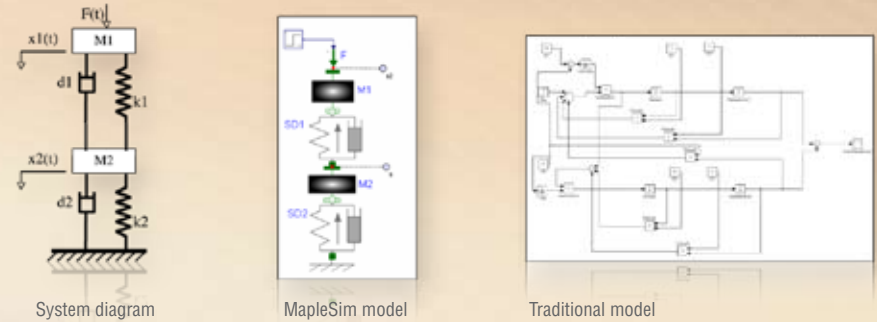


## The Physical Modeling Advantage

With traditional simulation tools, even a simple system is onerous to model. First, you need to manually derive the equations of motion, and then manipulate them into a form that can be entered into a block diagram representation.

With the cutting-edge physical modeling techniques in MapleSim, you simply re-create the system diagram on a screen and the equations of the model are automatically generated. The model maps directly to each physical component, showing how those components are connected together, and the equations of motion are generated. This approach can save hours, even days on complex applications.

### Modeling a double mass-spring-damper system



*The MapleSim model maps directly to the physical components of the model, whereas the traditional block diagram is much more complex, harder to produce, and looks nothing like the original system representation.*

Toyota, who has recently entered into a joint project with Maplesoft™, has been one of the earliest among industrial companies to embrace this approach to physical modeling: the concept of creating a computer-based model of a system to analyze, test, improve, and optimize the design before actually building the physical system.

## Applications

MapleSim has been successfully applied to such challenging modeling problems as:

- Active suspension
- Hybrid vehicle powertrain drives
- Biomechanical systems
- Spacecraft mechanisms
- Mechatronic multi-domain systems
- Micro-robotics



## Powered by the World's Strongest Math Engine

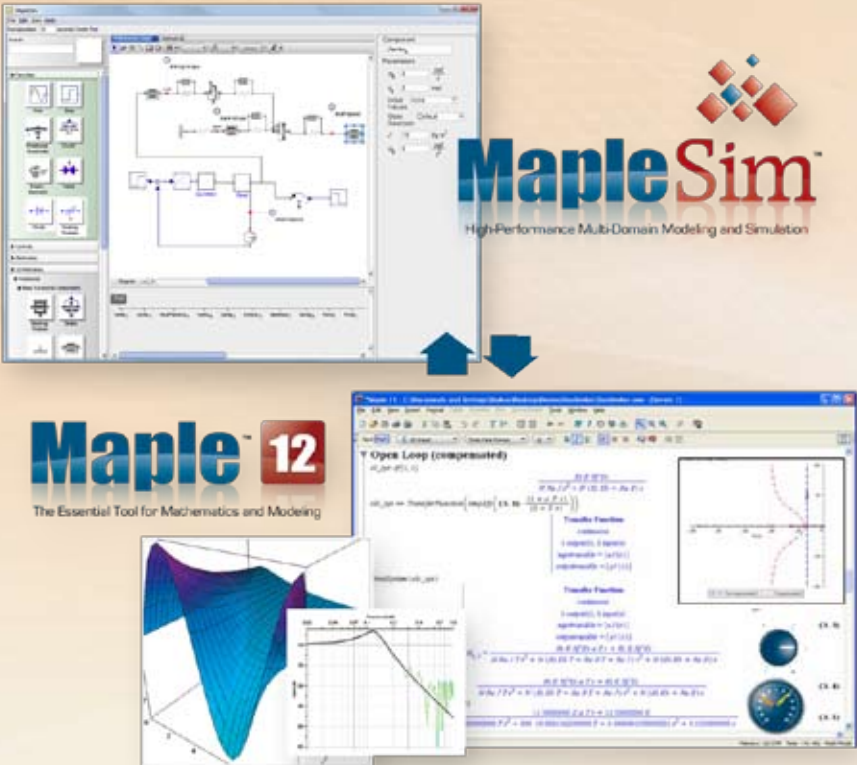
Behind MapleSim lies the power of Maple, the world's strongest math engine. As a MapleSim user, you will benefit in a variety of ways from over 20 years of research and development that have gone into the Maple product.

### How MapleSim Uses Maple

MapleSim builds on Maple's extensive numeric and symbolic computational abilities to perform high-speed simulations of very complex models. Features such as equation generation, symbolic simplification, and units management are all made possible by the Maple mathematical engine.

