Altair Activate®

Multi-Disciplinary System Simulation

Altair | solidThinking

Altair Activate provides an open integration platform for modeling, simulating, and optimizing multi-disciplinary systems-of-systems using inherent 1D block diagrams. Users have the option to include subsystem models either from Altair's 3D tools, such as Altair MotionSolve™ and Altair Flux™, or from 3rd-party tools. Models can also be imported from Simulink®.

Product Highlights

- Hierarchical systems-of-systems defined as parameterized models
- Signal-based and physical modeling can be conveniently combined to define a system model
- Built-in block libraries can be easily managed and extended
- Model exchange or co-simulation achieved through FMI / FMU
- Multi-disciplinary models can include multi-body models, electromagnetic models, FEA models, CFD models, and more
- 0D, 1D, and 3D modeling can be used together, allowing the best approach for different types of subsystems

Learn more:
altair.com/activate

Benefits

Improve System Level Performance
Simulate and improve the dynamic behavior of multi-disciplinary systems. Easily model, simulate, and validate smart systems where users can incorporate functions of sensing, actuation, and control coming from diverse components.

Leverage Model-Based Development
Activate provides a common framework for functional product assessment and communication throughout the product development process. Perform what-if analyses at the system level to quickly test numerous designs and investigate the interactions of all components and subsystems comprising a system.

Gain Product-level Functional Insight Early
Identify product-level problems early in the design process while ensuring that all the design requirements are met. Activate provides its users with a standard set of predefined blocks that can easily be combined to model systems.

Activate users can easily leverage the large library of Modelica® physical components to further describe the plant and the controller.

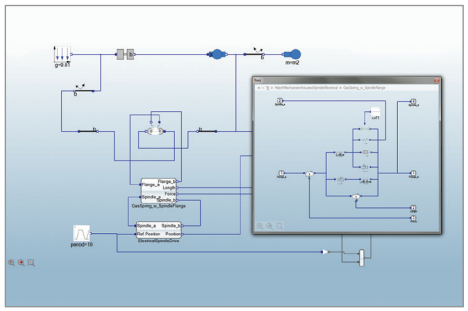
Capabilities

Build Diagrams Intuitively

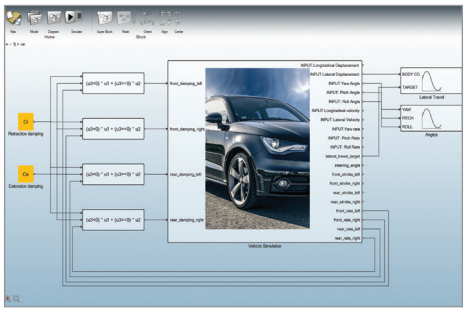
- Drag, drop, and connect paradigm to rapidly construct models
- Multiple window configuration with the ability to modify diagrams between windows using the drag-and-drop and copy-and-paste operations
- Support for concurrent loading of multiple models in a session

Hybrid Modeling
Model and simulate continuous and discrete dynamic systems.

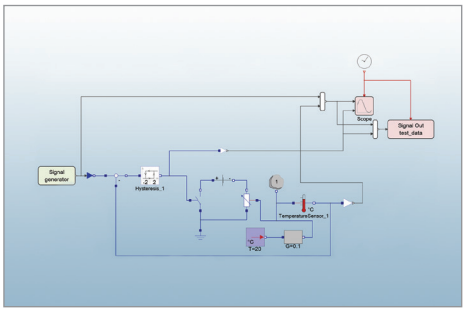
Multi-disciplinary Modeling
Activate allows users to model and simulate the combined system behavior of real-world systems with support for multiple domains such as Mechanical, Electrical, and more.



Physical component modeling of a hatch mechanism – (Mechanical/Electrical modeling)



Co-simulation of controller models with multi-body plant models



Room temperature control system with Modelica components

Hierarchical and Parametric Modeling

- Build hierarchical component-based models of a real-world system using 1D block diagram modeling libraries
- Mix signal-based and physical modeling blocks in the same model
- When modeling large or complex systems, easily create super blocks by encapsulating multiple blocks in a diagram into a single block
- Super blocks are modular, reusable, can be masked, and fundamentally behave like regular blocks allowing more flexibility
- Since a model can be hierarchical and parameters can be defined at different levels, Activate provides an 'all available parameters' option which lets users navigate in a diagram and get a report of all parameters that are known or defined at a current level

Built-in Block-based Model Libraries

Altair Activate includes a large variety of predefined blocks available in an easy-to-use library of palettes. Users can also create their own custom blocks in C or math scripts in OML and save them to new or existing libraries.

- Signal Generators
- Signal Viewers
- Signal Importers
- Signal Exporters
- Signal Conversions
- Signal Properties
- Math Operations
- Dynamic
- Hybrid
- Routing
- Logical Operations
- Activation Operations
- Matrix Operations
- Lookup Tables
- Ports
- Buffers
- Bus Operations
- Optimization
- Cosimulation
- FlipFlops
- Custom Blocks

Physical Component Modeling Using Modelica and SPICE

In addition to the signal-based blocks listed above, Activate comes with the Modelica standard library (MSL) – a collection of blocks describing the physical behavior of Electrical, Electromagnetic, Mechanical, and Thermal components. These blocks can be extended by user-defined Modelica blocks. Furthermore, users can provide SPICE netlists to model electrical circuits.

Library Management

Easily create components and assemble custom applications. Use Activate's library manager to create and edit custom libraries. Activate also provides an IDE along with API functions for users to further leverage library management.

Hybrid Simulator

Activate's simulator provides users with several high-performance numerical solvers that accurately and robustly solve dynamic systems including continuous, discrete-time, and event-based behaviors.

Solver Type	Stiffness	Solver Name
Fixed step -size	Non-stiff ODE	Forward Euler Explicit Trapezoidal Classical Runge Kutta Runge-Kutta
	Stiff ODE	Backward Euler Implicit Trapezoidal
Varible step-size	Non-stiff ODE	CVODE-BDF-Functional CVODE-ADAMS Functional DOPRI (Dormand-prince)
	Stiff ODE	Lsode CVODE-BDF-NEWTON CVODE-ADAMS-NEWTON RADAU-IIA for ODE CPODE
	DAE	IDA RADAUV-IIA for DAE DASKR

Optimization

Formulate optimization problems to improve the system parameters and design robust control strategies with multiple options.

Graphical optimization tool:

- The simplest way to formulate and solve optimization problems

Script-based optimization:

- A powerful mechanism for solving general optimization problems where the cost and constraints may be obtained from a combination of Activate simulation results and math scripts

BOBYA Optimizer block:

- This optimization block can be used directly in a model and doesn't require any external calling function or link-up
- Cascade multiple optimization blocks to formulate max-min and min-max problems

Model Exchange and Co-simulation via Functional Mock-up Interface (FMI)

Activate supports FMI 2.0 standard for both model exchange and co-simulation of dynamic systems including the ability to import and export FMUs (Functional Mock-up Units).

Co-simulation with Multi-body Models

The co-simulation interface lets users simulate a complex system that includes a multi-body system (MBS) and one or more control subsystems. In order to effectively simulate the entire system, the MBS is simulated with a multi-body simulation solver while the control subsystem is simulated with Activate.

Linearization

Activate allows users to create linear models from Activate blocks by linearization. The operating point can be computed either by running the simulation at a given time instant or by computing a steady-state point by imposing constraints on inputs, outputs, states, and state derivatives.

Compiling Models Into Executable Code

Activate supports code generation for system performance & IP protection.