

The Effects of Billboard Content and Visible Distance on Driver Behavior

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Abstract : Distracted driving has been one of the most integral concerns surrounding our daily use of vehicles since the invention of the automobile. While much attention has been recently given to cell phones related distraction, commercial billboards along roads are also candidates for drivers' visual and cognitive distractions, as they may take drivers' eyes from the road and their minds off the driving task to see, perceive and think about the billboard's content. Using a driving simulator and a head-mounted eye-tracking system, speed change, acceleration, deceleration, throttle response, collision, lane changing, and offset from the center of the lane data along with gaze fixation duration and frequency data were collected in this study. Some 92 participants from a fairly diverse sociodemographic background drove on a simulated freeway in Baltimore, Maryland area and were exposed to three different billboards to investigate the effects of billboards on drivers' behavior. Participants glanced at the billboards several times with different frequencies, the maximum of which occurred on the billboard with the highest cognitive load. About 74% of the participants didn't look at billboards for more than two seconds at each glance except for the billboard with a short visible area. Analysis of variance (ANOVA) was performed to find the variations in driving behavior when they are invisible, readable, and post billboards area. The results show a slight difference in speed, throttle, brake, steering velocity, and lane changing, among different areas. Brake force and deviation from the center of the lane increased in the readable area in comparison with the visible area, and speed increased right after each billboard. The results indicated that billboards have a significant effect on driving performance and visual attention based on their content and visibility status. Generalized linear model (GLM) analysis showed no connection between participants' age and driving experience with gaze duration. However, the visible distance of the billboard, gender, and billboard content had a significant effect on gaze duration.

Keywords : ANOVA, billboards, distracted driving, drivers' behavior, driving simulator, eye-Tracking system, GLM

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