White paper

AI based Low-light Image Processing Technology

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1. Introduction

Noise occurred in the captured image can be classified into a Temporal Noise that noise changes over the time and a Fixed Pattern Noise that noise occurs in a fixed form. Temporal Noise occurs due to irregular motion generated from the heat of electrons inside the semiconductor, and the size is proportional to the absolute temperature. Fixed Pattern Noise occurs due to the spatial property variation generated between pixels close to each other.

In low light environments, if gain level is increased in order to raise sensitivity in low light environments, noise is amplified as much as signal is amplified. In extreme low light environment where the amount of light is insufficient, noise remains the same while the components of image signals decrease, resulting in greater noise effects. This noise degrades the image discrimination power and increases the size of the data when compressing image which causes reduction of transmission and storage efficiency.

Generating high quality images in low light conditions is a fundamental and essential element of video surveillance camera, and noise reduction technology is especially important for network based video surveillance camera in order to provide transmission and storage efficiency.

2. Wisenet noise reduction technology **wisenet**

2.1. WiseNR II (Wise Noise Reduction II)

The latest noise reduction technology, WiseNR II , utilizes AI object detection technology to identify object appearance/ movements and remove motion blur adaptively in low light environments with large amounts of noise. In a scene without any objects or movements, a lot of noise is removed to deliver clear images, while in a scene with object appearance and movements, noise removal is adjusted to an optimal level to reduce motion blur and maintain as much contour information of moving objects as possible. This effectively resolves the issue of image blur and ghosts effect caused by excessive noise reduction.
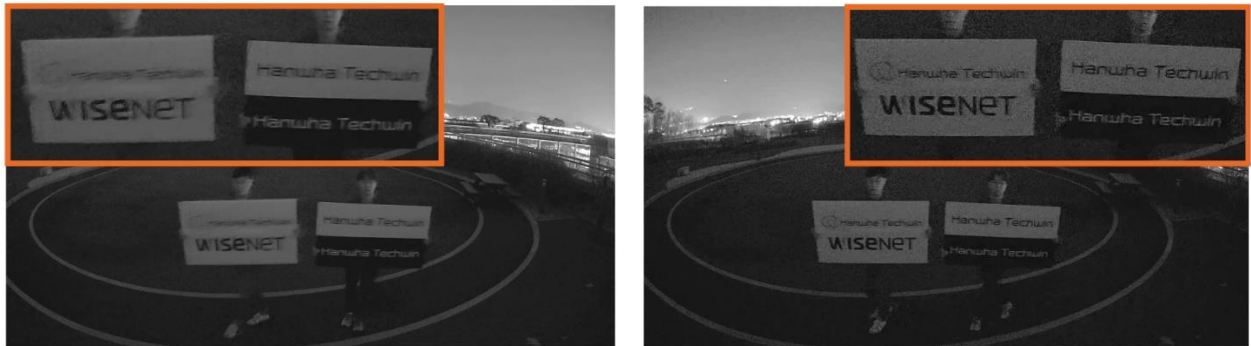

Image 1. WiseNR II (Left. WiseNR II off, Right. WiseNR II on)

2.2. AI based Prefer Shutter

Unlike conventional technologies that mainly controlled high speed shutters to reduce motion blur, AI based Prefer Shutter technology utilizes the latest AI technology to identify appearance and movement of objects and readjusts the Prefer Shutter value to an optimal level to effectively improve noise and reduce motion blur. In a scene without objects, shutters are automatically adjusted to low speed to maintain low levels of noise as well as bright and clear images. In a scene with lots of object appearance and movements, shutters are adjusted to high speed to reduce motion blur and deliver clear images.

Image 2. Use of AI based Prefer shutter
(Left) Low speed shutter in a scene without object movements
(Right) High speed shutter in a scene with object movements

2.3. Configuring noise reduction features

Users can select Hanwha Techwin's noise reduction features. It is recommended to select the Wise NR option in the environments where there are lots of object movements in a scene.
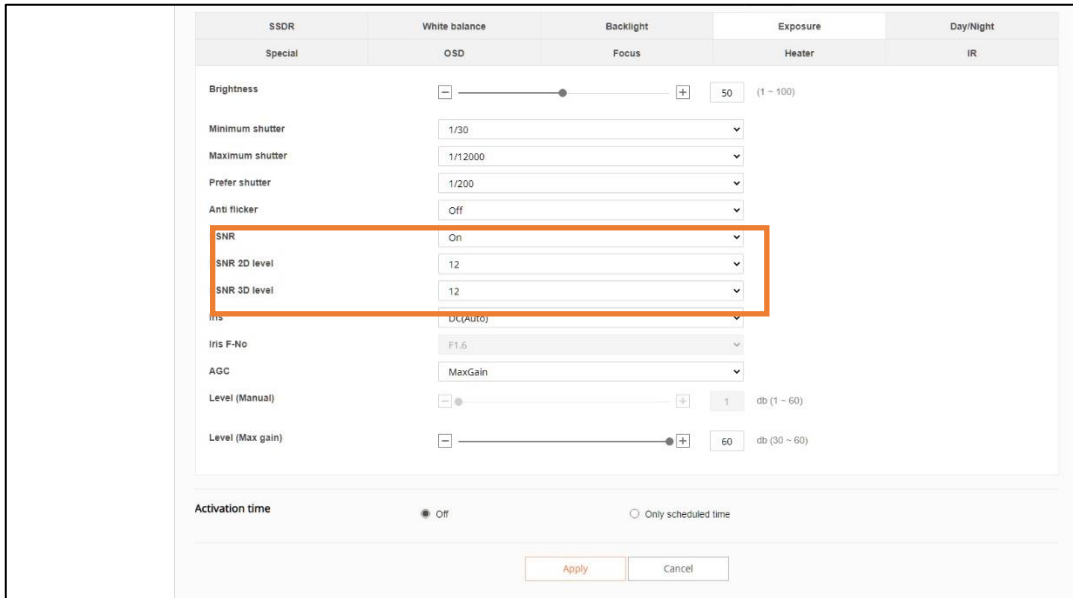

Image 3. WiseNR II setup

Menu : Camera Webviewer → Setup → Video & Audio → Camera setup → Exposure

3. Conclusion

Hanwha Techwin's latest AI based low-light image processing technology offers efficient monitoring of detected objects in low-light environment. Also, it helps to capture the cutting-edge BestShots, one of the most important features required in AI camera. It greatly enhances the efficiency of videos by removing inevitable noises and minimizing objects' motion blur based on analyzed AI data.

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