

Smart Urban Solutions: Alleviating Traffic Congestion with Innovations in the Detection and Localization of Free Street Parking Spaces through Artificial Intelligence and Motion Estimation

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Abstract

The pervasive issue of traffic congestion in metropolitan areas has led to numerous challenges, including delays, increased fuel consumption, environmental pollution, and a diminished quality of life. Additionally, the search for available parking spaces further exacerbates these problems, impacting productivity due to significant time wastage. Current solutions, either confined to parking lots or reliant on impractical street sensors and stationary cameras, fall short inaccurately identifying individual free street parking spots. This technical talk will present an innovative real-time street parking detection and localization system designed for both human-driven and autonomous vehicles. The proposed solution integrates seamlessly into modern vehicles, utilizing live video feeds from built-in navigation and obstacle avoidance cameras. By leveraging convolutional neural networks, video global motion analysis, and a distance measurement technique, this system ensures accurate detection and precise localization of vacant street parking spaces. The discussion will highlight efforts to eliminate the impact of car speed, prevent redundant detection during abrupt stops, and reduce computational costs and complexity. A unique and comprehensive dataset, tailored for this specific objective, will be introduced, serving as a cornerstone for training and evaluating established object detection network architectures. The goal is to identify an architecture that strikes the optimal balance between accuracy and computational efficiency, aligning with the prerequisites for seamless integration into each vehicle.