

# MathModelica® System Designer™

## Hello World

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### 1 Introduction

The most basic Modelica model is a differential equation. In this example a differential equation is implemented and simulated and it is also shown how to draw an icon for it.

### 2 Hello World Model

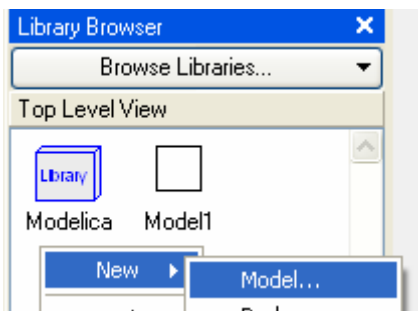
There is a long tradition that the first example in any computer language is a trivial program printing the string “Hello World”. Since Modelica, the language used in MathModelica, is an equation-based language, printing a string does not make much sense. Instead our Hello World Modelica program solves a trivial *differential equation*:

$$\dot{x} = -a \cdot x$$

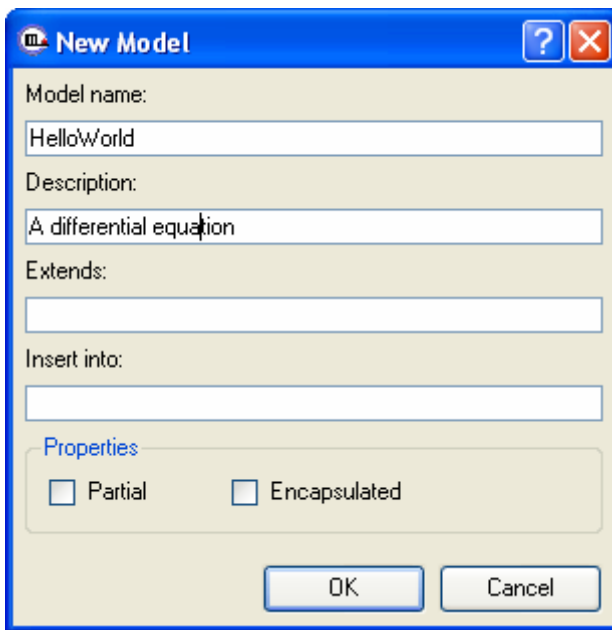
The variable  $x$  in this equation is a dynamic variable (here also a state variable) that can change value over time. The time derivative  $\dot{x}$  is the derivative of  $x$ , represented as  $\text{der}(x)$  in Modelica. All Modelica programs consist of class declaration (*class*, *block*, *model*, *package*, *etc*) and in this case we declare the program as a *model*.


```
model HelloWorld
  Real x(start=1);
  parameter Real a=1;
  equation
    der(x)=-x;
end HelloWorld;
```

To develop this model, begin by creating a new model. This is done by right-clicking in the Library Browsers Top Level View and selecting Model...:



This will open a dialog box in which you can set model name and description:




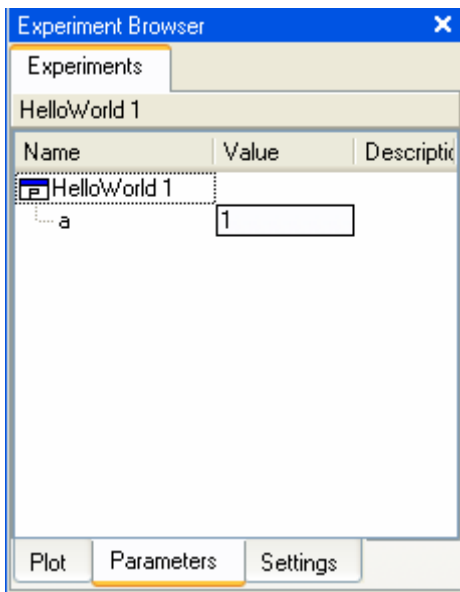
When clicking ok the model will be created in the top level view. Clicking on the Modelica Text View  to see the model code:

```
model HelloWorld "A differential equation"
  annotation(/.../);
end HelloWorld;
```

