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Perspective of Reality

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***Abstract* - Augmented reality known as AR changes the vision with which people look at the real world.AR is a direct view of physical, real-world environment just by augmenting elements. Unlike virtual reality, where a new digital world is created, AR just alters the actual world.GPS has become so widespread that most people couldn't live without it. One annoying aspect is that you generally have to take your eyes off the road to see the directions, along with turn-by-turn directions being difficult to line up to the actual road at times. To avoid this inconvenience, we can use AR to augment labels or tags which display directions, land marks, distances etc by wearing special AR glasses. These labels or tags should be limited, to avoid clumsiness to the driver. The final target is to make a system such that user cannot find the difference between scene of a real world and its virtual augmentation. Including AR applications makes our lives more productive, more safer, and more informative.**

I. INTRODUCTION

Traffic density is increasing on the freeway in large cities and country roads. Just one brief movement of distraction while you are behind the wheel, things get dangerous. One split of second of distractive driving and you are in the wrong lane exposed to an extreme danger. In 90% of all traffic crashes driver negligence is the main contributor. Nearly half of them are related to driver inattention, perceptual errors, or decision errors. Darkness, fog or other circumstances that limits the vision of the driver are not in the top of this list. However, it cannot be underestimated as it is often a combination of these causes that lead up to an accident. Late in the evening for example, when a driver is tired he might hit a pedestrian. The pedestrian is harder to see in the dark and the driver might have been able to see him or her in time if it was broad daylight.

Many solutions have previously been proposed in the automotive industry which typically concentrate in the collection of vehicular and traffic information without effective prioritization of their significance. Safe automobile driving requires drivers to process large amounts of dynamic information under time pressure. However, drivers can attend to only a small percentage of visual stimuli at once. To address this problem, i.e., to mitigate driving problems caused by excessive information, we propose to work on ways to make it easier to see navigation instructions without taking your eyes off the road. We can enable new technology i.e. Augmented Reality to seek attention of drivers driving during odd nights thus reducing the risk of accidents.

Augmented reality (AR) is a computer graphics technology that supplements a real environment with virtual objects or information based on computer technology. The level of immersion users experience in AR systems is an important aspect to seamlessly blend digitally created objects with the real world. AR is being used in several disciplines nowadays but the use of it in traffic is rare. Road traffic injuries put significant strain on health care budgets. For everyone killed, injured or disabled by a road traffic crash there are countless others deeply affected. Many families are driven into poverty by the cost of prolonged medical care, the loss of a family breadwinner or the extra funds needed to care for people with disabilities. Road crash victims, their families, friends and other caregivers often suffer adverse social, physical and psychological effects. AR decrease the problems faced by drivers driving at night times, at different climatic conditions especially during monsoons, backing and parking problems. That is why it might be interesting to analyse the use of augmented reality in this sector.To support this task, a possible solution could be the introduction of technology, specifically Head-Up Display (HUD).

Head Up Display and Augmented Reality in automotive context

The mode of display on the windshield or Head-Up Display (HUD) can be part of the solution for displaying information from systems to the driver. HUD being defined as "any transparent display that presents data without requiring users to look away from their usual viewpoints." Furthermore, the Augmented Reality (AR) concept, where the information displayed on the windshield is matching with elements of the real road

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scenery and has the potential to be presented at the place where the cause for the need of information presentation is located, reduces the number of glances to get critical visual information relevant for the driver.

Heads Up Display Concept:

HUD technology originated in military aviation applications and allowed for navigational, armament and vehicle information to be displayed upon an aircraft's windscreen directly in the pilots forward field of view. The application of this method of information provision allowed pilots to maintain their forward field of view, as well as see aircraft information. This resulted in an improvement in pilot efficiency. This allowed for an alternative means for information display, allowing critical information to be relayed in-flight by projecting it onto the windscreen. This system was beneficial to pilots, as they no longer needed to look below their line of sight to read specific instruments critical to their mission.

Since the late 1960s, HUD technology has been a possible solution for improving the negative aspects associated with complex in-dash displays. Using this technology, information can be presented to the vehicle driver without their need to move their eyes from the road, and, as a result, improving driver awareness. By projecting graphics in front of the driver's direct line of sight, the concurrent display of computer generated information with information from the outside world can be combined. This image projected onto the windscreen allows drivers to maintain their attention on the road by presenting the information within their forward field of view. A reduction in the eye-off-road time is achieved, allowing for increased awareness of what is happening on the road. Some of the HUD shortcomings can be overcome by the Augmented Reality (AR) concept. HUD-AR display is discussed for several types of functionalities useful in driving context:

HUD-AR and Driver's assistance functionalities:

Considering the potential advantages and to test the perverse effects, the HUD-AR types of display have been studied for several drivers assistance functionalities.

1. Drive path support

Lutz Lorenz & al. tested AR display to indicate safe corridor for lane change for the driver to safely take over. They showed an improvement of the take-over process by two positive aspects related to AR display in comparison with reference situation: 1) more drivers used the brake pedal to reduce speed, which is generally a positive indicator in terms of safety.2) all drivers steered and braked in a very similar manner, as the trajectories showed. Nevertheless, it was not assessed how drivers would have follow an adverse recommendation, e.g. in case a car would have been in the blind spot or approaching fast. Furthermore, this study showed that in situation of lane change, AR conditions tend to make drivers to look at the side mirror later than drivers not supported by AR information, as the drivers' visual attention was firstly attracted to the AR information on the road. Indeed, it was only after interpreting this AR information that drivers started checking the side mirror to prepare for the lane change.

