Simulink 3D Animation

Animate and visualize Simulink models in three dimensions

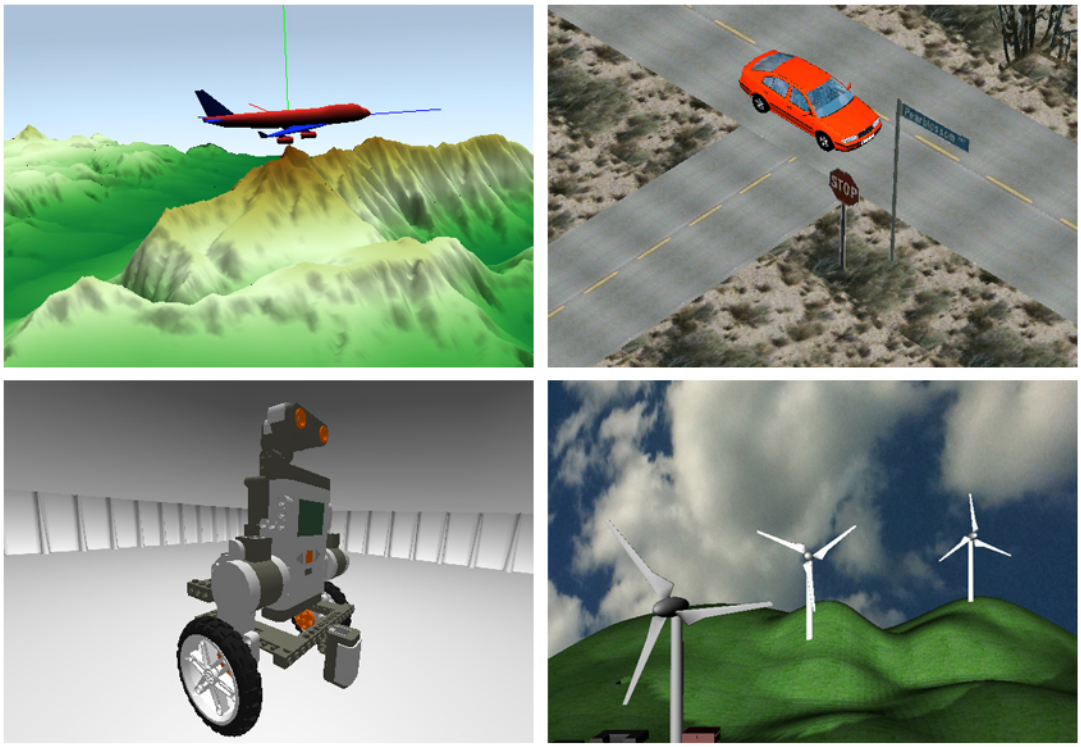
Overview

Simulink 3D Animation™ provides an interface linking Simulink® models and MATLAB® algorithms to 3D graphics objects. It lets you visualize and verify dynamic system behavior in a virtual reality environment. Objects are represented in the Virtual Reality Modeling Language (VRML), an open 3D modeling standard. You can animate a 3D world by changing object properties such as position, rotation, and scale during desktop and real-time simulations. You can also access 3D animation data in Simulink or MATLAB for post-processing.

Simulink 3D Animation includes a viewer for rendering and recording high-quality animations. With the 3D World Editor, you can author detailed scenes assembled from 3D models exported from CAD-based or Web-based sources. You can incorporate multiple 3D scene views inside MATLAB figures and interact with these views via a force-feedback joystick, space mouse, or other hardware device.

Key Features

- Simulink blocks and MATLAB functions for connecting models to virtual reality worlds
- 3D World Editor for authoring 3D worlds
- Video recording and animation playback
- Visualization of real-time simulations
- Client/server architecture
- Interaction with 3D views via a joystick, space mouse, or other hardware device



