7. Using the ‘manipulate’ command in Woldram Systemmodeler

This video explores how students can use the ‘Manipulate’ command in SystemModeler to create a range of interactive applications using a few lines of input. It also shows how to modify original models, creating an interactive object containing one of more controls that can be used to vary the value of one or more parameters.

Transcript

**Chris:** [00:00:21] So we've now created our model, plug in the values, change some values as well. That's all well and good. Most people like it some form of interactivity with our models. So I'm going to show you now how you can make it or modify our model so that we can enter a discrete value or use a slider to manipulate things. So the first one that we're going to look at is how do we just have a box where we can type in a value that we want change that. And watch our model change and the outputs change.

**Chris:** [00:00:53] So first thing we want to do is a manipulate and you'll notice here I'm going to stack some commands or nest them. So we'll do manipulate open square brackets, quiet open square brackets, models system plot. I forgot camel case there. So plot and open brackets model system model. S Y S model simulate. Okay. And then I'll open my square brackets again, so of nested three things here apart from the quiet, which just means that a generates that data in the background again camel case For that.

**Chris:** [00:01:44] We can see that I've stuck to commands here or nested them and programming talk. So we've got our manipulate quiet just means that it generates the data in the background without us really seeing any visual representation of it coming up. We've got model system plot, so that's going to create our graph's. Model System Simulate is gonna create our data.

**Chris:** [00:02:08] So I'll drop back down onto the next line again usual once. So we'll type in our model name here. So lossy demo so LossyGearDemo1. You'll see it'll auto populate and then add a comma at the end of that and then we use our opening brackets and we'll say parameter. Parameter values, which just means that we're modifying something, then our unusual point arrow and then opens on curly brackets. And we want plot now our name or our parameter that we want to change. In this case, I'm going to use DriveSine dot amplitude. Capital D drive sine dot amplitude. Yes, correct. Ok we'll close that. So that gives us our name for it and our unusual pointy bracket again. And then again give it a name to go with that. So we'll call that variable in this case amplitude. Space amplitude. Ok.

**Chris:** [00:03:25] So what we've said here is we're gonna use our Losey gear demo. Changing the parameter value, the one is drive sine and we're going to call it amplitude close brackets. And then we'll close our vertical and then greater than. And then we've got to close three square brackets here. That is this one. This one and this one, but we'll still notice that that first ones left open. Why? Because what we want to do, we want to give some structure after that to us.

**Chris:** [00:03:57] So we'll open to curly brackets and then we'll give it a parameter name. Parameter name was amplitude a m p Amplitude, which is from here. That one there amplitude and then we'll go comma an initial value of 1 and then we'll give it a description. So we'll just say it drive amplitude. That's basically a tag that will go in the box to tell us what we're doing. So D drive. We'll close our two curly brackets. One, two and a comma.

**Chris:** [00:04:44] Now you want, you want a phrase called continuous action. So that means that we can modify things dynamically or on the fly and it will actually physically show up in the graph.

**Chris:** [00:04:55] So we'll do continuous action. False. Like so then we'll close our square brackets, which is nice, so that, that basically closes off our very first set that we did. So if we do control enter, it should come up. And a technical glitch.

**Chris:** [00:05:24] When I've executed this command I've realized that it has come up with model system. plot fail. Not too sure why, but quick through just to check that syntax is correct. Again, remembering, it's really critical that we get things either spelt correctly or in the right order.

**Chris:** [00:05:43] So if we have a look here, we'll notice that for some reason I've spelt Drive incorrectly. So I'll have a go, we'll see when we execute this what happens. So it does look like something's happened here. So what this window is telling us is that, the model has simulated correctly it's generated data. But for some reason, it's not actually showing up any graph or any graphic representation of what's happened. Why might that be? Looking back up here. I noticed that it says model system plot. The command is actually system, model, plot. So you may find that when you work through and start to you get to use this. You'll be able to pick up things like that. Again, the drop-down menus are very, very handy. So with that just make sure that those are in the correct way. Now, hopefully when we execute this, we should get some nice pictures.

**Chris:** [00:06:47] So we've now got the drive amplitude with a numeric value starting one which we put in here. We can change this value and hopefully the graphs will change as well. So the draft's themselves just come up with our initial value.

**Chris:** [00:07:03] So say we change this to five. And hit Enter. We should find that. Yes, the graphs are changed to represent that change in value that we've got.

**Chris:** [00:07:18] So whether students can do here, if they've got a system and they want to model it and they want to have different values or play around with things when it comes to, for example, the force that's, say, on a lever, they'll be able to get a graph straight out, cut and paste into the folio and that it will obviously make up good part or good content within their folio.

**Chris:** [00:07:41] So the next thing I later try and do is, OK, that's not so usable, because every time you want to change it you got a stamp and a different number and change them.

**Chris:** [00:07:51] Change your graphs by clicking in the main box. I want to make it so that it's a bit more, how can say, dynamic. So we just move sliders and that changes things. So again, manipulating with a slider. I do have my notes here. It is very, very simple. So I will now cut and paste again this. So control C and drop down so that we've got a nice clean page down here. And do control V that puts it in there. So it's really at this stage that we want to start modifying things. I better not point at the screen. But this part here that we want to change things. So where we've got the amplitude initial value one, and given it a name on the box, we want to actually keep that, but after that, give it values. So on minimum value and a maximum value. So if we go between these two curly brackets. Curly braces. We can put our minimum value in there. So we'll do a comma, minimum value of zero. Sorry a minimum value of 1 and we'll do a maximum value of 10. So another comma, maximum value of 10. You'll notice that all the other bits of code stay the same. We don't change those. So if we hit enter, we should find that now we have a slider comes up, which is great here. If we start moving that along. Click down in there, you can actually change these graphs as they represent.

**Chris:** [00:09:22] Is it possible to make it so that the slider starts in the middle? Absolutely. So we could say minimum value one. But we want our default value of five. So go back up here. Backspace five. Put a common in. Control Enter. And we'll see that now our slide show starts in the middle halfway between 1 and 10, and we can move back down and redo the graphs or obviously move that back up so we can see the graphs again. So that's how we can add that interactivity to it.

**Chris:** [00:10:01] So that allows us to show our students how we can, and I'll just scroll back up to the beginning, how we can import a model from the fixed models that are there. Import our model, start to show it. Obviously, generate images, generate data from them, showed in a graphical form so we can put that in our folio. Show how we can plot things and make them larger. So obviously the images become clearer. Change specific pieces of data. So the various factors that we or are concerned about within our model. And also do that, scroll down slightly, do that with a box where we change the value in there. And then obviously change it using a scroll bar.

**Chris:** [00:10:53] If there are any parts in the notebook that the student saw, staff member who's developing these things feel aren't appropriate or they don't want included it, if you scroll over to the left, you'll see a series of square braces there. Those are the ones that turn bold when the commands are being executed. If you want to get rid of that portion of the notebook, just select it using a left click. Hit delete. And that will take out those portions. So I want to take those graphs out. I don't really want to see the ones where I've got to actually physically change the numbers.

**Chris:** [00:11:27] So that should hopefully get the student started using this with standard models and be able to experiment with various parameters and change those so that they can make them more interactive for their own benefit.