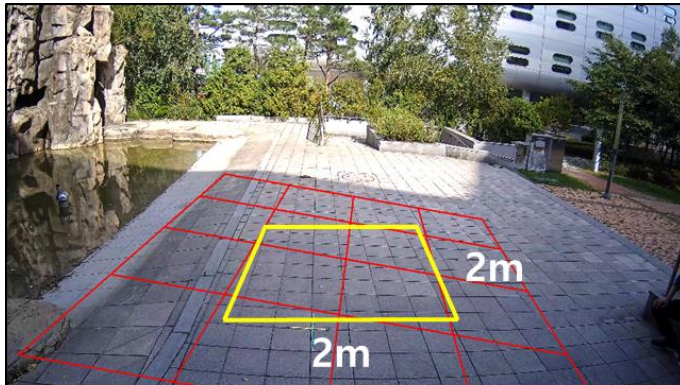
Below images show how tilt can change the size of grids. The grids in red lines are provided for illustration purpose and may vary in the setting page. The square in yellow lines represents the actual size of objects.



① [Rotation] The setting value is lower than the actual rotation angle of a camera.



② [Rotation] The value is set up properly.



③ [Rotation] The setting value is lower than the actual rotation angle of a camera.

- Variables of Social Distancing setting

- Users can configure minimal distance and observation time.
- Users can configure event trigger conditions according to desired policies.

(1) Minimal distance

- Users can configure the distance between objects subject to triggering Social Distancing Detection events.
- Events can be triggered when an object is closer than the preset minimal distance.
- Minimal distance can be adjusted by 0.5 meters from at least 1 to 4 meters.

(2) Minimal observation time

- Users can configure minimal time to detect the distance between objects and trigger events of Social Distancing Detection.
- Events can be triggered if the distance between two objects remain closer than the minimal distance for more than minimal observation time.
- Minimal observation time can be adjusted by 1 second from 0 to 5 seconds.

- Examples of adjusting grids

(1) Enter the camera height.

- Enter the height a camera is installed.

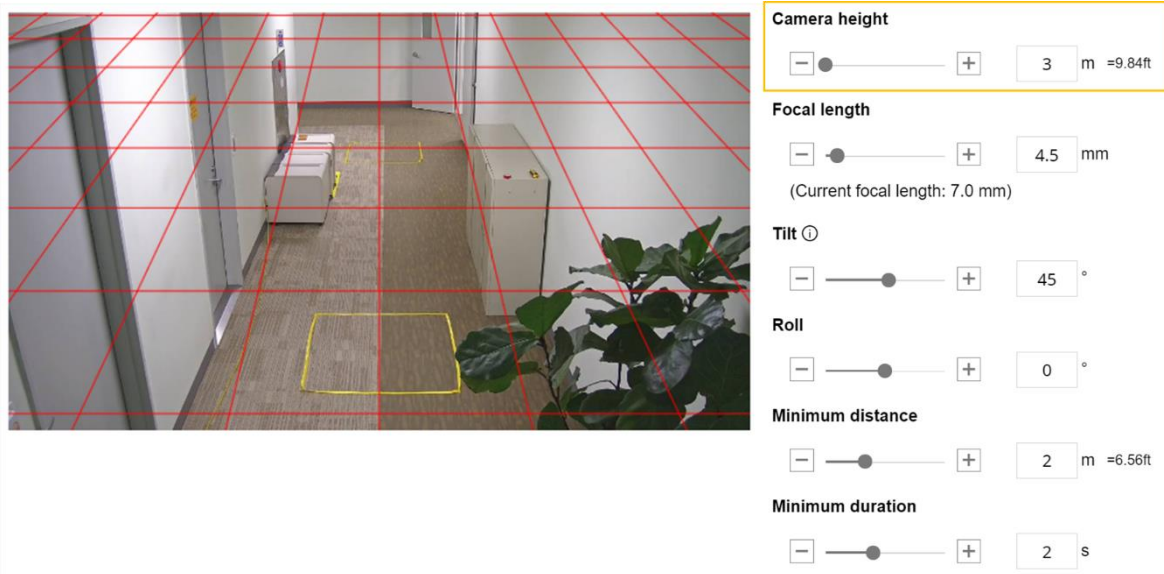


Image 18. Camera height configured at 3 meters

(2) Enter focal length.

