MyOpenLab

Build 3.0.8.0

Calculating with MyOpenLab

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CALCULATING WITH MyOpenLab

1. Calculation using the "Calculator" object

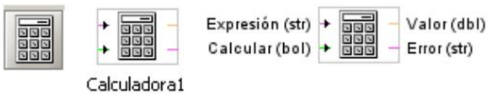

Figure 1

This function block collects a numerical expression in its "Expression" input and when we give the order in its "calculate" boolean input, the calculation is performed and the result is delivered in the "Value" output.

The syntax for writing the expression must conform to that specified in Table 1

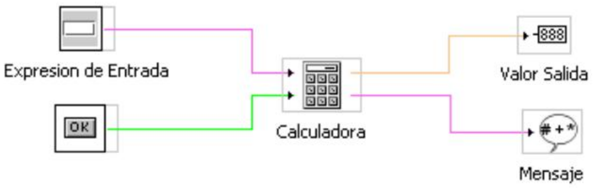

Figure 2

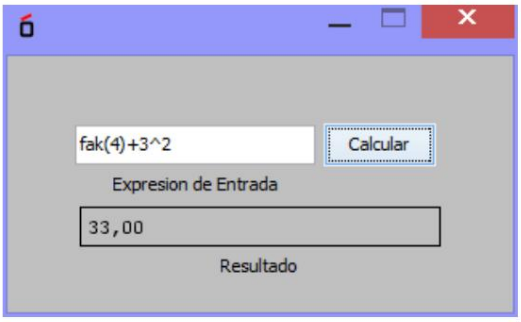

Figure 3

In figure 2 we see the scheme of the model to carry out calculations. The text input box allows us to write the mathematical expression and the "OK" button allows us to execute the calculation order.

The function fak(n) calculates the factorial of the number n

In figure 3 we see the appearance of the application in execution mode.

2. Calculation using the object "Calculator y=f(x)"

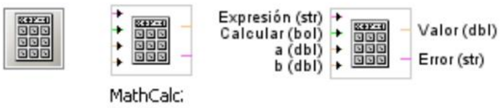

Figure 4

This calculator, unlike the previous one, allows calculation with a certain number of input variables that can be defined in the parameter editing window through the "Pins" value, which represents the number of input variables that we will have.

Variables are named in a fixed way starting with a and continuing with the letters of the alphabet.

Input variables: a,b,c,...
Output variable: Worth

The calculation is enabled by means of the Boolean input **"Calculate".**

Let's see an example in which we try to solve the solutions of a quadratic equation given its coefficients:

a*x2 + b*x + c =0

We know that the solutions would be

x1= [-b+(b2 -4*a*c)1/2] / 2*a

x2= [-b-(b2 -4*a*c)1/2] / 2*a

In this case we will have 3 input parameters: a , b , c

As we have two solutions we will use a calculation block for each of them.

We see that the entries of the parameters a, b and c are made through text boxes and then conversion of this (string) to a data type dbl. Let's not forget that the calculator works with parameters of type "dbl".

Figures 5 and 6 show the circuit window (model) and the presentation window (in execution mode) respectively.

