CRANE SIMULATOR

Liophant Simulation Club

Introduction

Real-time simulation as an operational training tool has traditionally been the preserve of applications where expense and risk in actual scenarios are easily recognized factors – such as for driving simulators

CraneSim is devoted to develop a new generation of training equipment, based on simulation and virtual reality, designed to support logistic companies.

The innovative development of the new Crane simulators has been based on the construction of simulators that are downsized compared to the products currently being used and marketed. These simulators are designed to act as integral part of training courses decentralized into particularly important areas for the transport world, such as in intermodality centres, interports, ports, District parks, etc.

CraneSim

Everyone knows that the key to crane operator training is adequate time at the controls. And time was, most anyone could climb into a cab and begin pulling levers.
But such training is costly, can damage equipment, and may even put people at risk.

CraneSim can help you:

Ø Better select training candidates, since studies show that up to 30% of trainees lack the necessary natural abilities such as eye/hand coordination and depth perception to become truly proficient

Ø Better train new operators, by helping them come up to speed more quickly

Ø Better evaluate and improve operator skills e.g. in preparation for the practical exams

CraneSim simulator is designed to provide an excellent training system for heavy vehicle operators and offer maximum flexibility for easy integration with existing operator training programmes.

CraneSim puts you at the controls of a typical mobile hydraulic crane equipped with telescoping boom and jib, and a variety of loads and hook blocks. Instruments readings are also displayed (boom angle, length, height, radius, quadrant), along with

a simulated load-moment indicator. You can follow the load, boom tip, or target position by simply changing the point of view during the simulation.

The driver's interface is accurate down to lights, brakes, steering, indicators and pedal controls. The standard system is delivered with the capability of configuring the simulation to various training options, including different gearbox, engine and articulation characteristics. The simulated vehicle dynamics are based on mathematical models that use actual vehicle information to provide accurate behavioural realism.

CraneSim provides the user with a distributed rendering functionality, which mimics the behaviour of a single computer with multiple displays.

The driver views the 3D simulated world on the PCs screens and virtual rear view mirrors. The audio systems reproduce realistic sound effects such as engine and wind noise, etc.

As the driver navigates the world all aspects of manoeuvring are continuously monitored by the simulation computer, including response to emergency conditions, driving techniques and economic performance in terms of fuel use, tyre and brake wear, engine wear and other such costs.

All simulation exercises are timed. But CraneSim offers even more feedback, by recording other key performance criteria such as maximum load sway, maximum height error, collision with obstacles, etc.
Simulation results are saved on the PC's hard disk as either files or entries in a special database for improved record keeping.

CraneSim provide the creation of accounts for authorized users, group them in classes, carefully review training progress and even compare the performance of different individuals over time.

At any time, it is possible to review the simulation data recorded in the CraneSim database. Once again, the login name and password is used to identify the user. When the user is a *trainee*, he can only review his own simulation data. But when the user is a *trainer*, he can review all simulation data, change user information (including login names and passwords), etc.

Extensive documentation (including sample simulation data) is also provided in the form of user-friendly Web pages, along with the crane manufacturer's load charts in electronic format.

CraneSim innovative instructional framework consists of a series of simulation modules fully developed and tested. Slowly but surely, the modules present simulation exercises of increasing difficulty in order to better train, and test, generic skills associated with moving loads in the presence of obstacles, while respecting upper and lower height bounds and load chart limits.

CraneSim is a true distributed interactive simulation application interconnecting more participating players in a common virtual world. CraneSim is based on the U.S. Defence Modelling Simulation Office (DMSO) - High Level Architecture (HLA) framework. HLA was initially developed as a methodology and protocol for use by the military to support networked interactive simulation training for battlefield

situations. These networked simulations can be locally or remotely connected. In this manner, more users separated by physical geographic distances can participate interactively at the same simulation.