MapleSim capabilities provided by Maple include:

- Elimination of redundant equations
- Separation of independent systems
- Large-scale symbolic simplification
- Efficient equation management
- Application of hybrid numeric-symbolic algorithms
- Advanced high-index DAE solving



### Additional Benefits

As a MapleSim user, you have direct access to the complete Maple system, including its intuitive user interface, technical documentation tools, and extensive library of algorithms. Many Maple document and analysis templates are included with MapleSim. Using the full power of Maple you can:

- Perform advanced mathematical analysis
- Create custom components from first principles
- Control simulation runs using Maple's powerful programming language
- Create live design documents



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**MapleSim™**  
High-Performance Multi-Domain Modeling and Simulation

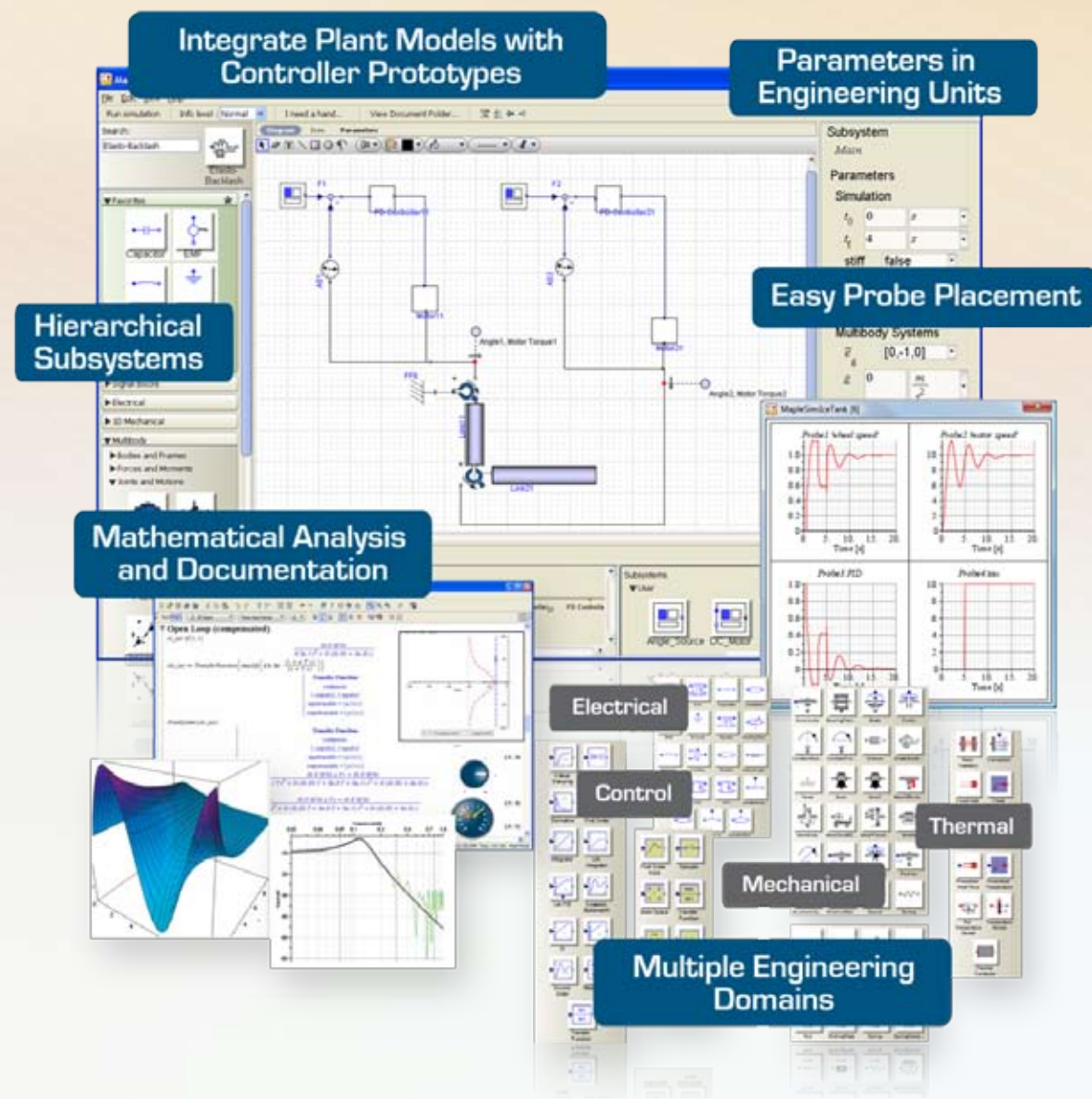
MapleSim™ is a high-performance multi-domain modeling and simulation tool that will revolutionize how you bring new products to market. In MapleSim, the world's most advanced symbolic computing engine comes together with traditional numeric solvers to supercharge the simulation and modeling process.



