Virtual Reality Scene Generator (VRSG)

MVRsimulation® Virtual Reality Scene Generator® (VRSG®) is a Microsoft DirectX based render engine that provides geospecific simulation as an image generator (IG) with game quality graphics. MVRsimulation's IG enables users to visualize geographically expansive and detailed virtual worlds on commercial off-the-shelf Windows PCs. Since 1997, VRSG has provided real-time, single- or multi-channel visualization of virtual environments, dynamic moving models and special effects. VRSG is used as a:

- Dedicated computer image generator coupled to an external simulation host in single or synchronized multi-channel mode.
- IG rendering features often required for manned/unmanned flight training, driving and first person simulations, and other applications.
- DIS stealth visualization tool for mission planning and real-time or after-action analysis of distributed simulation exercises.
- Built-in UAS camera payload simulation that includes overlay symbology for common UAS platforms, with the ability to generate streaming H264/H265 video with NATO/STANAG-compliant KLV metadata for stimulating tactical exploitation systems.

Mixed-reality simulation using VRSG and integrated with an ATAK end user device.

VRSG UAS camera simulation provides FMV streaming for stimulating tactical systems.

Real-time A-10 3D model in flight over the Tuscon, Arizona CONUS NAIP terrain.

Using advanced terrain and texture paging algorithms VRSG renders geospecific imagery over expansive round-earth 3D terrain while providing full-scene anti-aliasing and continuous level-of-detail morphing. VRSG is delivered with robust libraries of 3D models and high-resolution terrain of most of the world. VRSG is a component of MVRsimulation's rapid virtual world terrain creation and visualization technologies including Terrain Tools, an MVRsimulation plugin to ArcGIS® Pro, allowing users to create terrain internally.

As an executable-ready render engine with native DIS support, VRSG supports, but does not require, programming for use. VRSG configuration files and interface protocols provide the ability to control basic components of the render engine. Developers can augment VRSG's functionality using the MVRsimulation VRSG plugin Application Programming Interface (API).

A geospecific 3D bridge model in the new Miyako, Japan terrain. The Miyako and Ishigaki terrain databases include geospecific buildings and procedural buildings with geotypical textures. The terrain database includes port bathymetry and 50 cm imagery with 30-meter elevation data.

Holloman Air Force Base features runway lights, navigational signs, taxiways, windsocks, tarmacs, and geotypical buildings.

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Image generator features in VRSG7

- Asynchronous terrain and texture paging technology for visualizing high-resolution, photo-realistic databases at real time interactive frame rates.
- Continuous level-of-detail blending, decoupled levels-of-detail for terrain and textures.
- Support for multiple synchronized channels and multiple viewports per channel.
- Multi-texture techniques such as normal maps, gloss maps, shadow maps, light maps, and decals.
- Light points that respond realistically to visibility conditions.
- Realistic light lobes that yield per-pixel radial attenuation and per-vertex axial attenuation.
- User-extensible particle effects that respond to wind: dust trails, contrails, tactical smoke, volumetric flames, waves, blown sand or snow. Other effects include dynamic craters, wakes, track and wheel impressions, and solid particle ballistic effects.
- Native high-performance 3D human character render engine – no third-party software required. Capable of managing thousands of human character entities and displaying hundreds in the field-of-view.
- Ephemeris model for sun and moon position, moon phase, and star position.
- Support for VR and XR systems: Varjo XR and Varjo VR, HP Reverb, HTC Vive Pro and Tracker, and Valve Index VR.
- Eye and pupil tracking when used with the Varjo XR and Varjo VR head mounted displays.
- Object-on-object dynamic shadows cast by models and clouds.
- Simulation of ocean sea states: realistic 3D wave motion and wake waves, accurate environment reflections, and bathymetry.
- Dynamic cratering, deforming terrain surfaces to represent craters resulting from munitions impact.
- Utilities to convert FBX models and OpenFlight databases and models to MVRsimulation's model and round-earth VRSG terrain architecture.
- Full mission function support to include height above terrain, laser range, line-of-sight (intervisibility), and collision detection.
- OpenGL interoperability plugin that allows for code-reuse of legacy overlay symbology rendering from legacy systems.
- Significant Common Image Generator Interface (CIGI) V3.3 and V4.0 support.
- Edge blending and distortion correction support for third-party solutions from Scalable Display Technologies, VIOSO, and Dome Projection.
- Dynamic lighting and time-of-day conditions, light-point based star fields, horizon glow, and multiple sky models. Atmospheric model consists of 16 distinct layers each with unique visibility ranges and wavelength-dependent absorption and scattering properties for light, haze, and cloud interactions; ground fog and haze with sun-angle dependent density and color.
- Volumetric clouds and storm cells with optional volumetric precipitation effects.
- Full simulation analysis through capturing and visualizing DIS stream entities for real-time or after action review (AAR).

Full coverage of the island of Taiwan at a resolution of 50 cm, including portions of the Penghu Islands and Green Island. The terrain is populated with thousands of tree models, which were color-sampled from the underlying terrain imagery.

VRSG 3D model of the Bavar 373 long-range road-mobile surface-to-air missile system in the CONUS NAIP Yuma, Arizona terrain.

3D models

VRSG7 includes over 10,200 models including dynamic military and commercial vehicle, character and weapon, and static building and foliage culture models. Many models incorporate behaviors, animations, damage states, thermal hot spots, and articulated parts with switch states. MVRsimulation provides ongoing entity additions to support Combat Air Force Distributed Mission Operations (CAF DMO) requirements.

3D terrain

Geospecific round-earth VRSG terrain architecture of most of the world in 15 meter or better resolution with higher resolution insets of areas of interest, many with 3D cultural features.

Flight visualization

High-speed low altitude flight rendering to support fixed-wing, rotary-wing, and UAV/RPAS simulation. VRSG renders high detail sensor pod views with controllable distortion to mimic real-world views.

For more information, visit www.mvrsimulation.com, contact sales@mvrsimulation.com, or scan the QR code.

MVRsimulation

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