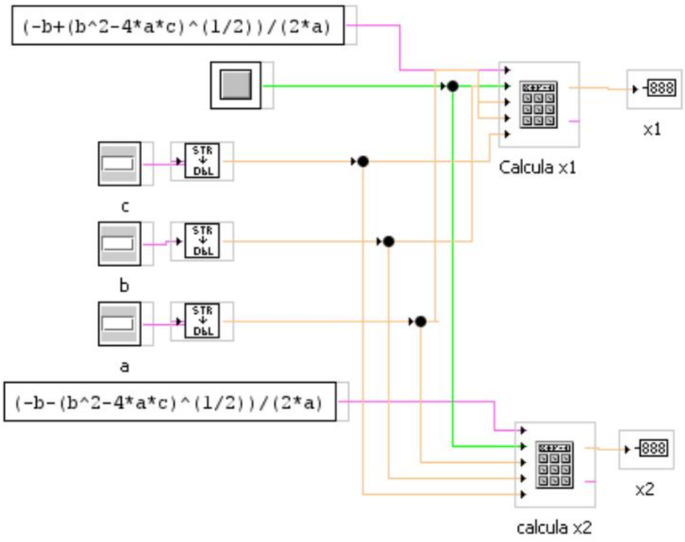

Figure 5

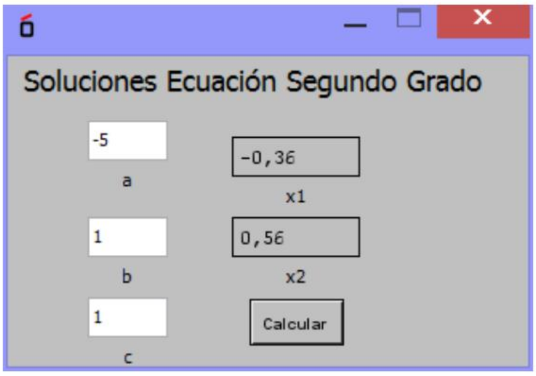

Figure 6

3. Calculation using the object "Calculator ext."

MyOpenLab has a function that allows us to calculate mathematical expressions with several independent variables.

In the example of the figure we see how the operator "Calculator ext1" has as inputs two variables "x" and "y" and in its input it has a text input box placed through which we will write the expression that we want to calculate.

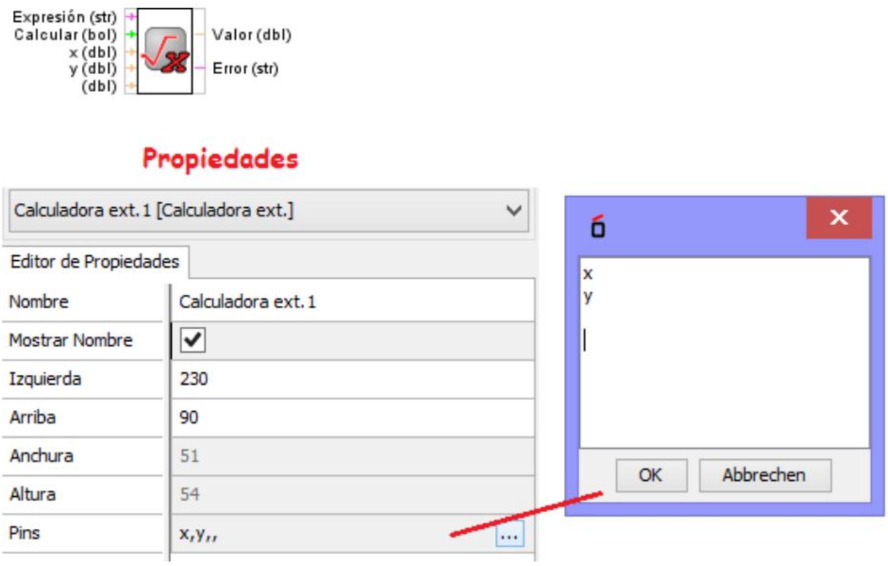

Figure 7

The calculator function can have several input variables, all of them of type dbl (decimal integer) and in its output it presents a value according to the mathematical expression that we place in its “Expression” input. The number of inputs is set through the “Properties Editor” window by means of the “Pins” value. If we click on this property, the entry editing window is displayed and we put each entry on a line.

In the example, a generic calculator is made that uses two variables "x and y" showing the result in the output. The inputs x and y are simulated by means of two sliders with values from 0 to 100.

