

ABSTRACT

The image quality of low-resolution home security cameras often presents a challenge in object identification, especially in low-light conditions or long-distance viewing. Blurry and poorly detailed images can significantly reduce the effectiveness of a surveillance system. While the ideal solution is to replace the hardware with a premium camera such as the GUOANVISION 12MP 4K, this is impractical and quite expensive for home users. Therefore, this study seeks an alternative solution through a deep learning approach to improve image resolution without modifying the existing hardware. The method used is the Super-Resolution Generative Adversarial Network (SRGAN). Based on the literature, SRGAN is capable of generating photorealistic high-resolution images through two main components: a generator and a discriminator, which work competitively to refine fine image details. To prove its effectiveness, SRGAN was tested on V380 Pro CCTV images and compared with the ESRGAN method using the objective metric PSNR (Peak Signal-to-Noise Ratio). The test results demonstrate the superiority of SRGAN in all test frames. The first frame recorded a PSNR of 20.63dB (SRGAN) versus 20.28dB (ESRGAN). In the second frame, SRGAN produced 35.94dB, significantly exceeding ESRGAN's 31.83dB. The third frame also showed similar results: SRGAN achieved 28.47dB, compared to ESRGAN's 25.94dB. With these significant improvements, SRGAN has proven to be able to approach the image quality of GUOANVISION 12MP 4K, making it a cost-effective and effective solution for home CCTV camera-based surveillance systems.

Keywords: Super Resolution Generative Adversarial Network (SRGAN), Enhanced Super-Resolution Generative Adversarial Network (ESRGAN), Low Resolution, High Resolution, CCTV, Peak Signal-to-Noise Ratio (PSNR).