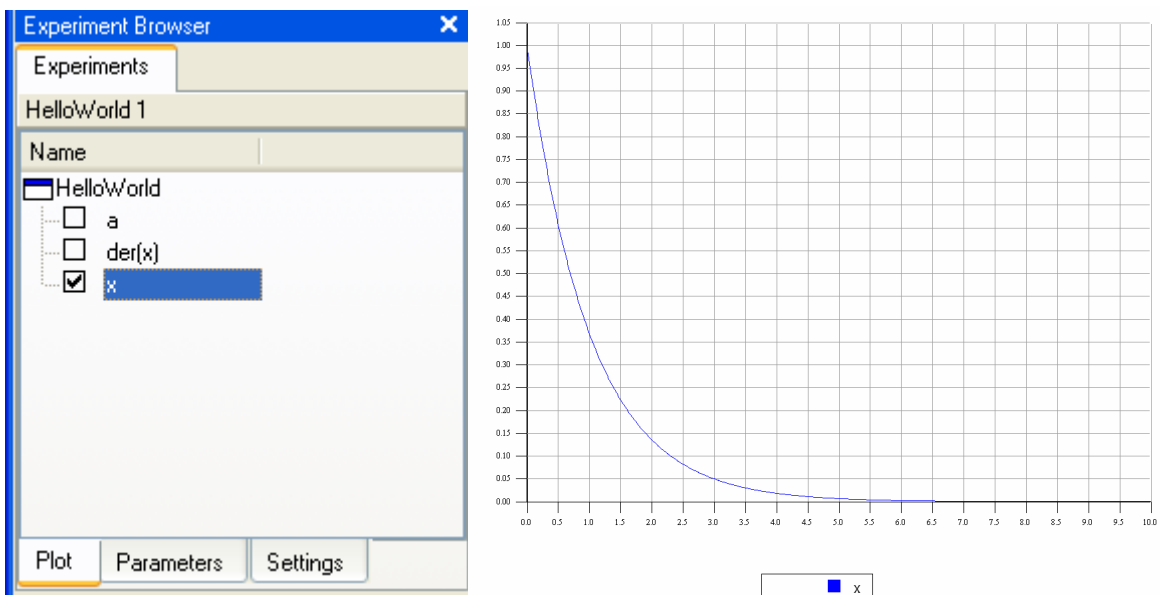
The annotation on the second row contains graphical information about the model. The information here is automatically updated when you edit e.g. the model Icon. Note that the description text has also been added to the model. Now it is just a matter of declaring the variables, parameters, and equations:


```
model HelloWorld "A differential equation"
  annotation(/.../);
  Real x(start=1);
  parameter Real a=1;
  equation
    der(x)=-x;
  end HelloWorld;
```

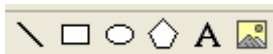
The model is now ready for simulation. To perform the simulation open the Simulation Center by clicking (Click ). A new program will open and the Hello World program is translated into an executable and an experiment is created and shown in the experiment browser:



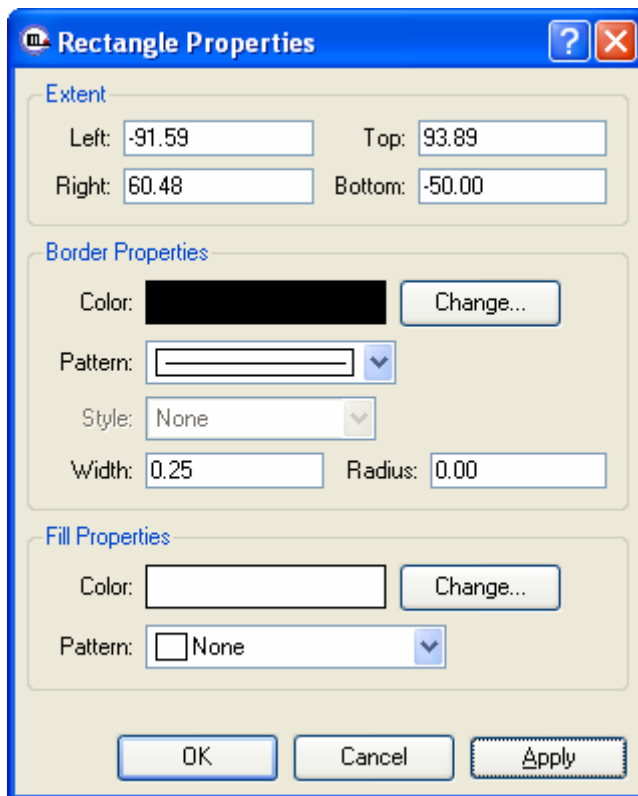
As seen the model parameter  $a$  can be set here, but we leave it for now. Instead we click the simulate button to invoke the simulation. Now the Plot tab is shown in the experiment browser and by clicking the check box in front of the variable  $x$  the result is plotted:



Once the simulation is performed we go back to the model editor to make an icon for the model. This is done by opening the Icon View (Click ) and using the drawing tools to draw:



Choosing the rectangle tool it is possible to draw a rectangle, and double clicking on the rectangle a property window, where colors, patterns, etc, can be set is opened:



We choose black fill color with a solid fill pattern and click ok. Afterwards we add a text and set color in the same manner to end up with the following icon:



The model will from now on be represented by this icon in the experiment browser.