Dissection of car crashes in high fidelity driving simulations

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Abstract

We implemented a novel visual tool to analyse driver behaviour in simulated car crashes. The crashes occurred in high-fidelity collision avoidance scenarios staged on the Iowa Driving Simulator. Driver performance data were digitised at 30 Hz and crash events were marked, allowing us to "rewind" the data stream to analyse driver performance in the final moments. By plotting vehicle speed, lane position, brake, accelerator and steering wheel position, and driver gaze position in the 5 seconds prior to collision, together with a representation of road geometry and trajectory of neighbouring vehicles, we were able to produce diagrams that clearly disclose the "anatomy" of a crash. A better understanding of the human errors that cause crashes can ultimately aid in the development of more rational strategies for crash prevention.

Introduction

Car crashes pose a serious public health problem and cause great suffering and financial costs around the world. By understanding the human errors that cause crashes, it should be possible to devise more effective injury prevention interventions. Yet real-life car crashes are sporadic, uncontrolled events. Moreover, some drivers choose not to report crashes, leading to an under-representation of crashes in state records, with ramifications for epidemiological studies of "at risk" drivers. Furthermore, there are few critical observations of driver performance in crashes that are reported. Unlike aircraft, cars do not contain "black-box" data recorders for subsequent detailed analyses of operator actions contributing to a crash. Driver error can be inferred from physical evidence such as skid marks and from the accounts of in-vehicle and nearby observers, yet such accounts may be incomplete or erroneous. It is desirable to study serious driver performance errors in an environment that is challenging yet safe for the driver and tester, preferably under conditions of optimal stimulus and response control (Rizzo and Dingus, 1996). For these reasons we are using the Iowa Driving Simulator (IDS) to investigate driving performance in different populations of drivers. As part of this research we have developed a new tool for analysing driving performance errors that may lead to crashes.

Brookhuis, De Waard, & Weikert (Eds.) ,1997. *Simulators and Traffic Psychology* HFES Europe Chapter