- To enter current focal length value, please refer to ‘Current focal length’ from the web page. (For box type cameras, enter actual focal length value of a lens, not ‘current focal length.’)

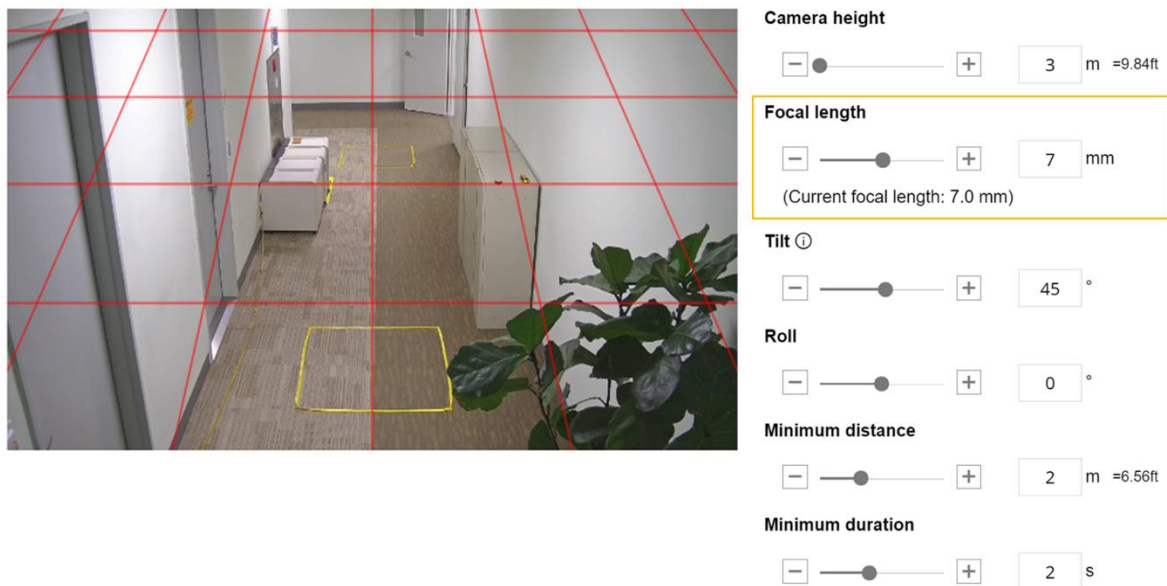


Image 19. Focal length configured at 7mm

(3) Enter rotation angle.

