Benefits of using a dynamic modeling software package in Electrical Engineering courses

Traditional teaching methods follow the process of *deductive* learning where students are taught particular theories that are reinforced with numerous hand calculations and labs. This teaches students to look at a system and predict the behaviour. It is equally important however to be able to look at a given behaviour and predict the system as well. Unfortunately this *inductive* style of learning is more difficult to teach because traditional methods do not support this “reverse engineering.”

Similarly, when using traditional software there is a disconnect between the theory and the model because the results are strictly numerical and are difficult to relate back to the underlying analytic equations. What is needed is software that allows you to look “under the hood” and see the equations that define the model, reinforcing the analytical concepts being taught in class.

In this paper, we examine how engineering concepts can be reinforced using a combination of theory, simulation, and hardware and how the math can be used in a more meaningful way through the use of contemporary modeling and simulation software tools.

We will examine a number of examples: Sine-driven Resistor, the inverting OpAmp, and DC motor plus OpAmp. The principle goal of this research is to establish that the use of contemporary software solutions such as Maple and MapleSim promotes inductive learning while also supporting deductive learning of traditional modeling approaches.