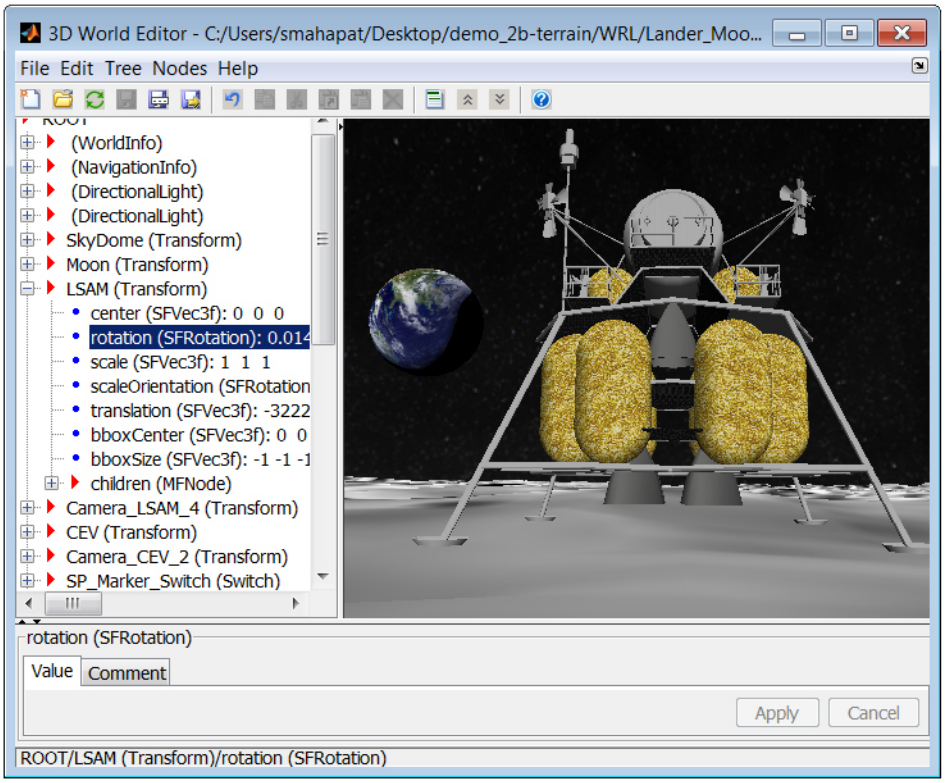
Visualization of Simulink based applications, clockwise from bottom left: self-balancing robot, aircraft over terrain, automotive vehicle dynamics, and wind farm.

Authoring and Importing 3D Worlds

Simulink 3D Animation provides two editors for authoring and importing virtual reality worlds: V-Realm Builder and 3D World Editor.

Building 3D Worlds

V-Realm Builder in Simulink 3D Animation is a native VRML authoring tool that enables you to create 3D views and images of physical objects using VRML. 3D World Editor offers a hierarchical, tree-style view of VRML objects that make up the virtual world. It contains a set of object, texture, transform, and material libraries that are stored locally for reuse.



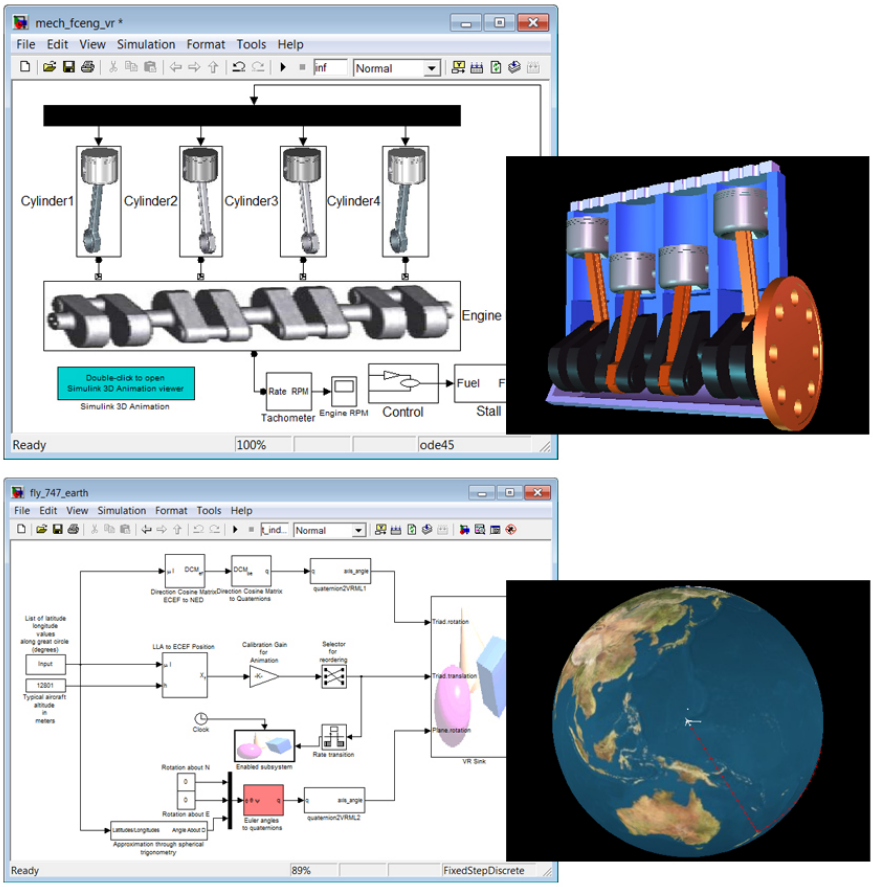
3D World Editor showing a hierarchical, tree-style view (left) and scene preview (right) of components of a lunar module.