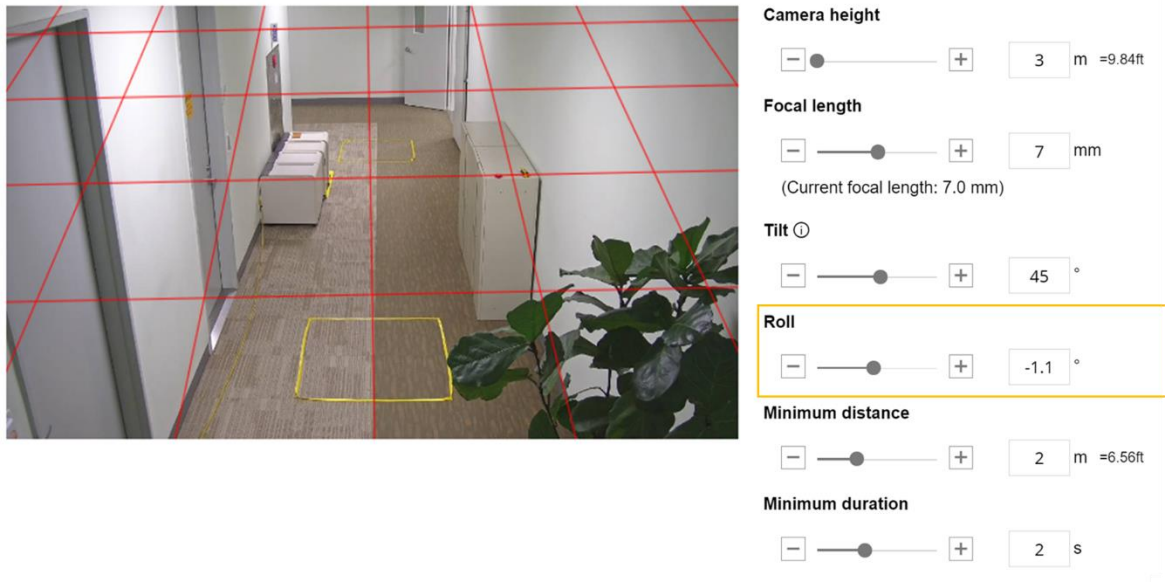


Image 20 Camera rotation angle set up at -1.1 degrees

- Consider boundaries of the ground and the walls when adjusting the rotation angle.

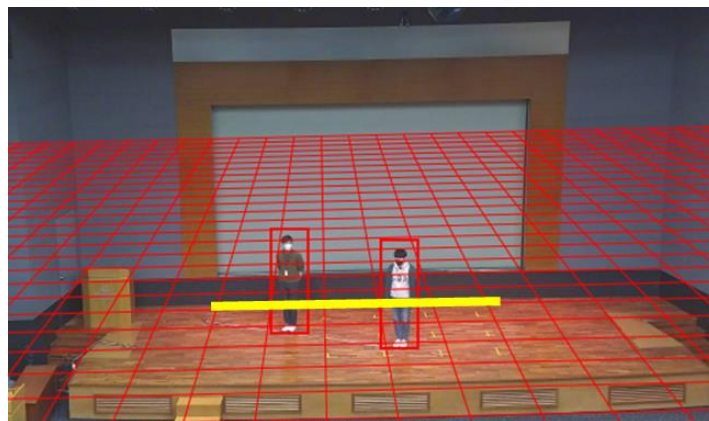


Image 21. Example of setting camera rotation angle

(4) Enter tilt angle.

- Match the size of 1 meter in actual subjects and grids.

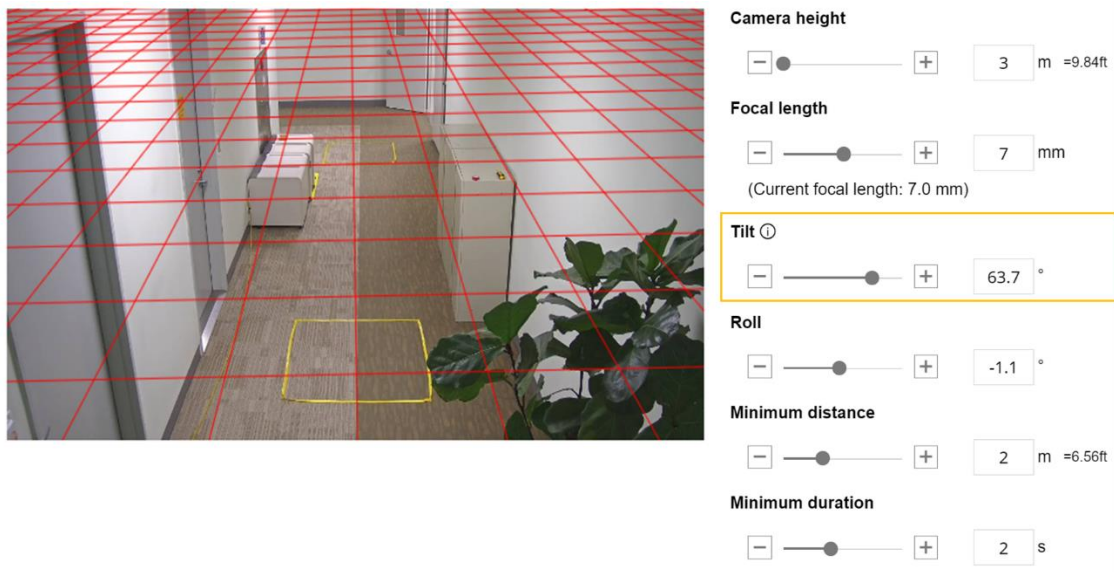


Image 22. Camera tilt angle configured at 63.7 degrees

(5) For box type cameras, if the value of focal length is not precise, the width and the depth of grids might not match their actual size. Adjust the focal length before changing tilt and rotation angles.