Trainee Station

A generic CraneSim Trainee Station is encompasses:

- Ø Simulation workstation (desktop or laptop).
    - o Only 1 simulation workstation if distributed rendering functionality is not used
    - o Up to 3 (better ergonomic solution) simulation workstation for distributed rendering purpose.
- Ø Input Devices
    - o 1 steering wheel and relevant pedals (clutch pedal included)
    - o up to 4 joystick (depending on the complexity of the crane simulated)
   - o onboard touch screen and push buttons simulation through workstation keyboard.

Trainer Station

The Trainer Station will encompass a desktop/laptop equipped with the TrainerVisio software included in CraneSim supply.

Both Trainee and Trainer station are multifunction reconfigurable workstations. This means that if needed the Trainee Station can be used also as a Trainer station.

Tech Spec

In the following main CraneSim Technical Characteristics are summarized.
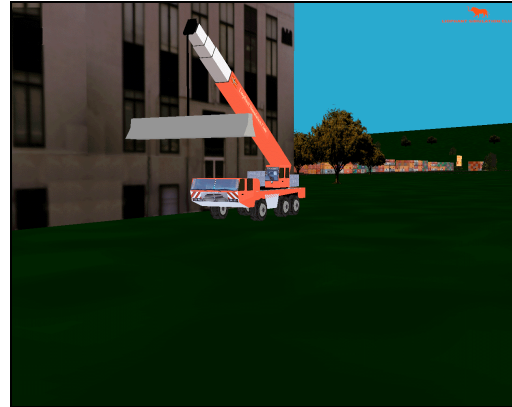
CraneSim Feature Summary

- Ø HLA compliant
- Ø Distributed co-operative training
- Ø Support for remote tutoring
- Ø Modular realtime simulation environment
- Ø Realtime execution kernel
- Ø Multi-pipe/multi-channel support
- Ø System and database configuration files
- Ø Professional documentation
- Ø Distributed simulation for synchronized displays

Input Devices

- Ø Multiple simultaneous devices (wheels, joysticks, etc.)
- Ø Syncronous and asynchronous reads
- Ø Device scaling
- Ø Calibration and verification tools

Dynamics

- Ø Multiple joint types: Ball and Socket, Hinge, Prismatic,

Angular, Linear, Universal, Car Wheel.

- Ø Hard contact constraints with no interpenetration.
- Ø Real-time dynamic response capable of efficiently simulating very large numbers of objects.
- Ø For extended functionality, easy integration with third party
- Ø Contact forces and normal available for accurate force feedback.
- Ø Stable and accurate vehicle dynamics including suspension models, Car Wheel joint and wheel traction systems.

Environments

- Ø Sky color
- Ø Fog type, color and visibility
- Ø Spline fog support
- Ø Time of day control
- Ø Light source selection
- Ø Environment effect selection
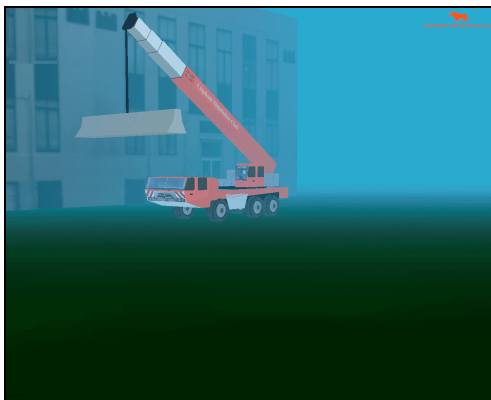
Environment Effects

- Ø Five-layer cloud model
- Ø Infinite horizon clouds
- Ø Scudded and see-through clouds
- Ø Top and bottom elevation control

- Ø Top and bottom cloud transition control
- Ø Dynamic moving clouds
- Ø Ground fog

Recommended Configuration

- Ø Windows workstation, 1.0 GHz
- Ø 256 MB RAM
- Ø 4 GB hard disk space
- Ø CD ROM drive
- Ø OpenGL 1.2 compliant graphics card
- Ø Windows XP Professional or Windows 2000 Professional Service Pack 2

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