ABSTRACT

Parking space scarcity in urban environments is an escalating challenge driven by the growing disparity between parking demand and supply, primarily fueled by the rise in car ownership. This necessitates the development of scalable, efficient, reliable, and affordable parking management systems for major cities. This project proposes a solution leveraging deep learning techniques, specifically utilizing Mask R-CNN for car detection and Shapely for Intersection over Union (IoU) calculations to ascertain parking space occupancy.

The proliferation of cars in urban areas has led to a critical need for effective parking management systems. The proposed solution addresses this need by harnessing the power of deep learning, which has demonstrated remarkable capabilities in various computer vision tasks in recent years. By employing state-of-the-art algorithms such as Mask R-CNN, the system aims to accurately detect cars within parking lots, laying the foundation for efficient parking space management.

The system's architecture is designed to streamline the parking management process, consisting of three major components: parking spot detection, car detection, and IoU calculation. Each frame of the input video undergoes car detection using Mask R-CNN, which identifies cars and their corresponding bounding boxes. These bounding boxes are then utilized to compute IoU values between the detected cars and the parking spot coordinates.

The IoU metric serves as a pivotal tool in determining parking space occupancy, as it measures the overlap between the detected cars and the predefined parking spots. A threshold-based approach is employed, where parking spots with IoU values exceeding a certain threshold are classified as occupied. This allows for real-time monitoring of parking space availability, enabling prompt action to be taken in response to changing parking dynamics.