

Control flow and Event handling

Spoken Tutorial Project
<http://spoken-tutorial.org>

National Mission on Education through ICT
<http://sakshat.ac.in>

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12 June 2015



Learning Objectives

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- ▶ **use 'if-else' statement**



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In this tutorial, we are going to learn how to:

- ▶ **use 'if-else' statement**
- ▶ **handle time and state events**
- ▶ **use 'when' statement**

System Requirements

- ▶ **OpenModelica 1.9.2**

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- ▶ **Any OS: Linux, Windows, Mac OS X or FOSSEE OS on ARM**

Prerequisites

- ▶ **equation-based modeling of physical systems**



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- ▶ **branching in any programming language**



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- ▶ **branching in any programming language**
- ▶ **class definition in Modelica**
- ▶ **Prerequisite tutorials are mentioned on www.spoken-tutorial.org**

Problem Statement

‘timeEventExample’ - ‘freeFall’ class with a constraint

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- ▶ **Ball is at rest until $t = 0.5$ seconds**

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‘timeEventExample’ - ‘freeFall’ class with a constraint

- ▶ **Ball is at rest until $t = 0.5$ seconds**
- ▶ **Free fall under gravity starts at $t = 0.5$ seconds**

CAUTION

**Number of equations in 'if' branch =
Number of equations in 'else' branch =
Number of variables in class/model**

Event

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- ▶ **Event** - Abrupt change in behaviour of a system
- ▶ **Time event** - time at which event occurs is known
- ▶ **timeEventExample** handles a time event at $t = 0.5$ seconds
- ▶ **State event** occurs when a system variable crosses certain value

Problem Statement

Ball under free fall faces a state event on touching the ground



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Behaviour when it hits the ground:



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- ▶ **Velocity reverts in direction**



Problem Statement

Ball under free fall faces a state event on touching the ground

Behaviour when it hits the ground:

- ▶ **Velocity reverts in direction**
- ▶ **Magnitude of velocity changes if the collision is inelastic**

Event-related operators

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Event-related operators

- ▶ **when** statement is used to signal an event
- ▶ **reinit(a,b)** assigns value of 'b' to 'a' and resumes simulation
- ▶ **pre(a)** returns the value of variable 'a' before event
- ▶ Eg: **reinit(a, 10)** - assigns a value of 10 to 'a' when event occurs

Assignment

- ▶ **Simulate 'bouncingBallWithHysteresis' model and generate 'h' vs 'time' plot.**



Assignment

- ▶ Simulate 'bouncingBallWithHysteresis' model and generate 'h' vs 'time' plot.
- ▶ Notice the difference between 'bouncingBall' and 'bouncingBallWithHysteresis'.



About the Spoken Tutorial Project

- ▶ Watch the video available at http://spoken-tutorial.org/What_is_a_Spoken_Tutorial
- ▶ It summarises the Spoken Tutorial project

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- ▶ If you do not have good bandwidth, you can download and watch it



Spoken Tutorial Workshops

The Spoken Tutorial Project Team

- ▶ Conducts workshops using spoken tutorials
- ▶ Gives certificates to those who pass an online test
- ▶ For more details, please write to contact@spoken-tutorial.org

Forum to answer questions

- ▶ **Do you have questions in THIS Spoken Tutorial?**
- ▶ **Choose the minute and second where you have the question.**
- ▶ **Explain your question briefly.**
- ▶ **Someone from the FOSSEE team will answer them.**

Please visit <http://forums.spoken-tutorial.org/>



Textbook Companion Project

- ▶ **The FOSSEE team coordinates coding of solved examples of popular books**
- ▶ **We give honorarium and certificate to those who do this**

For more details, please visit this site:

<http://OM.fossee.in/Textbook-Companion-Project>



Lab Migration Project

- ▶ **The FOSSEE team helps migrate commercial simulator labs to OpenModelica**
- ▶ **We give honorarium and certificates to those who do this**

For more details, please visit this site:

<http://OM.fossee.in/lab-migration-project>



Acknowledgements

- ▶ Spoken Tutorial Project is a part of the Talk to a Teacher project
- ▶ It is supported by the National Mission on Education through ICT, MHRD, Government of India
- ▶ More information on this Mission is available at <http://spoken-tutorial.org/NMEICT-Intro>



Thanks!

<http://openmodelica.org>