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CALIBRATED HEADS-UP DISPLAY

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ABSTRACT

This article is about heads up displays (HUDs). A heads-up display (HUD) is a technology used in a vehicle's infotainment display system that allows the driver to view an image on the vehicle's windshield or a panel just below the driver's line of sight, or, to put it another way, a display that is wirelessly connected to the internet and shows real-time traffic and navigation information on a car's windshield while driving. The head-up display (HUD), which enables users to simultaneously view a real image and information projected on it without making substantial head movements or eye scans, introduces a new way of displaying information. The head-up display (HUD) invented a brand-new method of information delivery. HUDs have been used for a variety of tasks, including aircraft manipulation, Automobile driving and machinery maintaining to help users better understand their surroundings. The head-up display is far more energy-efficient than the postage-stamp LCD screens used frequently in today's head-up displays for mobile devices. Head-up display screens produce a clean, clear image independent of the lighting conditions outside since they project images directly into the retina. The study above describes how heads-up displays function in real-world situations and specifies three categories of HUD techniques such as head-mounted or ground-referenced, optical see through or video see-through, and single-sided or two-sided types.

KEYWORDS: HUD (Heads-Up Display), Vehicle's Infotainment Display, Vehicle's Windshield, Real Image, information delivery, windshield.

INTRODUCTION

In the amidst the evolution of technology we have become more dependent on devices than we can imagine. This has led to innovation of assorted items to make our lives very stressless and easy. One such innovation includes the Heads Up display in vehicles [1]. This Heads-Up display is in the basic of its level of innovation. There arises some problem when we think of this as it is. Sometimes we might be travelling on a road which contains multiple turns to go to various places. Sometimes the direction we see in our phones might be misleading and it can be the case that we might miss a turn. If we are on a national highway this will cause huge confusion and will waste a lot of time [2]. There can be cases where the green board will show the directions of a few unusual places and when we really arrive at that turning, we might miss it. Hence to avoid all these problems we have produced a solution where we can upgrade the already existing HUDs to an advanced level and provide people with some enhanced technology [3].

