Ansys Simplorer Co-Simulation

A Complete Co-Simulation-Based Design Environment for Elecctrical and Hybrid-Electric Vehicles

https://scholar.archive.org/work/p4miwmm4tnhmjie3v45vp24huq/access/wayback/http://www.ansoft.se/news/articles/A_complete_co-simulation_based_approach.pdf

SIMPLORER

The solution for the above mentioned problems is a combination of different modeling languages and algorithms in an integrated design environment. For the design of electrical machines, solenoids, sensors, and other electromagnetic or electromechanical components, FEA methods are appropriate and proven to deliver viable results. The tools used in the design environment are Maxwell ® 2D and Maxwell® 3D. These tools provide this functionality for many different electro-magnetic and electromechanical components. The tools allow the design and optimization of components with static, harmonic, or transient solvers and under consideration of moving parts, such as rotors or plungers and the connection to the external driver circuit. To provide the design results from the FEA level to the subsystem design level, model extraction technology is required. The proposed solution provides ECE, an Equivalent Circuit Extraction technology describing the electromechanical component behavior using multi-dimensional lookup tables.

At the subsystem and system level, the design requires a multitude of algorithms for different problems of complex technical systems. Usually the design is performed combining conservative methods (recognizing the conservation of energy such as Kirchhoff's Law in electrical engineering) with nonconservative methods, such as state machines for event-driven systems, and block diagrams for continuous systems. However, traditionally, these different methods were used independently and were not integrated.

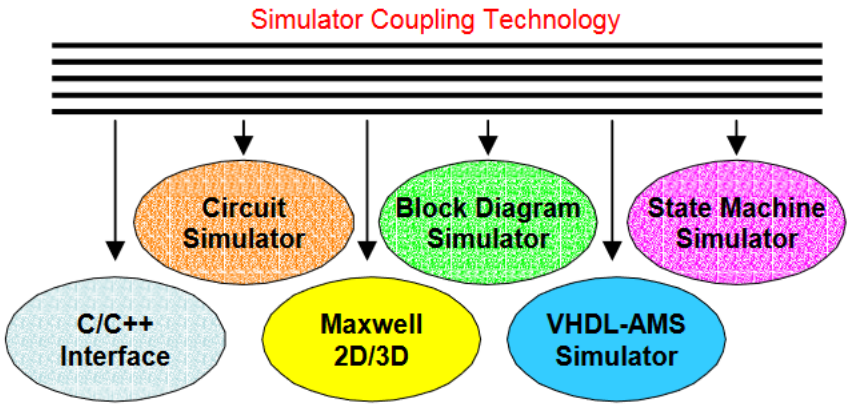


Fig. 3 SIMPLORER Simulator Coupling Technology

SIMPLORER ® , the system-level design tool of the design environment, combines these three major languages under one roof and makes them available simultaneously. Based on a unique simulator coupling technology, the SIMPLORER kernel co-simulates a fast and numerically stable circuit simulator, an analog and digital block diagram simulator, and a state machine simulator. Providing the according modeling languages, engineers can simultaneously use different level modeling components at the same model. This co-simulation approach allows to use different abstraction levels of modeling languages for the appropriate application and utilizes the most efficient algorithm for each of the languages.

Book:

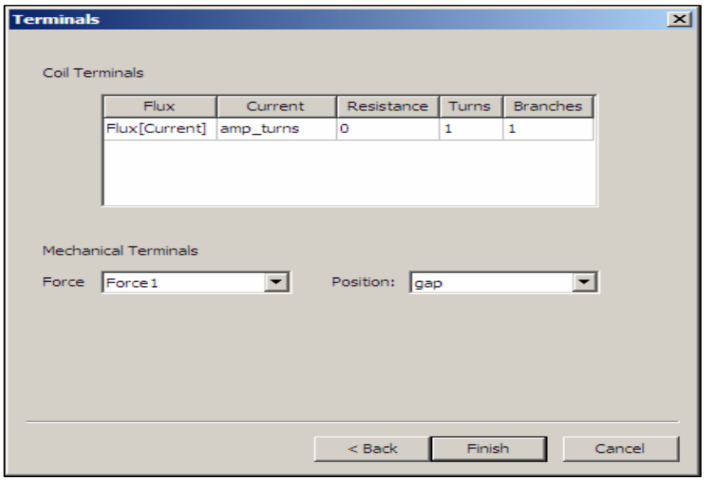
TRANSISTOR LEVEL MODELING for ANALOG/RF IC DESIGN - Springer

Referene From Page 137 (bottom) Many references, etc, to non-conservative.