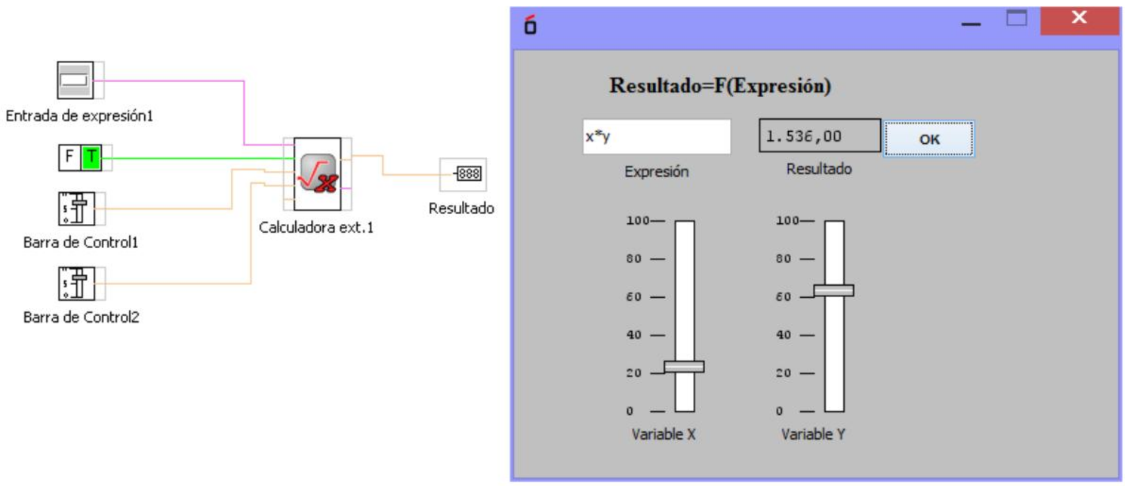

Figure 8

Expression calculations can also be performed with other calculation library objects. Let's see how.

4. Calculation Examples:

Example 1: Conversion of temperatures

With this example we are going to implement a very simple calculation model in which we go to the values of the basic calculation operators that are incorporated into the MyOpenLab numerical library.

It is about making an application that transforms degrees Celsius into degrees Fahrenheit and degrees Kelvin.

The input data of the model will be:

T= Temperature in ºC

The output data will be:

F= Degrees Fahrenheit
K= Kelvin degrees

The formulas used for these conversions are as follows:

K=C+273

F = C*(9/5)+32

Figure 9 shows the circuit window with the complete model. Figure 10 shows the display window with the model in execution mode.

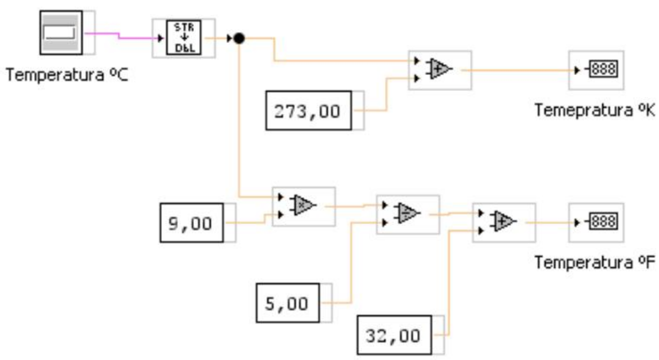

Figure 9

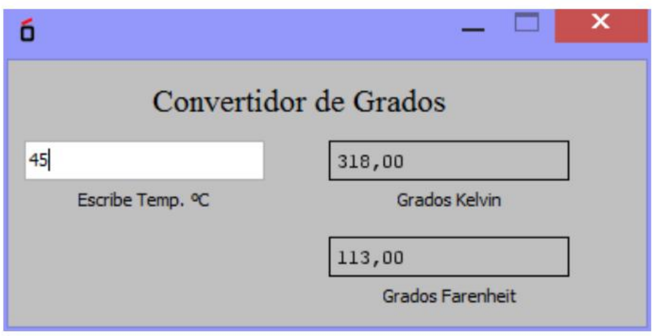

Figure 10

4.1. Example 1: Calculation of the value of the resistance of a wire based on its length and its section.

In this example we are going to study the variation of the value of the electrical resistance of a conductor as a function of its length, its section and its resistivity.