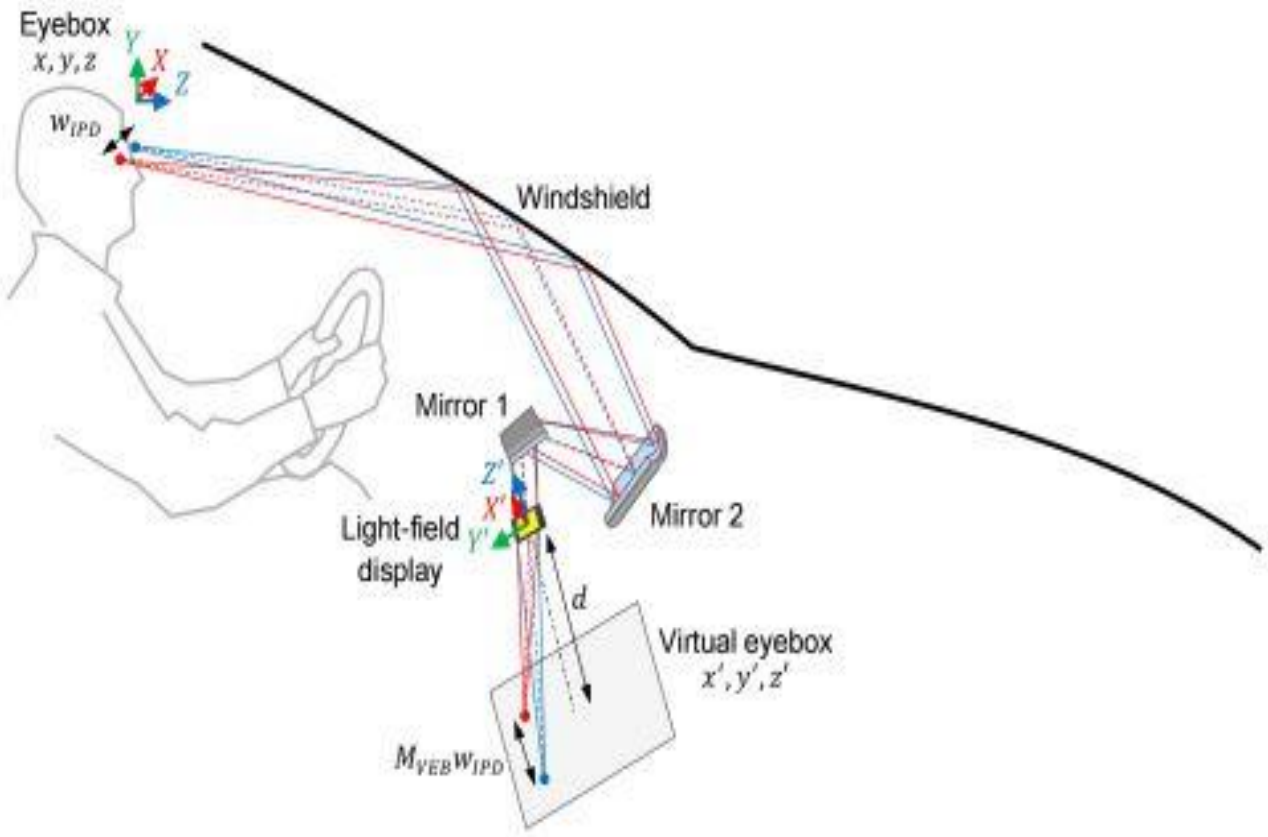

Figure 1: Spectrum of Vision

Literature Survey

For the driver which display is shown in the maps such as take right or left or take your turn to the next upcoming left in the google maps audio or in the car display the driver might feel very confusing or very difficult to watch or listen to the audio while driving so we can hereby solve this problem by heads up display where the display shows where the turn must be taken or how many yards is left for the turn to be taken approximately can be told in the road ,where the vehicle is moving by taking the display of the road through the front camera and display where exactly the turn has to be taken since the driver eyes are focused on the road, driver might feel easy and confident while driving since his eyesight will also be on the road. In many respects, the engineering and marketing departments, rather than the people who will be using the car, are what drive the deployment of technologies like HUD [4]. The combiner shows symbology in relation to the outside view both vertically and horizontally, subtended towards the pilot's vision. HUDs are typically powered by two independent redundant computer systems on aircraft avionics systems. Instead of receiving pre-calculated data from the flight computers, they directly receive input from the aircraft's sensors and carry out their own calculations [5].

