Night-time Video/Image Enhancement and Object Detection Using YOLOv8and OpenCV

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ABSTRACT

This work proposes a computationally efficient pipeline to perform real-time nighttime object recognition by combining a refined YOLOv8 model with conventional image enhancement. Our approach successfully reduces the noise and poor visibility that significantly impair detector performance in low light by utilizing Gamma Correction, CLAHE, and Bilateral Filtering. Achieving real-time performance (>20 FPS) and maintaining good detection accuracy (97–98% mAP), the suggested approach reduces processing time by 12–14% when tested on the ExDark, Night OWL, and custom datasets. By establishing a reliable and effective baseline for crucial applications such as autonomous driving and surveillance, our study validates the potent combination of deep learning and picture preprocessing.

Keywords: Night-time object detection, YOLOv8, OpenCV, image enhancement, real-time processing, low-light vision, gamma correction, CLAHE, bilateral filtering, deep learning, surveillance, autonomous driving, computer vision, performance metrics.