The independent variables of the model are:

• L = Conductive wire length (m) • D =
Wire diameter (mm) • r =
Resistivity in (ÿmm/m)

The dependent variable in this case is only one:

R= Conductor resistance R=(r*L)/pi*(d/2)2

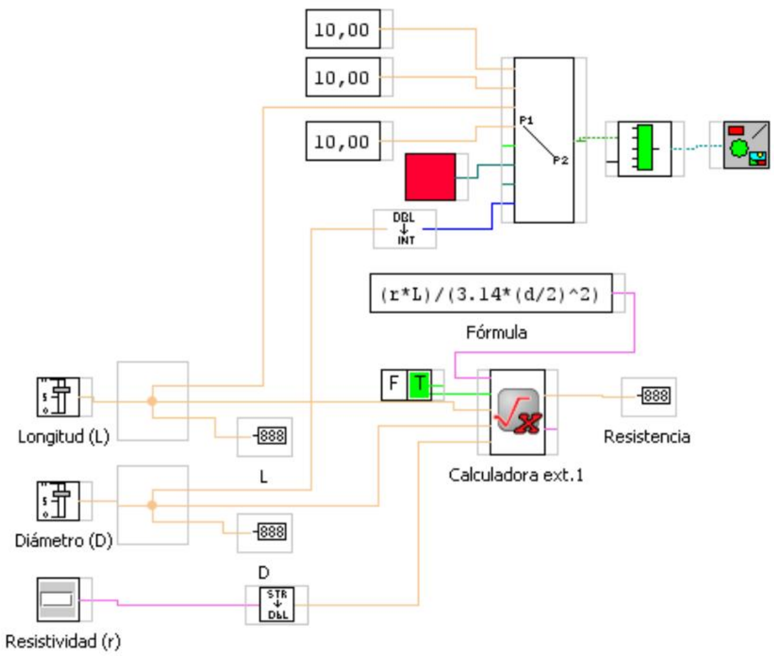

Figure 11

We see in the Circuit Panel the "Calculator ext.1" to which the three independent variables that are simulated are connected with two sliders (L and D) and a text input box (r) that before connecting to the calculator previously we converted from str->dlb.

We put the formula to the calculator through a text input object (str).

In order to facilitate the understanding of the phenomenon, a line has been drawn with the corresponding “Draw Line” canvas object on which we control the length (variable X2 that simulates the length) and its thickness (variable stroke width that simulates the diameter of the thread). . These variables are logically collected from the corresponding sliders that control the L and D variables of the model.

In the following figure we see the appearance of the Visualization Panel in simulation mode.

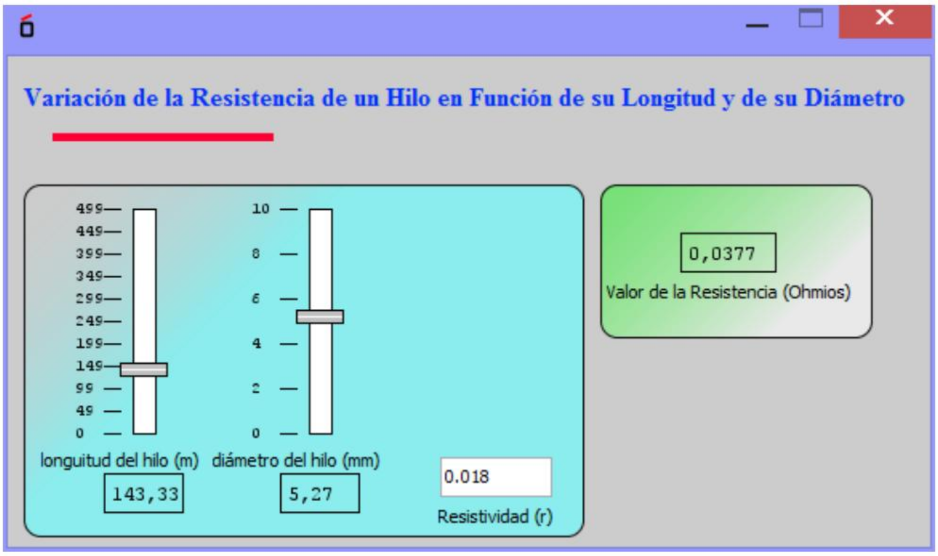

Figure 12

4.2. *Example 2: Calculation of the space traveled by a mobile.*

In the following example we are going to simulate the behavior over time of a mobile affected by a uniformly accelerated movement.

