

NADS Imaging System Upgrade

David A Heitbrink

ABSTRACT

After many years, the National Advanced Driving Simulator needed to upgrade its visual system, including both Image Generator and Projectors. The existing system had become obsolete, unreliable, and its performance had degraded since its initial delivery. The NADS simulator is a full motion simulator with a 360 degree view. NADS is primarily used for Human Factors research of driving in both day and night time situations. Through this upgrade process we selected LED illuminated DLP projectors, designed a new hardware mounting system, fiber optic video distribution and projector control systems, a tuning software application, and a new IG.

Sufficient brightness and resolution is achieved by using 16 projectors in portrait mode. The visual system provides both warping and blending functions to provide a seamless view between the projector images.

To fit the new projectors, we designed hardware mounts that fit in the existing dome, provide for quick removal and mounting of new/spare projectors, provide for adjustments for the placement of the projectors, and provide mounting/strain relief for projector wiring and signal distribution. The mounting design was optimized to provide for ideal overlap between projectors, minimize wasted image space and prevent shadowing.

For the Image Generator, we decided to construct our own render nodes, using COTS hardware with professional grade video cards that support hardware synchronization.

To achieve synchronization we designed our own communication protocol and a hardware signal generator to drive both our Image Generator and our simulation subsystems (scenario control, dynamics, etc.) To fulfill our interoperability requirements for the rendering software, we adapted software developed for the NADS MiniSim (using Open Scene Graph). Finally we designed a separate software system for management and monitoring of the Image Generator.

Overall, we achieved our design goals with our imaging system upgrade within a reasonable budget.

BIO

David A Heitbrink

David Heitbrink is a Software Engineer at the National Advanced Driving Simulator. He is responsible for maintaining many of the software systems that run the NADS simulator, including scenario control system, scenario authoring tool set, and many other the smaller systems. He was the lead software developer on the effort to design a new Image Generator for NADS, as well a new audio subsystem a few years before that. Mr. Heitbrink received his Bachelors of Science from the University of Toledo in Computer Science and Engineering. He continued to receive is Master of Science in Engineering at the University of Toledo in the spring of 2005, after which he joined NADS.