

Application oriented Simulator Display System Specification

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ABSTRACT

Within a simulator the purpose of the visual system is to generate the visual impression through the presentation of rendered images from a virtual environment. The quality of these images is affected by every part of the visual pipeline: starting with the database and its included models, the renderer and its specific features up to the display including the screen, for a projection system. Usually, a display is specified using technical terms like the resolution, for instance, or brightness or the contrast ratio. All these specifications describe the performance without any reference to the application. They do not support a user in figuring out, whether a display is suitable for his application or not. This is similar for the other subsystems in the visual system, as well.

The idea behind a driving simulator is to reproduce the real world driving environment as realistic as possible, to stimulate the simulator driver to behave like in the real world. When driving in a car, the information gathered from the traffic signs has an important impact on the driver's behavior. Due to the importance of the directives given, it has to make sure, that a driver can read the signs early enough to react accordingly. This requirement leads to a specific distance ahead of the sign, where it has to be readable for an approaching driver with an average vision.

Within a driver in the loop simulator, every traffic sign model has to exactly meet the specified features for real world signs. Nevertheless, precisely observing this does not necessarily lead to the same distance ahead, where a sign becomes readable for the simulator driver. Several features of the display as well as the whole visual system have an important impact on the readability. The pixel resolution for instance has a major impact on the perceivable image sharpness. When displaying textual information, the image sharpness very much affects the readability of the information.

The sharpness of an image is not only affected by the resolution. The contrast ratio also has an influence on the sharpness. Additionally, contrast is not only a parameter of the display itself.

Within a projection environment, the contrast of the projected images is influenced by the screen's reflectivity characteristics and by the screen geometry. The display brightness has a similar effect on the sharpness of the presented image and thus the readability of textural information in it.

In summary, several technical features of the display affect the driving simulation based specification "readability of traffic signs".

From the driving simulator user's point of view, the distance where an approaching car and its speed can be detected, is another application-oriented specification. Several technical features affect this specification, as well. More application-based specifications can be defined. They will be introduced and discussed within this paper.

This specification set covers all application relevant aspects. An application specialist, with only basic knowledge of the display systems technical features, can define these specifications, while a display system specialist with only minor application experience can transfer these application-based specifications into technical specifications. This approach guarantees for a comprehensive consideration of all application important features, and it also guarantees for the selection of the best suitable display system.

BIO

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Hannsjoerg Schmieder is the Manager for Visual Systems at the Daimler Driving Simulator Center in Sindelfingen, Germany. He joined the Daimler simulation team in 1986, and since then he has been in charge of all simulator visual systems, including the image generator hard- and software, the projection and display systems as well as the visual databases. Throughout his more than 30 years in the driving simulation business Schmieder also designed, prepared and ran many driving simulator experiments, and he has been involved in several major system upgrades. His primary interest has always been focused on the further development of the visual system's technology in simulation. Besides working for Daimler, Schmieder used to teach Computer Architecture, Computer Graphics and Computer Science classes at the University of Applied Sciences in Berlin for almost 20 years. Prior to his work for Daimler, he has been a member of the Computer Graphics Research Group at Technical University Berlin for several years. Hannsjoerg Schmieder holds a Diploma in Electrical Engineering and Technical Acoustics from Technical University Berlin. He is the father of 3 adult children and likes to spend as much time as possible with his grandson, to travel with his wife, to take pictures on these trips and to play drums.