To address the problem we will distinguish two variables to be calculated: space X and velocity V. As we know, both variables are calculated according to the following equations:

$$X=Vo*t+1/2*a*t2$$

V=Vo+a*t We

will clearly distinguish the dependent and independent variables as well as the parameters or values that we consider constant.

Independent Variables: t=time

Dependent variables:

v= Instantaneous speed

X= Distance traveled

Constant parameters:

V= Initial velocity a=
Acceleration

To make the mathematical model of the phenomenon we will use two blocks

functional “Calculator ext.” And  each of them will be in charge of calculating each of the two dependent variables.

We are going to simulate the independent variable (time) using a block

analog variable generator “Generator” .

This block will allow us to generate an analog value of the decimal type (dbl) according to its input parameters. In this case, we decided that of its configuration parameters, only the maximum count value called "to" in the component is configurable. The generator parameters would be of the form: from=0 ; step= 1 ;delay= 100

This means that we will count the time starting from 0 jumping from 1 to 1 with a time between one number and the next of 100 ms.

In the figure we see how the two calculation blocks remain. The variable "t" reaches both of them from the same generator, as is logical. The generator blocks have three control signals that are generated by three push buttons:

Start = Start of time count
Stop = account stop
Reset = Zeroing of the counter (start of the time variable)

The values of the parameters "a" and "Vo" can be modified in simulation mode through a text input box. This text is then passed to a dbl type variable and connected to the calculation blocks.

The model would be fully defined with these blocks, but it will be useful to be able to display the values of the variables. For this we have resorted to several visualization objects:

Color Bar: To visualize the space
Needle Gauge: For Speed
Temporal Graphic Tracer: For space
Numeric Output: For space

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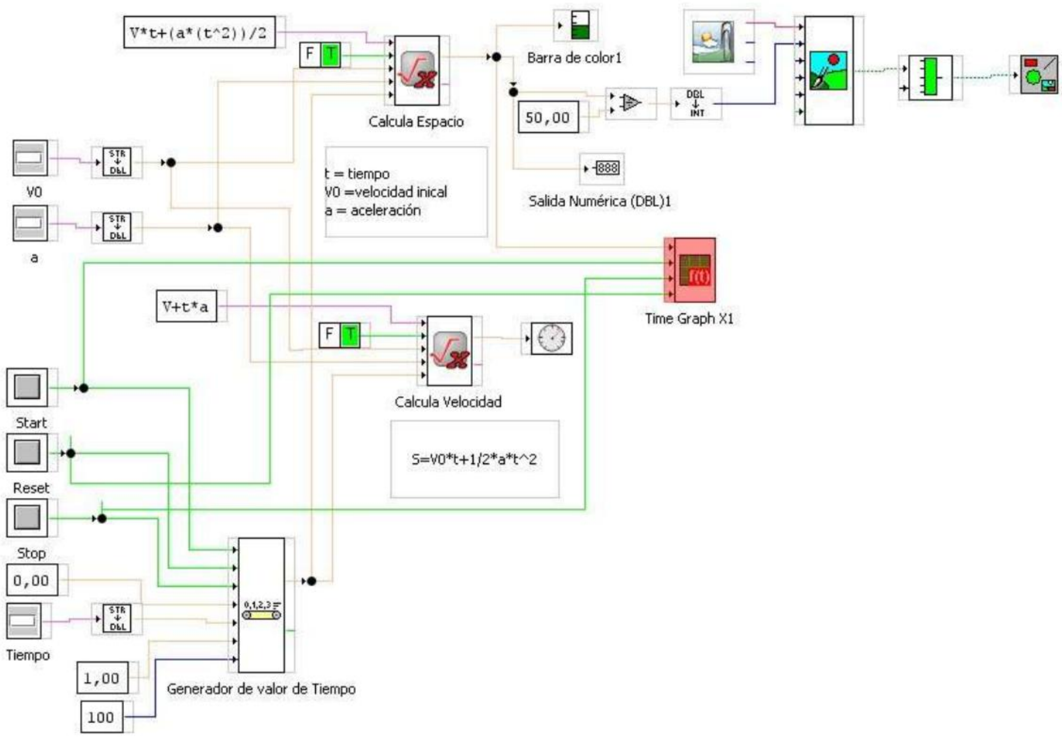

Figure 13

An object (cart) has also been placed in the model that will move depending on the space in the positive direction of the x-axis (horizontally), for this we have resorted to the canvas object library where the "Draw Image" object has been used. " as well as the mandatory object that creates the canvas space "Canvas" and the necessary grouping object "Group"

In the figure we see the objects that are responsible for showing the cart in motion.