# MapleSim™ High-Performance Multi-Domain Modeling and Simulation

MapleSim™ is a high-performance multi-domain modeling and simulation tool that will revolutionize how you bring new products to market. In MapleSim, the world's most advanced symbolic computing engine comes together with traditional numeric solvers to supercharge the simulation and modeling process.

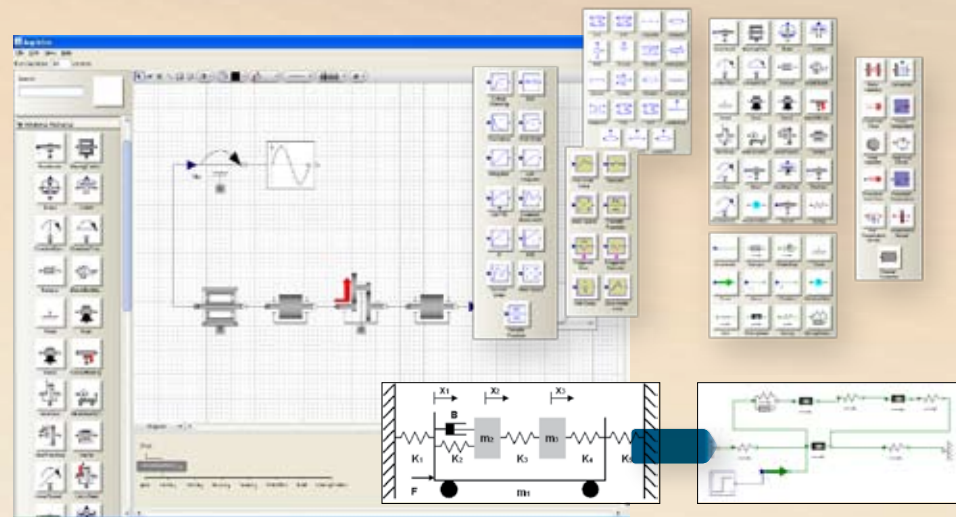
Systems are described in a compact and intuitive component diagram using next-generation physical modeling techniques, making them easier to build and understand. Model equations are automatically generated and simplified, yielding concise models and high-speed simulations of sophisticated systems. With MapleSim, you will produce better products and dramatically shorten the product development cycle.



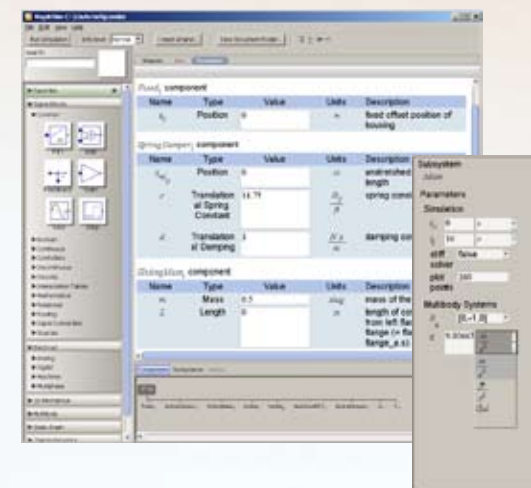
## The MapleSim Advantage

**MapleSim allows you to mix physical components with traditional signal-flow blocks.** You can build plant models that incorporate physical components from multiple domains and create controller prototypes using signal-flow blocks, all in one environment.

**The model diagram looks like the real system.** With MapleSim, you avoid having to translate your design into equations and manipulate them into signal-flow block diagrams. You can simply re-create the system diagram on your screen using components that represent the physical model. Model validation is fast because the model looks the same as you would draw by hand.



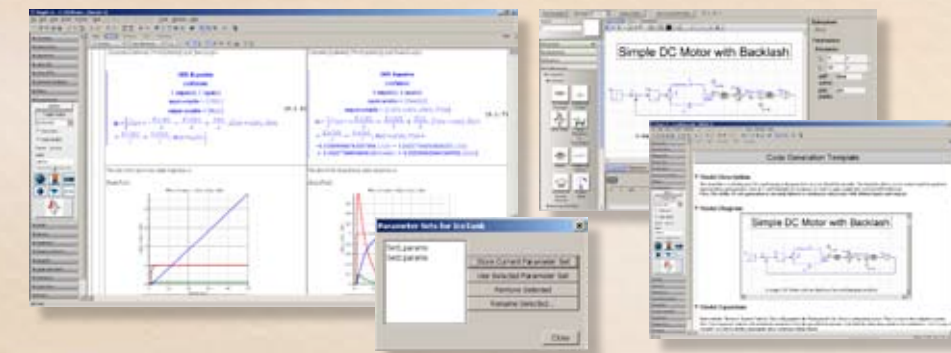
**Multi-domain models are easily assembled from pre-built components.** MapleSim ships with over 500 components from over 10 domains, including continuous and discrete signals, rotational, translational and multibody mechanics, hydraulics, thermodynamics, and electric circuits. MapleSim recognizes how components can be connected and prevents illogical connections.