Lane keeping: Lane keeping can be especially critical for inexperienced drivers and lane-keeping support can be very desirable for bad weather conditions and darkness. The AR concept allows underlining the drive path, making it then more salient for the driver.

HUD-AR for lane keeping support

Displaying the drive path in AR can improve lane-keeping behaviour by decreasing the lane deviation

2.Detection of critical road events

Drivers must beware of vehicles, road hazard, lanes, pedestrians and traffic signs while controlling vehicle speed and directions. All these works increase physical and mental workload, which is dangerous especially for elderly and people with slow recognition and responses. Therefore, an alarm that alerts the driver of a danger in the road can help to minimize driver workload and reduce vehicle accidents. The fact to display critical road event on the windshield can help driver's hazard event detection.

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HUD-AR for obstacle detection support

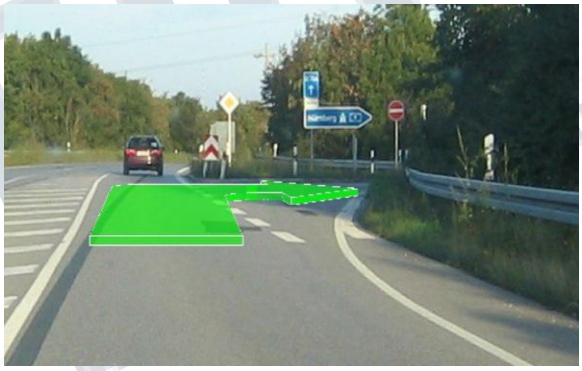
3 Night vision

AR display can improve visualization during night, indicating location of pedestrians and obstacle, enabling effective and efficient information transfer directly understandable by the driver.

4 Navigation

Display methods used in current in-vehicle navigation systems are inappropriate for best-practice use. It is argued by many that the incorporation of HUD with existing Vehicle Navigation systems can benefit users in such a way that they improve driver awareness and driving ability. Using a HUD system allows the driver to maintain their vision of the road, but also allows them to navigate and to determine their location whilst mobile. The concept of projecting navigation instructions and guidance onto the windshield using HUD or AR has been investigated for some years with the objective to make decision making easier for the driver orienting himself in various traffic situations and road infrastructure complexities. Indeed, using a GPS-based navigation system displaying on-screen information creates issues of divided attention, drivers having to focus on both the information display and the road, and extra cognitive load in matching the computer-generated streets on the GPS system to the real streets in the 3- dimensional perspective that drivers have. An AR projection can be used to minimize the issue of visual distraction, divided attention and cognitive load by overlaying driving directions on the windshield and on the road, making it easier for the driver to focus attention in one single location and to translate the virtual information to effective navigation instructions. The whole windshield surface is used to project navigation information such as destination and distance combined with the direction, which the driver should follow.

Example of HUD-AR for navigation signs and driving directions projected onto the windshield.



HUD-AR for contact-analog navigation arrow helping the driver to find a way in complex driving situations.

The incorporation of HUD within vehicles can enhance the display of critical information, warning/notifying drivers of system errors or required directional changes. This system therefore could assist driving awareness. Nevertheless, the negative aspects of this technology must also be explored, to ensure the design of a safe usable system.

By investigating and developing guidelines, as well as looking at alternate ways of displaying information to the user, we will be able to assess and determine if the use of HUD technology with vehicle navigation systems are a viable option for enhancing navigation tasks. The actual provision of such a device that includes HUD and In-Car Navigation will depend upon the guidelines developed for displaying the information within the driver's forward field of view. They will be tested and evaluated so as to better understand the overall effectiveness and usability of such a system. The incorporation of HUD within vehicles

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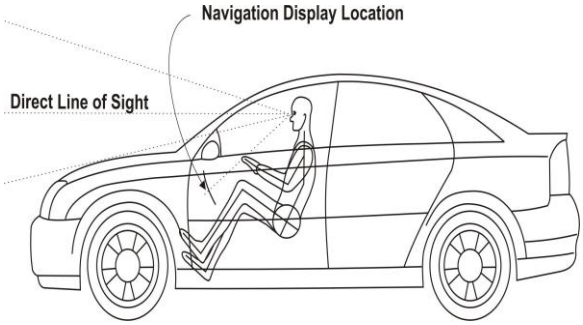
cannot be considered issue free, as it is believed that they present considerable performance and safety issues.



Navigation display location and direct line of sight.

CONCLUSION

The incorporation of HUD technology with In-Vehicle Navigation offers the prospect for negating the negative affects associated with current display methods for electronic navigational guidance. Using this technology can improve driver awareness due to the fact that drivers will no longer need to look below the visionary line of sight of the vehicle, and present navigational information in the form of a modified map on the windscreen. Presenting any information on a windscreen whilst the vehicle is in motion has both positive and negative aspects.

However, the location of the screen and screen components is seen as a big factor in determining if these facets will affect the primary task of driving. Displaying the image in the middle of the screen will cause distraction for the driver, as they need to differentiate between what is on the windscreen and what is in fact actually a real object on the road. An optimal position needs to be determined for projected information display to allow for concurrent driving and information access. Using current guidelines from current In-Vehicle Navigation systems and modifying them for use with HUD technology can improve the driving and navigation task. These guidelines will guide a cartographic design for windscreen-presented navigational information. Testing is needed to determine if this incorporation of HUD and in-vehicle navigation systems is feasible

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