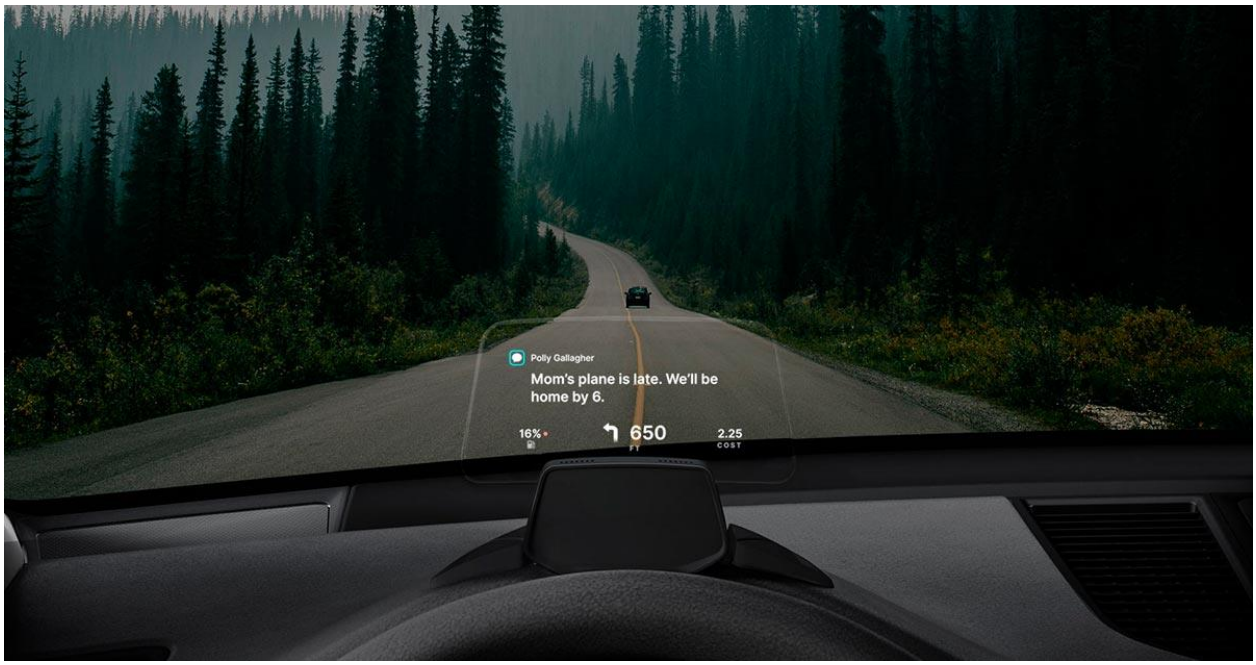

Figure 2: Heads up display

Methodologies Used

1. Category 1:

The speed of the approaching vehicle can also be seen in the heads-up display which is extremely helpful for the driver to control the speed in the scenarios where the traffic police can charge a fine for over speeding within the city limits [6]. Hence, a warning or beep sound is given in the vehicle for over speeding, telling the driver you must reduce the vehicle speed [7].

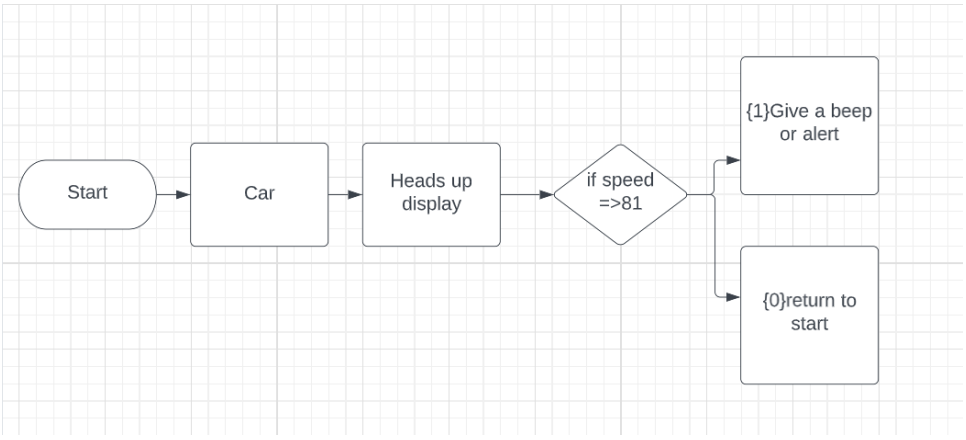

Figure 3: Flowchart of Category 1

An indicator hereby shows where you must take a right turn to reach your destination. But when we view in the google maps it might just show to tell us that take right to 300 yards which might be very confusing so this heads-up display might be extremely helpful to take accurate turns and less time consumption because it guides always to the right direction [8].

