BR Professional Series of Driving Simulators

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Overview

BR Series of Driving Simulators

The BR series of desktop driving simulators are designed for professional use in driver training, testing, rehabilitation, and research. High fidelity simulation of all types of ground vehicles including autos, trucks, and buses at a low cost is the goal of these simulators. A wide variety of driving scenarios is built-in to each simulator as is the ability to collect and record a variety of driver performance measurements. The BR series is powered by STISIM Drive™ simulation software which has been in use for more than 20 years.

BR1050 Driving Simulator

The BR1050 includes driving simulation software and a steering wheel pedal set (Thrustmaster™ RG PRO) and is designed for those who want to develop their own driving scenarios and be able to alter vehicle performance characteristics. It includes a scenario building programming capability that allows the user to select or create unique driving conditions and traffic environments. The BR1050 contains more than 35 built-in driving scenarios covering a wide variety of driving conditions and performance measurement parameters. This model also includes the ability to change vehicle performance characteristics including vehicle handling and power train performance. In addition, this model allows the user to alter input/output control characteristics, driver performance measurement parameters, sound effects and instrument display features. The flexibility of this model makes it well suited for those who are conducting driving research or driver testing.

Thrustmaster RG PRO

Computer Requirements

A 2 GHz or faster Windows™ PC with Windows™ XP or VISTA operating system, 1 GB RAM, 1 GB available hard disk space, 1 or 2 monitors, nVidia or similar video graphics card with at least 256 MB of onboard memory, speaker system, and 2 available USB ports. A Windows™ 7 version is currently under development.

Complete Systems

For those not wishing to use their own computer systems, simulator models are available with complete computer systems and all necessary peripherals. These complete system models have the simulator and steering wheel/pedal set software pre-installed. Those desiring the more extensive simulator features of the BR1050 model in a complete system should order the **BR1100** model. The BR1100 includes all the components of the BR1050 model plus a Windows PC with two LCD monitors and a speaker system.

Model Upgrades

An advanced steering wheel/pedal set (Logitech™G27) is available for those customers requiring greater steering, acceleration and braking realism. The BR1050EX and BR1100EX models include the Logitech™ G27 system.

Logitech G27

Right hand drive vehicle configuration, and left lane roadway simulation is also available as is a metric system (e.g., kilometers per hour) option.

Other simulator upgrades are also available (see below).

Warranty and Technical Support

1 year parts and labor, 10 hours free technical support.

Simulator Software Specifications

All driving simulator models incorporate STISIMDrive™ simulation software originally developed for the U.S. Department of Transportation. The simulation software has undergone many years of testing and refinement and is used currently in a wide variety of research and practical settings. The use of high fidelity software simulation is critical to the success of any driving simulator. Additionally, the robust capability of this software allows for extensive modification of simulator components as user needs and simulation technology evolve.

Functional Capability

The driving simulation software is fully interactive (the driver controls both speed and steering) and includes: visual and auditory feedback to the driver; a vehicle dynamics model; and an easy to use driving scenario development capability with extensive driver performance measurement. The simulation software and hardware have been optimized to provide immediate, smooth, presentation of visual feedback necessary for proper driver research, training and evaluation on a LCD monitor or projection system. A separate instructor operation station (IOS) is used to monitor the driver simulation and control simulation configuration, scenarios, and data collection.

Vehicle Dynamics Model

The simulated vehicle mathematical model allows the user to specify steering and speed control characteristics that are meaningful to the driver. The steering dynamics include understeer that properly changes steering sensitivity as a function of speed, and an unstable heading divergence that simulates the effects of road crown and provides a means for adjusting steering workload. Speed control dynamics consist of allowing the specification of number of gears and gear ratios, throttle acceleration and deceleration limits, and an unstable speed divergence that may be used to set the workload of the speed control task. Auditory feedback is provided for engine speed and acceleration limits. Tire limits account for a maximum cornering capacity and stopping deceleration. Sound effects associated with exceeding the tire limits during cornering and braking are also provided.

Visual Scene Display

Standard visual display scenes of 60 deg horizontal are presented using a 19 in. diagonal conventional computer monitor. The scene includes a roadway, horizon scene and atmospherics, secondary task displays, intersections, traffic control devices and interacting traffic including pedestrians. The driving scene is controlled by user-specified events and tasks as defined in event files using commands from the Scenario Definition Language (SDL). The SDL approach provides an almost unlimited flexibility in specifying driving scenarios and visual scenes without requiring any programming expertise.

Sound

The auditory display is presented using conventional PC-based sound components. The PC's sound processor board is used to generate sounds based on commands from the vehicle dynamics module as well as to reproduce pre-recorded sound files. This approach allows the production of engine sounds, tire screeching, crash sounds, sirens and voice sequences needed in various applications. (Note that the speaker system can be replaced by an inexpensive headset if silent simulator operations are desired).

Scenario Definition Language (SDL)

Events files written using the SDL are designed to provide a user-friendly environment for the specification of driving tasks, complex road/traffic events and overall driving scenarios. Expertise in graphical database development is not required. Events are specified in file lists as a function of distance traveled.