3.8. Field of View

When using Wisenet AI cameras, it is recommended to keep a straight horizon line for aligned images.

Objects should be right-side-up for reliable performance.

If an image in camera is reversed, go to 'Setup' > 'Video and Audio' > 'Video setup' and enable 'Upside down' or 'Left and right reverse.'

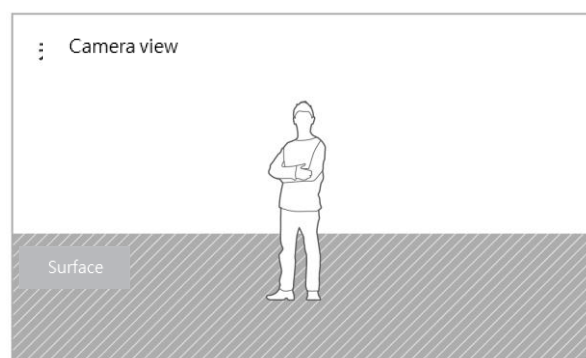


Image 23. Recommended Field of View

3.9. Precautions for camera installation

False or failed detection could result if cameras are not properly installed according to recommended requirements. The following conditions can reduce the cameras' performance.

- 1) Camera installation angle at less than 30 degrees (Direct under)
- 2) Challenging lighting conditions with shadows or low-light environments
- 3) Scenes with strong background lighting such as direct sunlight, backlighting, or direct lighting

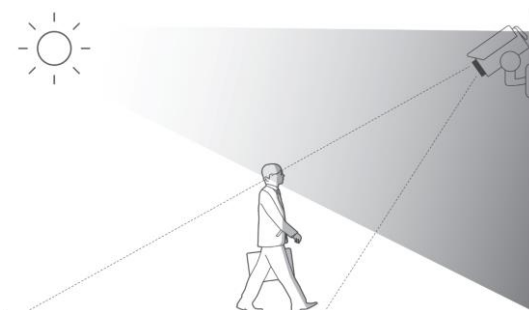


Image 24. (Undesirable condition) When cameras get affected by direct sunlight and light, or backlighting

- 4) Motion blur caused by slow shutter speed or low frame rate
- 5) Increased Dynamic Range¹
Dynamic range can be reduced with Wide Dynamic Range (WDR).
- 6) Objects have similar illumination or color as the background.
- 7) Random objects occlude different objects



Image 25. (Undesirable condition) When random objects occlude different objects

¹ Dynamic Range: The difference between the darkest and the lightest tones in an image

- 8) Several objects moving together
- 9) Objects reflected in reflectors such as mirrors



Image 26. (Undesirable condition) When objects are reflected in reflectors

- 10) Objects moving fast
- 11) To detect fast moving objects, it is recommended to increase the field of view.
- 12) Designating object detection size as smaller than its actual size
- 13) Designating object detection size as bigger than its actual size
- 14) The ratio of the object's size to the whole image is too large.
- 15) Object occlusion or partial objects can still be detected in Object detection, but can cause false positives as the detection is enabled only by attributes from detected areas.

Hanwha Techwin's Wisenet AI cameras provide top notch video analytics technologies through AI. By accurately detecting and classifying attributes of meaningful objects (person, vehicle, face, license plate, etc) in video surveillance, users can utilize the information in various applications.

Hanwha Techwin offers a range of video analytics that can take full advantage of camera devices (systems). All video analytics features adopt intuitive Webviewer of cameras for easy configuration and operation. The features are expected to help users build efficient video surveillance systems and engage in systematic information gathering and analysis.

WISeNeT

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