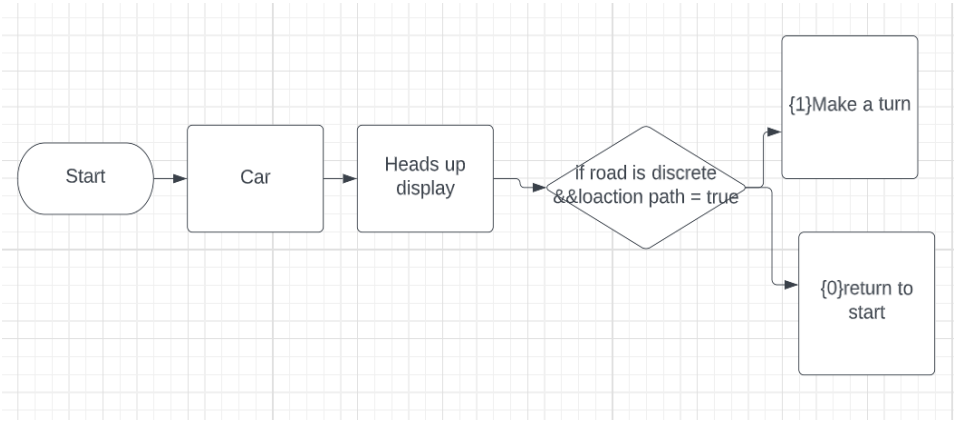

Figure 4: Flowchart of Category 1

2. Category 2:

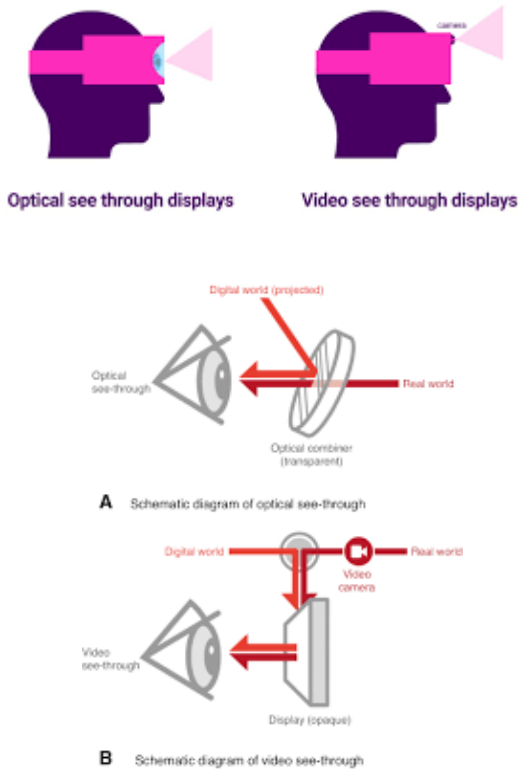

Figure 5: Working flow of events

The driver views the road through a mirror while artificial visuals with graphics are superimposed on it. The HUD (HEADS UP (Unified Process) DISPLAYS) preserves the genuine scene's quality [9].

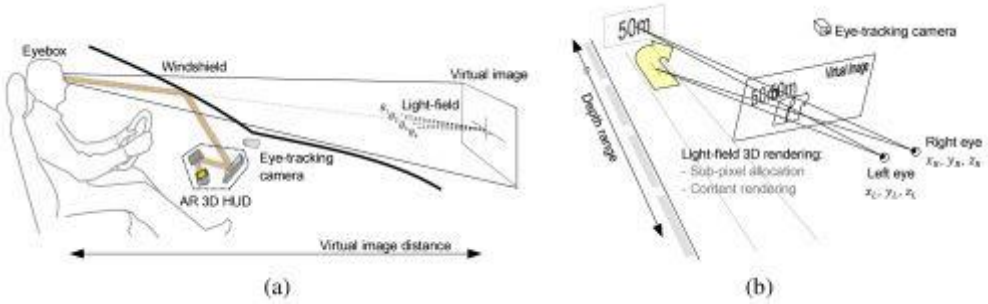

Figure 6: Human Vision

Additionally, the actual scene is compatible with eye accommodation and convergence reactions. The responses, however, do not apply to virtual things. In other words, the user is at a different distance from the genuine picture than the artificial images are [10]. To receive information in both settings, the user's eyes must alternatively adjust to these distances.

3. Category 3:

According to the relationship between the eyes and the Head up Display, HUDs (HEADS UP DISPLAYS) are divided into single-sided and two-sided varieties based on their field of view [11]. Whether images are presented to the eyes is a significant factor that determines the range of relevant fields [12].