Events include roadways, curves, hills, intersections, signals, signs, interactive traffic, pedestrians, buildings, fog, starting or stopping data collection, etc. Attributes of events include the distance at which an event is introduced, road markings, road grade, curvature, vehicle speeds, signal timings, etc. The event file format also has a subroutine feature that allows complex events that are composed of an arbitrary number of simpler events to be called as a single event.

Driving Tasks

The events in the Scenario Definition Language allow specifying a number of driving tasks that permit measurement of psychomotor, divided attention, situation awareness and other cognitive behavior. Steering and speed control behavior can be measured on straight and curved road sections with varying visibility levels. Subsidiary peripheral signals may be presented that divide the driver's attention. Interacting intelligent traffic may be programmed that require steering and braking for avoidance. The specification of lead and opposing vehicles can require the driver to make passing decisions while signal light timing can be specified to require stop/go decisions. Cross traffic and pedestrians may be specified to intersect the driver's path. Turning situations may be setup in combination with pedestrians and interactive traffic. Situation awareness may be tested by including interactive traffic/pedestrians and adjacent vehicles that interfere with lane changing.

Performance Measurement

Commands in the Scenario Definition Language can be used to specify data collection starting and ending at specific distances. One command specifies the measurement of mean and standard deviation of a range of vehicle motion and driver activity variables. Another command allows saving time histories of vehicle and driver variables between specified distances. A time-to-collision

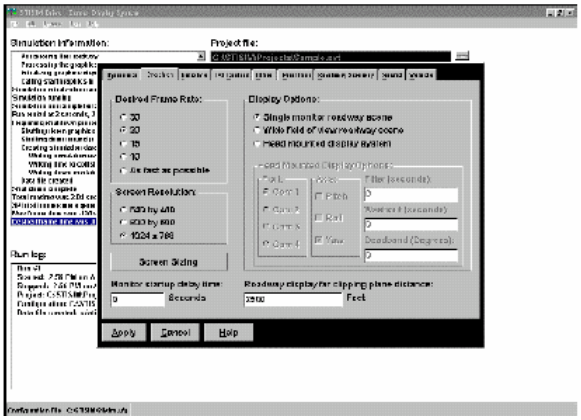
measure is obtained for all vehicle and pedestrian encounters. Overall scenario performance measures, such as total tickets, speed limit violations, accidents and total driving time, are collected throughout a run. During divided attention sequences response times and correct and missed responses are recorded. These data may be stored on disk and transferred to other software for further processing and analysis. The SDL output commands may also be used to synchronize events in the driving scenario with external data measuring devices.

Steering, Braking, and Acceleration Control Interface

The steering wheel is attached to a force feedback interface which allows for ergonomically correct steering wheel inputs. Steering gain and other dynamics are adjustable through the simulator configuration interface. Reproducing vehicle steering forces and dynamics allows driver physical limitations and driver skills to be evaluated under more realistic conditions than is available with other desktop simulators. The quick release of the steering wheeling unit allows easy re-location of the driving simulator when desired. The steering wheel unit incorporates a horn and a turn signal arm which, when operated, provide both visual and auditory signal display effects. A left-right scan button allows the user to view the scenario scene beyond that provided by the single simulator monitor. The brake and accelerator pedals unit is attached to a non-skid platform placed under the desk. The pedals unit can be quickly detached from the steering wheel system when the driving simulator needs to be moved. An upgrade to the pedal set is available for those with a need for a heavy-duty pedal set.

Simulator Configuration

The simulation can be configured as required by the user through a graphical user interface. Configuration options include vehicle dynamics variations, visual scene variations (eye-height, mirror placement, resolution, etc.), sound options (allows user-specified sound files, muting of crash noise, etc.), and driving controls options. The system may be configured with a separate monitor for controlling the simulation and providing a real-time status display for an experimenter. An autopilot mode may be selected to simplify the setup of driving scenarios. Different configurations may be setup and stored for recall when necessary.



Instructor Control

In addition to configuration control, the instructor has control over a variety of simulator functions from the IOS station. Instructors can slew the visual scene to illustrate potential hazards to the student. The instructor can also pause or stop the simulation at anytime and discuss elements of the scenario to the student. A playback and record function allows the instructor to review all or parts of a simulator session in slow or regular speed. Recording of simulator sessions also allows replay of key session incidents to a larger audience. The simulator records individually identified data files and video recording files for each driver so digital stored

records can easily be retrieved when needed and printouts of summary performance can be provided to each driver after each session.

Administrative Control

With the addition of networking capability centralized administrative control over simulator scenario design, configuration, and driver data files can be controlled at a central source. The password protected configuration control assures that only authorized individuals are permitted to alter simulation scenarios or simulator configurations. Administrators can then establish standardized training curriculum where each simulator contains identical scenarios and vehicle configurations. Data files can be removed quickly and easily from simulators and stored centrally for later analyses.

Other Upgrades

Customized scenarios, developed either from existing ones or completely new, can be ordered from Beta Research. This allows upgrading of scenarios to train and evaluate new driving tasks or challenges. Visual components within the scenario such vehicles, buildings, roadways, signage and others can be upgraded as well as audio instructions and sound effects. Additionally, different vehicle configuration and performance characteristics can be developed. For example, drivers may be evaluated on different vehicle categories (autos, trucks, etc.).