5. How to manipulate models in Wolfram SystemModeler

This video shows how to use manipulators in SystemModeler to conduct experiments on a previously-built model. It shows how to develop an interactive object containing one or more controls to vary the value of one or more parameters.

Transcript

**Colin:** [00:00:19] In this video, I will be exploring how to use manipulates to conduct an experiment on the model that we built. In order to create a manipulate. We need to type in manipulate. And you'll notice the context main menu brings up the word manipulate and square bracket, quiet, square bracket again. And we're going to collapse a whole lot of separate commands that we've used before into one line, so we'll be putting together SystemModeler plot with SystemModeler simulates a square bracket system model plot, square bracket system, model, simulate. And as before, we need to give a directive as to which particular model we're interested in simulating. In this case, it's our model two. And as soon, I do the inverted commas, the quotes, the model that I've worked on have come up and I can click on model two.

**Colin:** [00:01:31] What we need to do is give some indication that we're intending to change variables. So we're going to be putting a comma, a less than symbol and in the vertical line on the keyboard, which you'll find just above the enter. And we're going to put in quotes parameter values. Close the quotes. And then we're going to point that towards the things we're going to change. And that's a dash with a greater than symbol to give us an arrow. And then we have curly braces.

**Colin:** [00:02:12] And the parameters we're looking at changing for this experiment, the ones that make sense would be to change the resistances. So we're going to change resistance 1 and resistance 2. In the previous video we talked about changing voltages. And so it was resistor one dot v and resistor two, dot v. In this case, we're changing resistance so it would be resistor one dot R, capital R and resistor two dot capital R. That's what I'm type in now. And we again put this in quotes. Resistor one dot capital R close the quotes and we point this towards our variable label. Using the arrow dash greater than symbol. And I'm going to call this one resistor one. Now we're going to do this twice. So put a comma and I'll copy exactly what I have here. Paste it next door. But now change everything to resistor. two to save a little bit of time. So these are two things we're going to change.

**Colin:** [00:03:28] And once I've done that, I can close my curly brace and then put in my vertical line just above the enter, the greater than symbol and then close off the square bracket and put a comma.

**Colin:** [00:03:50] Now, we need to now indicate those things we wish to plot. So we've indicated, first of all, the things we want to change now, the things that we would like to plot. And the things we'd like to plot, are the voltage drop across the resistances and also the ramp voltage. So I'll put a, after the come up with a curly brace and now I'm going to put in resistor one and resist two dot V to represent the voltage drop across them and the ramp voltage. These again go in quotes. So resistor one dot V for the voltage drop close to quote comma, and I can copy that and put the same thing next door. Change that to a two comma and we need to now put in the ramp voltage. And it's rep voltage, one dot v and we put that in quotes as well.

**Colin:** [00:05:08] And we need to make sure we close off the myriad brackets, so we need to close off curly brace and also two square braces. We put a comma.

**Colin:** [00:05:23] The next part is giving the software an idea of where we want the slider to start at and also the range of each slider. They can be different. In this case, we're going to make them have the same range and the same starting values.

**Colin:** [00:05:38] So I've got a comma here and the next thing I need to do is put in two curly braces because I'm going to be changing two manipulates. Two curly braces, and now I can directly reference that variable, which I called resistor 1 and resistor 2. So resistor 1 comma. I'm going to start that slider often at fifteen thousand ohms.

**Colin:** [00:06:15] The next part is to give a label to the slider, so quotes again. And I'm going to give that the label as resistor one label that makes sense. So the slider, the manipulate will have resistor one above it so the person knows what they're manipulating. And so I've done that for a resistor, number one. And the next thing I need to do is give the range of the slider. And I'm going to give it a range of ten thousand to fifty thousand. Once I've done that, I can close off the curly brace there. Now, comma, the next one is going to be practically the same. So what I can do is I can copy that little section there. Paste it next door. Change it to resistant two and then the label for the slider also to resist two. Got those changed.

**Colin:** [00:07:22] And the last thing I need to type in is continuous action. And then point that towards false. And then close off the last square bracket. Press shift Enter.

**Colin:** [00:07:48] So now I can move my cursor to the end of that line. Press shift, enter and then the graph comes up with the manipulates. And you can see at the moment that both resistors are showing the same voltage drop between them and that's because the resistors are both the same value. If I move this slider, you can see that it will update the results and will show the change in voltage drop across the resistances. According to the resistance values.

**Colin:** [00:08:19] So this is a nice experiment. The students can add this four criteria 3, of course, but they can also put it in their portfolio to satisfy aspects of criteria 6 experimentation.