ENVIRONMENT PERCEPTION SYSTEM FOR SMART VEHICLES

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ABSTRACT

Navigating today's advanced automotive world, drivers face the peril of blind spots, especially during maneuvers like parking or lane changes, which can lead to severe accidents. Existing aids, such as mirrors and sensors, are no longer adequate, underscoring the need for a more technologically integrated approach to enhance driver awareness and safety.

Our project, aimed at neutralizing blind spot hazards, responds to the demand for an advanced system capable of providing clear visuals, accurate object distance, and a bird's-eye view, all in real-time to facilitate quick driver decision-making. The 'Environment Perception System for Smart Vehicles' is an innovative Advanced Driver-Assistance System (ADAS). It incorporates four stereo fisheye cameras and an NVIDIA Jetson Nano processor, a blend that enabled the creation of a multi-functional visual aid. This system processes integrated camera feeds, employing advanced algorithms to eliminate distortion and measure object distances, compiling a unified bird's-eye view. The user-friendly interface, controlled via pushbuttons, allows easy switching between functions designed for parking, lane changes, and distance alerts.

The final product stands out as a robust ADAS, merging state-of-the-art hardware and software to deliver essential visual input to drivers. It guarantees an 81° field of-view, monitors object distances within 23 meters, and presents a detailed bird's-eye view within 3 meters, all at a smooth 10 fps. Its intuitive control panel ensures user-friendly operation across its various features.

Significantly, our system delivers over 90% accuracy in object detection, essential in high-speed contexts, setting it apart in the market. Its bird's-eye view feature simplifies previously complex driving tasks. By offering real-time, high-caliber visual information, we edge closer to autonomous driving technology, playing a pivotal role in evolving safety standards and influencing the automotive industry's trajectory.

Index Terms *— Advanced Driver Assistance Systems (ADAS), bird's-eye view.*