Annex 60 Bouncing Ball Exercise

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Introduction

The aim of this exercise is to become familiar with the Modelica text editor. You will need to write your own model equations in this exercise.

Assignment

Create a model of a bouncing ball in two dimensions. The ball has an initial position (x_0, y_0), initial velocity ($v_{x,0}$, $v_{y,0}$) where $x_0 = 0$, $y_0 = 1$, $v_{x,0} = 0.1$ and $v_{y,0} = -0.3$ are parameters. The vertical component of the velocity is influenced such that

$$\frac{\mathrm{d}\, v_y}{\mathrm{d}\, t} = -g$$

where $g = 9.81$ m/(s^2). Whenever the ball hits the ground it bounces back up but it looses 20 % of its kinetic energy ($v_y^2/2$).

Tips

You'll need the following Modelica concepts:

1. Initial equation section
2. when-clause
3. reinit($\cdot$, $\cdot$) function

Result

Figure 1 shows the result of this exercise. Think about why the ball falls through the ground.

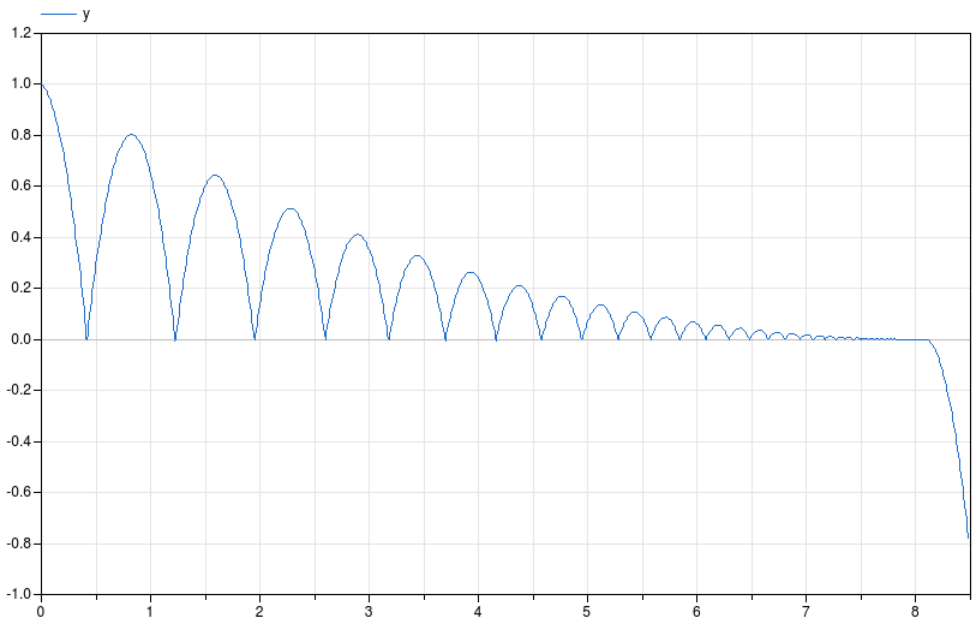

Figure 1: Result of the exercise: y-position as a function of time.