**Units management removes potential conversion and consistency errors.** You can assign units to your component parameters and maintain them throughout your model simulation. MapleSim automatically converts between unit systems (for example, SI and Imperial), so component parameters do not need to be in matching systems.

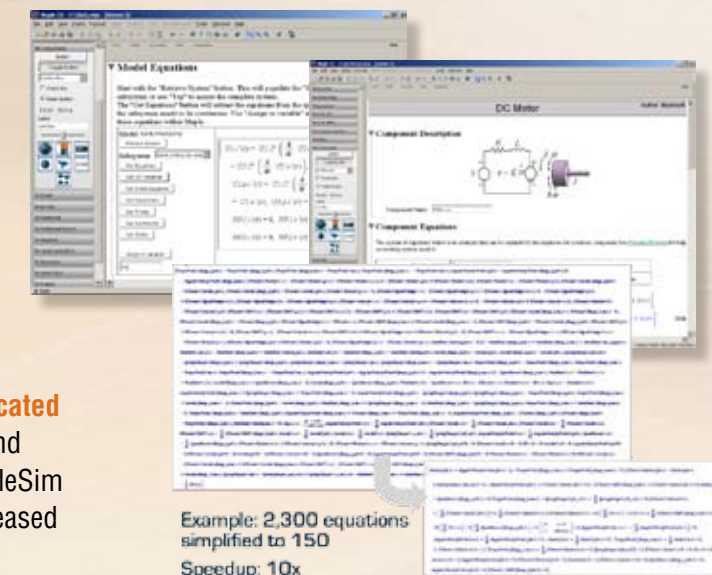
**Live design documentation captures analysis behind the model.**

Live design documentation ensures that the thinking behind your work is preserved and offers an environment for experimentation, performing “what-if” scenarios, and recording the background, design constraints, and other pertinent information for your model. Using the Maple™ technical document environment, you can access the model equations and perform analysis and other tasks to better understand, fine-tune, and document your model.

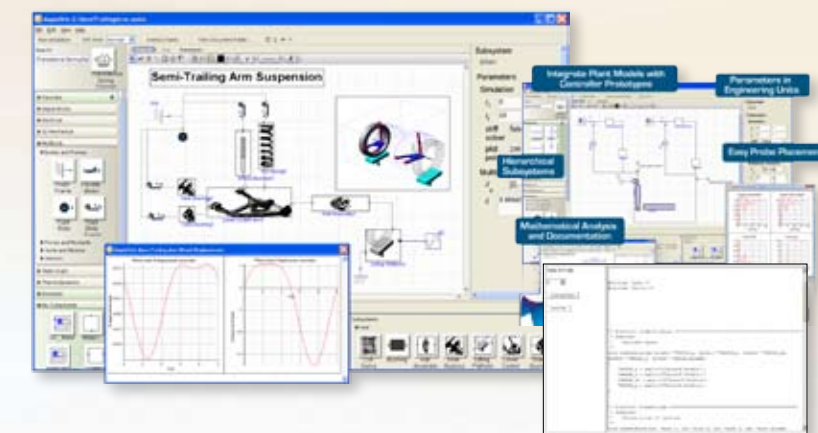


**System of equations are automatically generated for you.**

Since MapleSim is built on Maple, the same powerful symbolic computation abilities are at its core. Unlike purely numeric calculations, symbolic technology has the ability to directly convert a physical system representation to mathematical equations. Using a mathematical representation, you have the flexibility to perform operations such as solving for any variable and parameter sweeps.



**Complex models are automatically simplified using sophisticated symbolic techniques.** By performing automatic substitution and algebraic simplification, and by eliminating redundancies, MapleSim creates concise, numerically efficient models that provide increased simulation speed without losing fidelity of results.



**Solutions are easy to share and deploy.**

MapleSim makes it easy to share your models and results with your colleagues, and to transfer your work to other products in your toolchain. You can share models and associated design and analysis documentation using a single file, distribute libraries of custom components, and transfer models to other simulation systems by automatically generating C code from a model.