Chapter 15
Virtual and Augmented Reality in the Automobile Industry: Applications and Future Directions

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ABSTRACT

This survey paper aims to discuss the areas of enhancement of virtual reality (VR) and augmented reality (AR) in the automotive industry: the basic principles, practice, problems, and points of improvement. It also emphasizes the application of VR in design improvement, prototyping and manufacturing, and sales presenting extraordinary experience and increased efficacy. Applications of AR in repair and maintenance, navigations, and driver assistance are analyzed with reference to

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enhancements of diagnostics, trainings and safety. Some of the issues that stem from the implementation of the two technologies include; technicalities, costs and acceptability by users. Finally, the paper outlines a future outlook touching on future trends and how VR and AR need constant enhancement and deployment in the automotive industry.

1. INTRODUCTION TO VIRTUAL AND AUGMENTED REALITY IN THE AUTOMOBILE INDUSTRY

1.1 Overview of VR and AR Technologies

Virtual Reality (VR)

Virtual Reality (VR) is an aspect of interactive digital environment which involves one's physical experience of it. The users wear virtual reality headsets like Oculus Rift, HTC Vive, or PlayStation VR to access a fully created world where they can even have a possibility to touch 3D objects and navigate through virtual space. The technology that supports VR is comprised of several elements that include head mounted displays (HMDs), motion sensors and handheld controllers(Anthes et al 2016). These elements together make it possible to allow users to feel and to interact with Virtual Real Environment as if they were real environments and enable one to simulate given situations(Singh N and Singh S 2017),.

Augmented Reality (AR)

While on the other hand, the augmented reality (AR) provides a closer look of the physical world by placing computer-generated images or label over the real environment(Huang et al 2018). AR uses instruments like smart phones and tablets, AR glasses (like Microsoft hololens) and Heads Up Displays (HUDs) in cars. With these devices, users are able to view digital content overlaying the real world the users are in(Aswini et al 2023). AR covers simple ones such as navigation direction shown on the windscreen of a car up to fully interactive ones such as an augmented repair manual to provide the steps to repair part of a car and has the instructions shown on the parts of the automobile.