Importing 3D Content from the Web

You can build 3D worlds with several 3D authoring tools and export them to the VRML97 format for use with Simulink 3D Animation. In addition, you can download 3D content from the Web and use it to assemble detailed 3D scenes.

Importing CAD Models

3D World Editor lets you manipulate 3D VRML objects imported from most CAD packages for developing detailed 3D worlds that animate dynamic systems modeled in Simscape™, SimMechanics™, and Aerospace Blockset™. Simulink 3D Animation enables you to process VRML files created by CAD tools such as SolidWorks® and Pro/ENGINEER®. You can use the SimMechanics Link utility to automatically create SimMechanics models from CAD tools and add associated Simulink 3D Animation visualization to them.



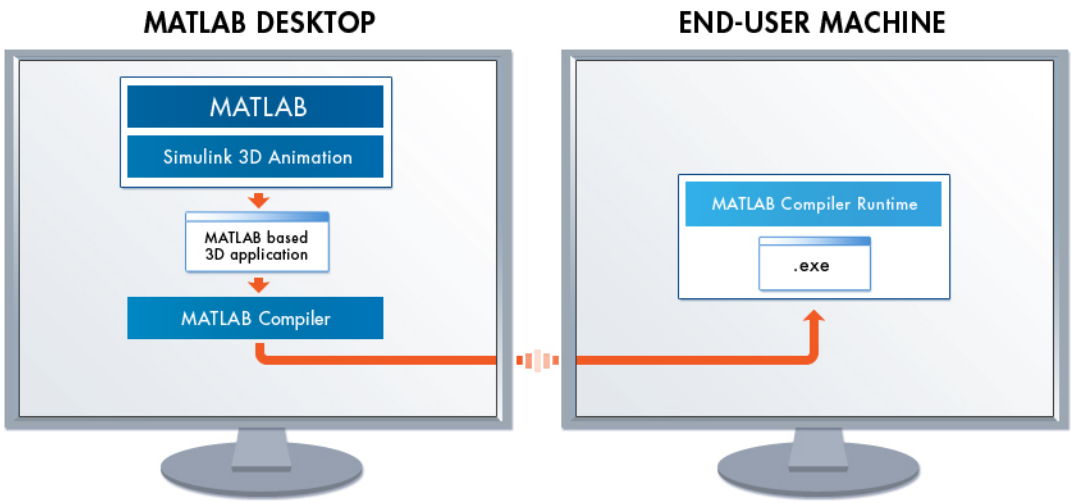
3D animation of the dynamics of an internal combustion engine modeled in SimMechanics (top) and trajectory trace of an aircraft computed using coordinate transformations from Aerospace Blockset (bottom).

Animating 3D Worlds

Simulink 3D Animation provides bidirectional MATLAB and Simulink interfaces to 3D worlds.