In the first case we need a correct description of the charge which will compensate for the difference between the partial and full derivative otherwise the model will not be charge conservative. The consequence that the model is not charge conservative is that this difference will create additional current, solution will become path dependent and the HB of the simulator will have difficulties to converge [4, 17–20, 45–47].

Manual Maxwell 3D (an old manual from v11):

- ECE from the Parametric Analysis (Continued)
  - This window defines the Terminals of the conservative nodes in Simplorer. The conservative nodes will have their Across and Through quantities solved by Simplorer, ensuring the physical meaning of the simulation.
  - The Flux (and therefore the EMF) is the electrical Across quantity in this case. The current is the Through quantity.
  - In the Mechanical domain, gap is the Across quantity whereas Force1 is the Through quantity.

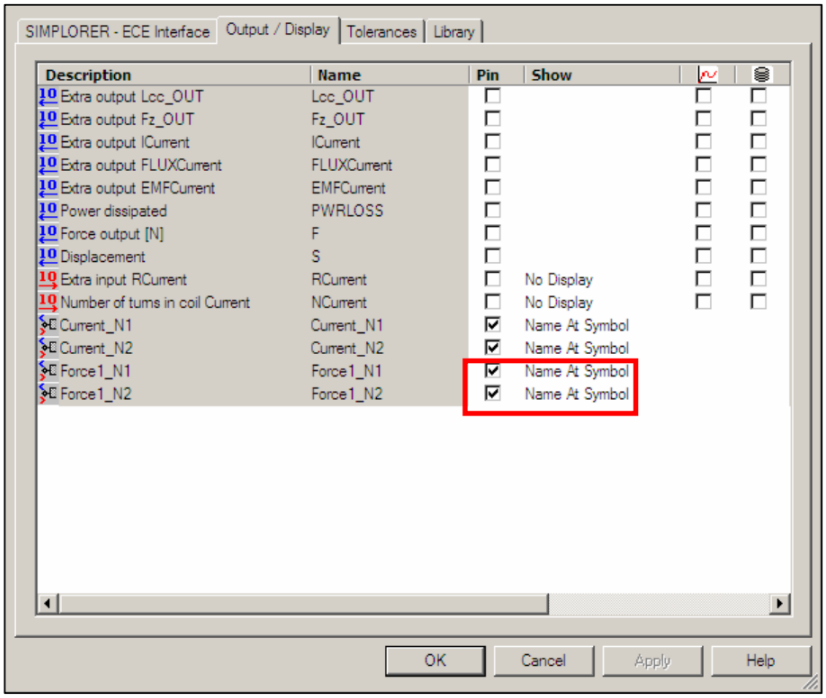


  - Since Maxwell has defined the correct values for the Terminals, simply accept the suggested parameters by clicking on Finish.

A reference to "Non-Conservative":

Create the Component in Simplorer (Continued)

- In the component dialogue box, select the **Output/Display** tab. In the **Pin** column, 4 boxes are checked: Current_N1, Current_N2, Force1_N1, Force1_N2. These terminals correspond to the electrical and mechanical terminals we defined during the ECE process in Maxwell. Verify that in the **Show** column, the **Name at Symbol** is chosen to ease the wire connection on the sheet.



- As additional input (non conservative node), you can specify the number of turns in the Coil (in Maxwell, we just gave the overall value of the current) as well as give an additional resistance corresponding to the coil in the Solenoid.
- The component is ready to be used in a Simplorer project.

So, in Maxwell's Simplorer it appears there is a way to designate a "Coil" as "Non-Conservative."

More information is required (675 pages to read) but it's a "light at the end of the tunnel" anyway!