Figure 7: Tesla Infotainment System

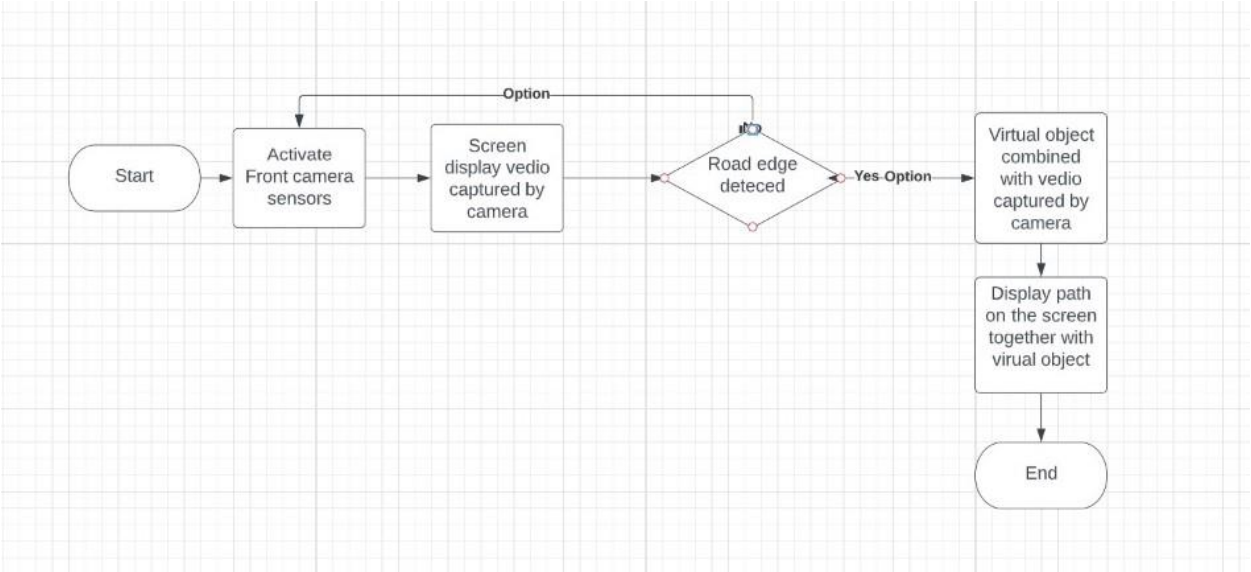

Figure 8: Flowchart of HUD

RESULTS AND DISCUSSIONS OF HEADS-UP DISPLAY

Heads up display is any transparent display that presents data without requiring users to look away from their usual viewpoints [13].

Technology can be used to make our lives easier. One such Tech in the automobile world includes Heads Up display. At the present state, the Heads-up display is in its maximum updated state, but for the upcoming generations there are some ideas where we can advance the screen [14]. We can take the example of the Tesla Infotainment screen where a small car representing tesla is seen on the road and the AI (Artificial Intelligence) uses the camera feed to convert it into an interactive system where the screen shows the exact copy of vehicles on the road. We have played many cars racing games where the map shows the road we must take, and a line will be travelling on the road showing the direction required [15]. A similar user interface can be created for the heads-up display where the road we are travelling will indicate a purple or green line to show us the direction of the destination [16].

Figure 9: Graphical Representations

We can integrate both software and have an interface built, which is the result of this merger [17]. Where the heads-up display will show the real time feed from the front camera of the car. This will have an environment where the car is moving on a screen like the eyesight of the driver. The movement of the car will be updated directly in the screen [18]. Now the technology to be used should be imported in such a way that a line should be drawn Infront of the moving car to show the direction of the destination [19].

General displays will show only the wordings or the arrowhead of the navigation but in the present model the display will show the upcoming road with a line showing the direction of the way. This will be especially useful on highways where there are multiple diversions and one miss in the turning will send you in the wrong way 20]. Hence a single line will correctly show which road we should take.

Figure 10: Expected Looks of advance HUD

In national highway roads there will be boards in such way that will confuse the driver to which road they should take [21]. In situations like these we can use the heads-up display to be more accurate. Here one road will lead to a different city and vice versa. This is also the case when there is a road connecting a fly over and an underpass. A google maps will show a road going straight but will not tell whether it is upwards or downwards. This problem will be solved when we use the new program for heads up display [22]. It will clearly show the individual routes one must take to reach the destination. Extra information can be stored in the database of the car where it shows warnings before arriving at the problem site.

When a car is over speeding on a highway where the speed limit is less than 80 km (about 49.71 mi)/hr. the display will show a warning signaling to slow down.

