Bridging AI and Urban Safety: A Real-Time License Plate Recognition System for Sustainable and Inclusive Cities

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Abstract:

This paper introduces a hybrid framework for automatic license plate recognition (ALPR) that integrates classical image processing with modern deep learning to provide accurate, real-time vehicle identification. Designed not only for technical efficiency but also for societal benefit, the system enables law enforcement, transportation planners, and civic authorities to enhance public safety, promote lawful road usage, and support smart urban governance. By leveraging OpenCV-based preprocessing with a deep convolutional neural network (CNN) for character recognition, the system performs reliably across challenging conditions such as low lighting, glare, and motion—achieving robust results at high video frame rates. Beyond technical performance, this research contributes to broader sustainable development goals (SDGs), particularly SDG 11 (Sustainable Cities and Communities), SDG 16 (Peace, Justice, and Strong Institutions), and SDG 9 (Industry, Innovation, and Infrastructure). It offers a scalable, cost-effective solution for real-time surveillance, access control, traffic analytics, and detection of fraudulent activity, particularly in high-risk or underserved urban areas. The system's ability to function autonomously and responsibly in complex environments positions it as a tool for fostering safe, inclusive, and data-driven urban ecosystems. By embedding AI technologies into public infrastructure in a human-centered way, this work bridges the gap between innovation and impact, setting a foundation for future AI systems that prioritize both performance and social good.

Keywords:

Automatic License Plate Recognition (ALPR), Deep Learning, Smart Cities, Public Safety, Sustainable Development Goals (SDGs).