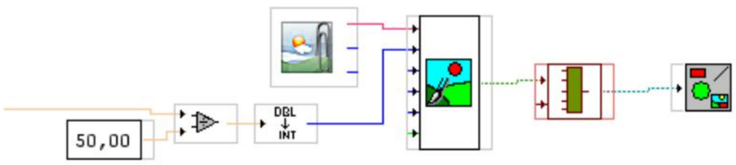

Figure 14

Finally, the display screen in execution mode is the one shown below in figure 15

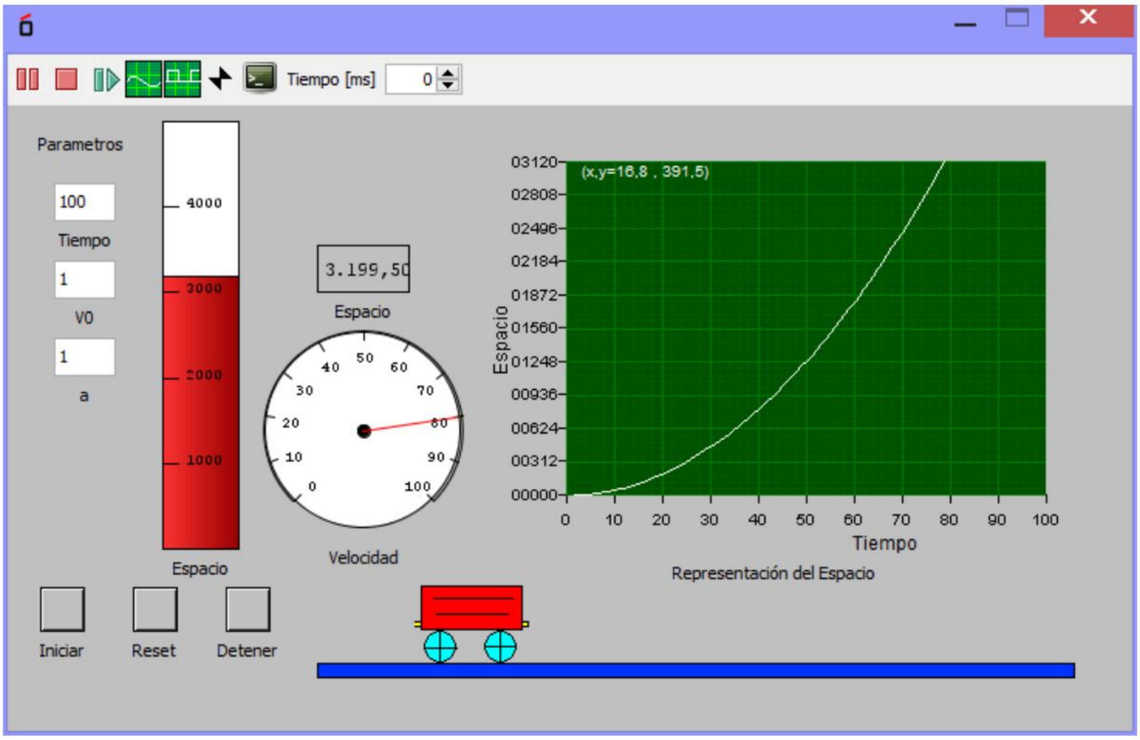
Tiempo [ms]
0
Parametros
100
Tiempo
1
V0
1
a
4000
3000
2000
1000
Espacio
3.199,50
Espacio
Velocidad
(x,y=16,8 , 391,5)
Espacio
Tiempo
Representación del Espacio
Iniciar
Reset
Detener

Figure 15