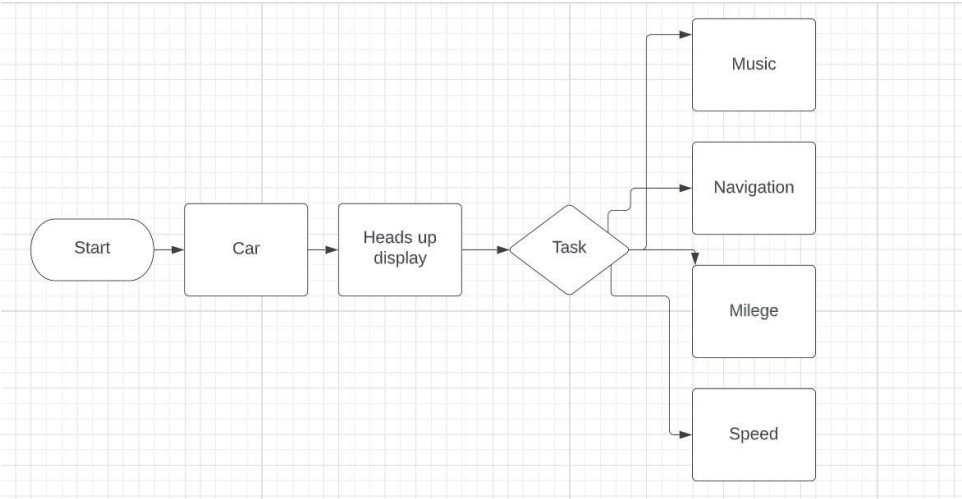

Figure 11: Flowchart of ARHUD

The majority of uses for head-up displays are for professional purposes, mostly in military aircraft, where they were first implemented. The number of industries using HUDs, though, is growing nowadays. Examples include the automotive industry and augmented reality in video games. As an example of an Intelligent Transport Systems case study, we will concentrate on automotive applications, considering novel and experimental HUD uses while first providing a quick introduction to HUDs used on aircraft. A HUD is a tool that can help prevent many causes that contribute to traffic accidents. These include human mistakes, vehicle errors, and the unavoidable accident itself. Human error causes accidents most frequently when people are drowsy, drunk, or distracted while driving.

A HUD is the tool required to address those issues. A HUD system must offer drivers a wealth of data from a variety of categories, such as route guidance/navigation, traffic signs, cargo/road/vehicle conditions, and choose the best way to display this data [23]. Crucial factors to consider include having a user-friendly system because a driver's ability to process this data is a key factor in its acceptance and use. These applications being used in a vehicle will make human life much easier. Overall, this will make humans use a lot of their technical skills to develop such a product. When the finished product is out it will have its own place in the market.

CONCLUSION

Using a Heads-up display will be not only be a satisfactory solution to the given problem but also be a next generation update for the upcoming vehicles. We can use this for heavy vehicles as well. This will help drivers to navigate and not miss any roads on the highway or city roads. Hence, I conclude by saying that when we use precautions like these to upgrade our lives accidents can also be reduced. When I mention accidents, it means when some cars miss a turn, they tend to stop right there only [24]. This will disturb the vehicles coming from behind and might end up hitting the cars that has stopped. Things like these will be reduced when a technology like calibrated Heads-up is introduced into our daily life. Real time examples include when a person is driving in a crowded area and there are so many people on the road that the road will be covered. The person might think that there is no road at all [25]. But if there was a Heads-up display which indicates the road on spot then it would have been easy to take that road.

REFERENCE

1. Asai, K., and Kobayashi, H. (2005). Computer assisted instruction using augmented reality in operating the transportable earth station – Comparison between single-sided and both-sided HMDs-, Proc. Human Computer Interaction International, (CD-ROM, pp. 1- 8, vol. 6 – Human Factors Issues in Human-Computer Interaction)
2. Asai, K., Kobayashi, H., and Saito, F. (2006). Comparative effectiveness of computer-assisted instruction using a head-up display for operation of the transportable earth station, IEEJ Transactions on Electronics, Information and Systems, vol.126, pp. 465-473
3. Azuma, R. T. (1997). A survey of augmented reality, Presence: Teleoperators and Virtual Environments, vol. 6, pp.355-385
4. Bian, Z., Ishii, H., Izumi, M., Shimoda, H., Yoshikawa, H., Morishita, Y., and Kanehira, Y. (2006). Development of a tracking method for augmented reality applied to NPP maintenance work and its experimental evaluation, Proc. ACM Symposium on Virtual Reality Software and Technology, pp. 35-44, Limassal, Cyprus
5. Caudell, T. P., and Mizell, D. W. (1992). Augmented reality: an application of head-up display technology to manual manufacturing processes, Proc. International Conference on System Sciences, pp. 659-669