MATLAB Interface to 3D Worlds

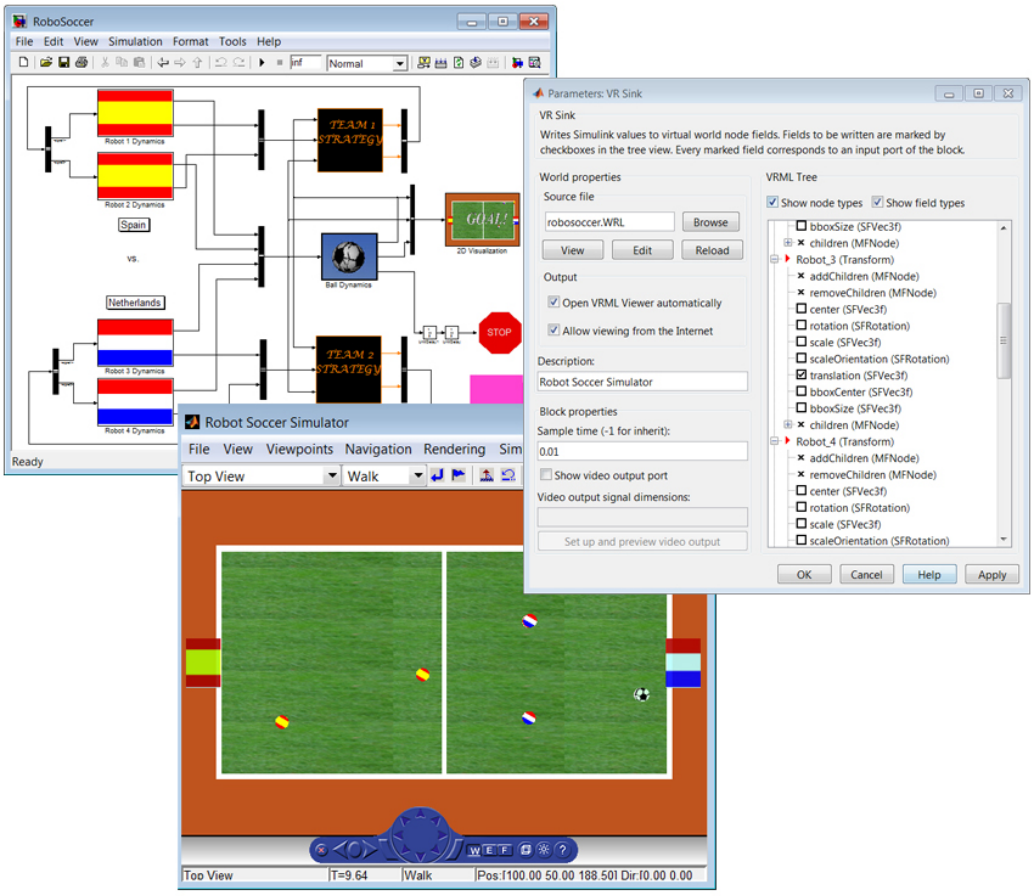
From MATLAB, you can read and change the positions and other properties of VRML objects, read signals from VRML sensors, create callbacks from graphical tools, record animations, and map data onto 3D objects. You can use MATLAB Compiler™ to generate standalone applications with Simulink 3D Animation functionality for royalty-free deployment.



MATLAB based 3D application compiled as an executable using MATLAB Compiler and deployed on an end-user machine running MATLAB Compiler Runtime.

Simulink Interface to 3D Worlds

You can control the position, rotation, and size of a virtual object in a scene to visualize its motion and deformation. During simulation, VRML object properties in the scene can also be read into Simulink. A set of vector and matrix utilities for axis transformations enables associations of Simulink signals with properties of objects in your virtual world. You can adjust views relative to objects and display Simulink signals as text in the virtual world. You can also trace the 3D trajectory, generated using Curve Fitting Toolbox™, of an object in the associated virtual scene. For example, you can perform flight-path visualization for the launch of a spacecraft.



Modeling and simulation in Simulink of a multi-agent system animated with Simulink 3D Animation. The virtual world is linked through the VR Sink block (middle) and viewed with the Simulink 3D animation viewer (bottom).

Viewing and Interacting with 3D Worlds

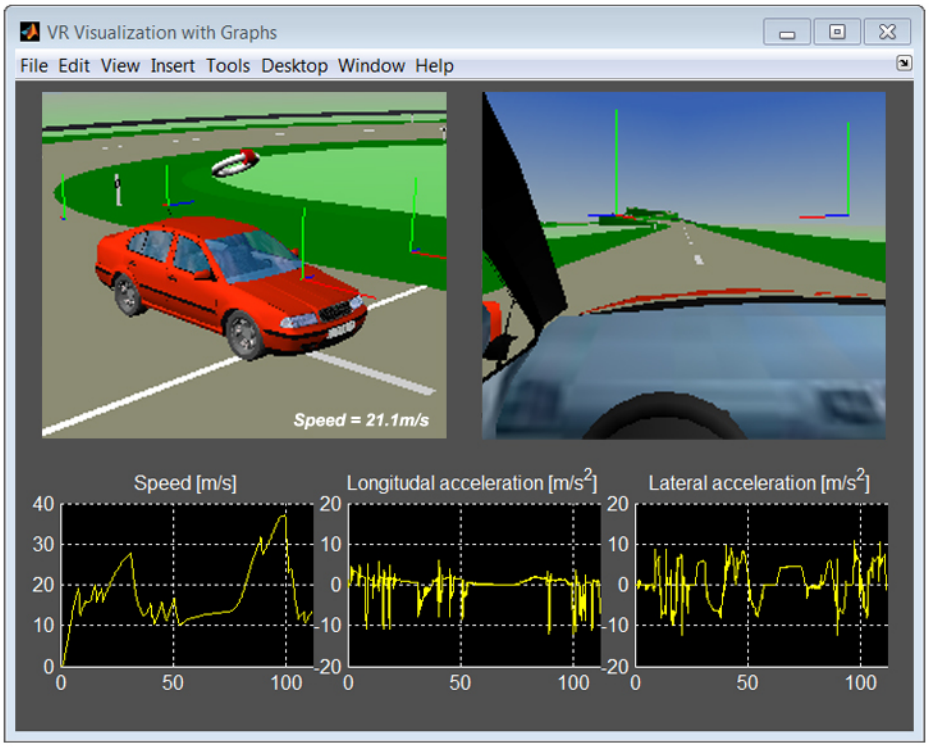
Simulink 3D Animation provides VRML viewers that display your virtual worlds and record scene data. It also provides Simulink blocks and MATLAB functions for user interaction and virtual prototyping with 3D input devices, including 3D mice and force-feedback joysticks.

