Extra Exercises for Chapter 14. Software: Further Progress

Chapter 14 contains a large collection of exercises to make further progress with Stella and Vensim. The extra exercises on the BWeb show the Vensim equivalent of two of the Stella examples.

1. Verify the Vensim Insect Model

Build the model in Figure 1 with the same parameters as in the Stella model in Figure 14.22; the fraction female = 0.5, eggs per female = 4; incubation period = 6 months, maturation period = 5 months, and adult period = 1 month. Set the initial value of all stocks to zero.

Now, take note of the name for the stock “New Over Wintering Eggs.” This is to remind us that we need a separate equation for eggs that will hatch in the 4th month of the simulation. Read the Vensim documentation about the PULSE function and use it to get the “initial eggs to hatch in 4th month” = 120*PULSE(4,1). The births flow is identical to the “total eggs hatching.”

![Vensim Model](image)

Figure 1. Vensim version of insects model.

The diagram includes a “monthly counter” to keep track of the month of the year: MODULO(time,12). This variable is not connected to other variables in the model, but it is useful to include in tables of results. For example a table that shows the monthly counter and the “total eggs hatching” will allow us to verify that the hatching appears in the same month each year. The flows in Figure 1 use the DELAY FIXED function, as shown in Table 1.

<table>
<thead>
<tr>
<th>Equation</th>
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<tr>
<td>new eggs hatching = DELAY FIXED(eggs deposited*(1-egg loss fraction), incubation period , 0)</td>
</tr>
<tr>
<td>new egg loss = DELAY FIXED(egg loss fraction*eggs deposited, incubation period , 0)</td>
</tr>
<tr>
<td>maturation = DELAY FIXED(births, maturation period .0 )</td>
</tr>
<tr>
<td>deaths = DELAY FIXED(maturation, adult period , 0 )</td>
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Table 1. Equations for the flows in Figure 1.
Simulate the model to verify the number of adults will follow the pattern in Fig. 2.

![Fig. 2. Adult insects in the Vensim model.](image)

2. Verify sampled noise in Vensim.

Build the Vensim structure in Figure 3 and confirm that you get the pattern shown in Figure 4. You should see a new value for Sampled Noise every year. Use MODULO for the counter and RANDOM UNIFORM for the noise that changes every DT.

![Fig. 3. Vensim structure for sampled noise with the noise interval set to 1 year.](image)

![Fig. 4. Sampling every year in Vensim.](image)
Notice that the precise values in Figure 4 do not match exactly with Fig. 14.8. This is to be expected since the programs do not necessarily generate the same sequence of random numbers.