6. Dede, C. (1986). A review and synthesis of recent research in intelligent computer-assisted instruction, International Journal of Man-Machine Studies, vol. 24, pp. 329-353
7. Fadden, S., Ververs, P. M., and Wickens, C. D. (2001). Pathway HUDs: Are they viable? Human Factors, vol. 43, pp.173-193

8. Minnesota Commercial Driver's Manual, Department of Public Safety, State of Minnesota, 1997.

9. Modjahedzadeh A. and Hess R.A., "A Model of Driver Steering Control Behavior for Use in Assessing Vehicle Handling Qualities," Journal of Dynamic Systems, Measurement, and Control, Vol. 115, 1993, pp.456-464

10. Tripmate, DeLorme Inc., http://www.delorme.com, Two DeLorme Drive, P.O. Box298, Yarmouth, ME 04096.

11. CoPilot, TravRoute Software, http://www.travroute.com, 1000 Herrontown Road,Princeton, NJ 08540.

12. SkyMap, Etak, Inc., http://www.etak.com, 1605 Adams Dr., Menlo Park, CA 94025-1486.

13. CARiN, Philips, http://www.carin.com, Rembrandt Tower Amstelplein 1, 1096 HA,Amsterdam, Netherlands.

14. Lowe J.R. and Ornelas J.R., "Applications of Head-Up Displays in Commercial Transport Aircraft," Journal of Guidance, Control, and Dynamics, Vol. 6, 1983, pp.77-83.

15. Grunwald, A.J., Merhav, S.J., "Vehicular Control by Visual Field Cues-Analytical Model and Experimental Validation," IEEE Trans. on Systems, Man, and Cybernetics, Vol. SMC-6, No. 12, 1976, pp. 835-845.

16. Grunwald, A.J., Robertson, J.B (Jarque Bera)., and Hatfield, J. J., "Experimental Evaluation of a Perspective Tunnel Display for Three-Dimensional Helicopter Approaches," Journal of Guidance, Control, and Dynamics, Vol. 4, 1981, pp. 623-631.

17. Negrin M., Grunwald, A.J., and Rosen, A., "Superimposed Perspective Visual Cues for Helicopter Hovering Above a Moving Ship Deck," Journal of Guidance, Control, and Dynamics, Vol. 14, 1991, pp. 652-660.

18. Hess, R.A. and Gorder P.J., "Design and Evaluation of a Cockpit Display for Hovering Flight," Journal of Guidance, Vol. 13, No. 3, 1990, pp. 450-457.

19. Weihrauch, M., Meloeny, C.C., and Geosch, T.C., "The First Head Up Display Introduced by General Motors," SAE #890288, 1989.

20. Beyerlin, D.G., "New Uses and Image Sources for Head-Up Displays of the Future," SAE #950960, 1995.

21. McCosh, D., "Second Sight," Popular Science, 1998, Oct.

22. Sojouner, R.J., and Antin, J.F., "The Effects of a Simulated Head-Up Display

Speedometer on Perceptual Task Performance," Human Factors, 1990, 32(3), pp.329-339.

23. Steinfeld, A. and Green, P., “Driver Response to Navigation Information on Full Windshield Head-Up Displays,” Int. Journal of Vehicle Design, Vol. 19, No.2, 1998.

24. Office of Land Management, http://rocky.dot.state.mn.us, 395 John Ireland Boulevard, St. Paul, MN 55155

25. Mapprojections, http://www.forestry.umt.edu/courses/FOR503/part4.htm, HansZuuring, University of Montana.