Menu interaction in Head-Up Displays

Natasa Milicic & Thomas Lindberg
BMW Group Research
Germany

Abstract

Introduced to the market several years ago, the Head-Up Display (HUD) has turned out to be one of the most innovative display technologies in the automotive industry. One of its most significant advantages is a minimized gauge reading time, compared to Head-Down Displays such as instrument clusters. However, certain cognitive effects are associated with the use of this display location. The most familiar effects are cognitive capture and perceptual tunnelling. These effects have to be considered carefully since advanced Human–Machine Interfaces could make a further step towards interaction concepts within the HUDs. Differences between Head-Up and Head-Down Displays, regarding interaction strategies and driver distraction are likely to be found. The question at hand is which types of interactions are suitable to be performed in a HUD. Therefore, a special driving simulator experiment was designed to examine these aspects. Within 120 min, 36 subjects had to perform several secondary tasks while driving in the BMW driving simulator. Each task had to be performed using the Head-Up Display as well as using the Central Information Display (CID) in the upper middle section of the dashboard. The HUD resulted in a more efficient operating time, better driving performance (lane keeping) and less cognitive and visual demand (measured by a Peripheral Detection Task). However, the interaction type and design remain crucial to glance time duration and to several driving performance parameters. Prolonged glance time has to be prevented by using an appropriate information scheme and by reducing interaction complexity to a minimum.

Introduction

Head-Up Displays (HUD) overlay the front scene with information. They were initially developed for use in military aircraft to enable pilots to see any relevant information whilst keeping their eyes on the flight scene. This technology has also been used in vehicles since the 1980s. In contrast to aircraft, where the information is shown in a combiner, HUDs in cars use the automobile windshield to reflect the virtual image in the driver's primary field of view. The construction is displayed in figure 1.

The most striking advantages of HUDs are a minimized gauge reading time (Gengenbach, 1997) and a significantly better recognition of sudden or unexpected

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