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Hands-off Parking: Deep Learning Gesture-based System for Individuals with Mobility Needs

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Abstract : Nowadays, individuals with mobility needs face a significant challenge when docking vehicles. In many cases, after parking, they encounter insufficient space to exit, leading to two undesired outcomes: either avoiding parking in that spot or settling for improperly placed vehicles. To address this issue, the following paper presents a parking control system employing gestural teleoperation. The system comprises three main phases: capturing body markers, interpreting gestures, and transmitting orders to the vehicle. The initial phase is centered around the MediaPipe framework, a versatile tool optimized for real-time gesture recognition. MediaPipe excels at detecting and tracing body markers, with a special emphasis on hand gestures. Hands detection is done by generating 21 reference points for each hand. Subsequently, after data capture, the project employs the MultiPerceptron Layer (MPL) for in□depth gesture classification. This tandem of MediaPipe's extraction prowess and MPL's analytical capability ensures that human gestures are translated into actionable commands with high precision. Furthermore, the system has been trained and validated within a built-in dataset. To prove the domain adaptation, a framework based on the Robot Operating System (ROS), as a communication backbone, alongside CARLA Simulator, is used. Following successful simulations, the system is transitioned to a real-world platform, marking a significant milestone in the project. This real vehicle implementation verifies the practicality and efficiency of the system beyond theoretical constructs.

Keywords : gesture detection, mediapipe, multiperceptron layer, robot operating system
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