VRML Viewers

Simulink 3D Animation includes viewers that let you navigate the virtual world by zooming, panning, moving sideways, and rotating about points of interest known as viewpoints. In the virtual world, you can establish viewpoints that emphasize areas of interest, guide visitors, or observe an object in motion from different positions. During a simulation, you can switch between these viewpoints.

Integrating with MATLAB Handle Graphics

The Simulink 3D Animation viewer integrates with MATLAB figures so that you can combine virtual scenes with MATLAB Handle Graphics® and multiple views of one or more virtual worlds.



Example of a graphical interface authored with MATLAB Handle Graphics. The screen shows a car suspension test on a race track that combines multiple 3D views (top), including speed data and visualizations of the steering wheel and force triads, with 2D graphics for trend analysis (bottom).

Recording and Sharing Animations

Simulink 3D Animation enables you to record scene data and share your work.

Recording Scene Data

Simulink 3D Animation enables you to control frame snapshots (captures) of a virtual scene, or record animations into video files. You can save a frame snapshot of the current viewer scene as a TIFF or PNG file. You can schedule and configure recordings of animation data into AVI video files and VRML animation files for future playback.

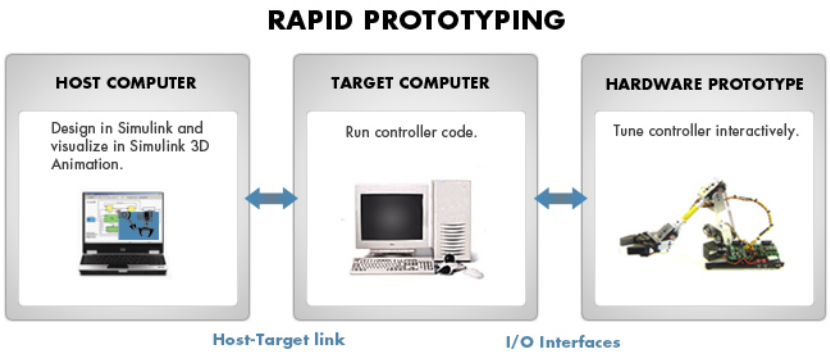
You can use video and image processing techniques on frame snapshot and animation data. These approaches enable the development of control algorithms using a visual feedback loop through the link with a virtual reality environment instead of physical experimental setups.

Enabling Collaborative Environments

Simulink 3D Animation lets you view and interact with simulated virtual worlds on one machine that is running Simulink or on networked computers that are connected locally or via the Internet. In a collaborative work environment, you can view an animated virtual world on multiple client machines connected to a host server through TCP/IP protocol. When you work in an individual (nonnetworked) environment, your modeled system and the 3D visualization run on the same host.

Visualizing Real-Time Simulations

Simulink 3D Animation contains functionality to visualize real-time simulations and connect with input hardware. You can use C code generated from Simulink models using Simulink Coder™ to drive animations. This approach enhances your hardware-in-the-loop simulations or rapid prototyping applications on xPC Target™ and Real-Time Windows Target™ by providing a visual animation of your dynamic system model as it connects with real-time hardware.



Components of an xPC Target real-time testing environment that includes Simulink 3D Animation for rapid prototyping (top) and hardware-in-the-loop simulation (bottom).

Resources

Product Details, Demos, and System Requirements
www.mathworks.com/products/3d-animation

Trial Software
www.mathworks.com/trialrequest

Sales
www.mathworks.com/contactsales

Technical Support
www.mathworks.com/support

Online User Community
www.mathworks.com/matlabcentral

Training Services
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