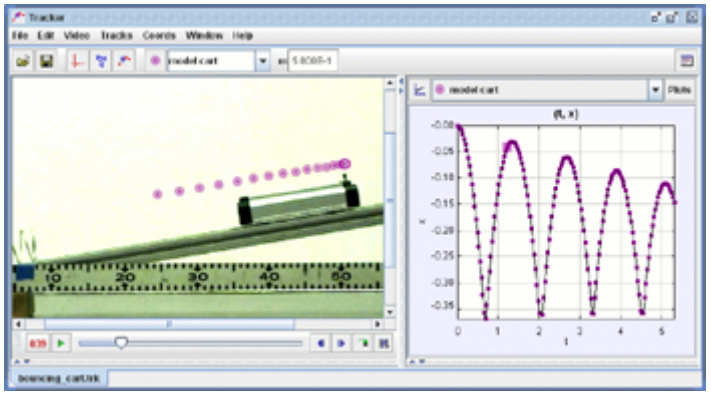
Tracker/EjsS/OSP Workshop for Singapore Teachers



Tracker User Interface

2 Malan Road Block J, Level 4 eduLab@AST and IT Room 2

October 26-29, 2015

Leaders: Wolfgang Christian and Douglas Brown

Local Facilitators: Wee Loo Kang Lawrence, Leong Tze Kwang, Leong Tze Kwang, Ning Hwee Tiang, Tan Kim Kia, and Chan Him Nok

Sponsors: the National Research Foundation (NRF), Ministry of Education (MOE), and National Institute of Education (NIE).

Schedule Overview

- Monday

  Beginner's workshop on the use of Tracker. Overview of ComPADRE, Open Source Physics, and Tracker resources. Introduction to Tracker video analysis, creating and importing video clips, and data analysis using Tracker (projectile motion). Formulate personal curriculum development objectives.

- Tuesday

  Intermediate workshop on the use of Tracker. Formulate personal curriculum development objectives. Using analytic and dynamic models to predict motion. Multiple objects (collisions and center or mass). Polar coordinates (simple harmonic and pendulum motion). Continued work on personal curriculum development objectives.

- Wednesday

  Advanced workshop with OSP tools and resources. Use of Easy Java/JavaScript resources to complement Tracker activities. Improve personal curriculum development objectives.

  NUS Public Lecture:

  - Tracker, Video Analysis and Modeling Tool and
  - Open Source Physics

- Thursday

  Expert workshop using Tracker and Easy Java/JavaScript Simulation Models.

  - Group Project: Barbie Bungie.
  - Packaging and sharing personal curriculum in TRZ and zip files with worksheets.
  - Personal curriculum development presentations.

Schedule: Day 3

- 09h00 – 10h45 Creating Models with EjsS
  - Introduction to ComPADRE
  - Structure of a JavaScript model in EjsS
  - Variables and their types.
  - Initialization, fixed relations, and custom functions
  - The ODE editor and the Prelim code page
  - Binding model variables to view elements and controls

  Tutorial: Harmonic Oscillator ID13103
- 11h00 - 12h00 Enhancing the View
  - Tables and arrays
  - Cascading Style Sheets
  - Packaging and Distributing Zip Archives

  Examples on ComPADRE: Chain of Oscillators ID12977 , Free Fall 3D ID13369
- 12h30 - 14h30 Lunch
- 15:00 – 17:00 NUS Public Lecture:
  - Tracker, Video Analysis and Modeling Tool and
  - Open Source Physics

OSP-EJS-ComPADRE

"A curriculum in which computation is absent or plays a minor role is inauthentic to the contemporary discipline. This absence is one of the most striking examples of our failure to update the curriculum."

B. Sherwood

We offer a Computational Physics Education solution:

Open Source Physics (OSP) develops curriculum resources that engage students in physics, computation, and computer modeling. OSP material is based on computational physics as expressed in the Java OSP code library.

Easy Java/JavaScript Simulations (EjsS) is free open source modeling and authoring tool that is designed to create interactive simulations in Java (applications and applets) without the necessity of prior programming knowledge. EJS uses the core OSP library for many of its operations.

Tracker is a free video analysis and modeling tool. Students can both analyze the motion of objects and overlay simple dynamical models on the video and see how well the model matches the real-world.

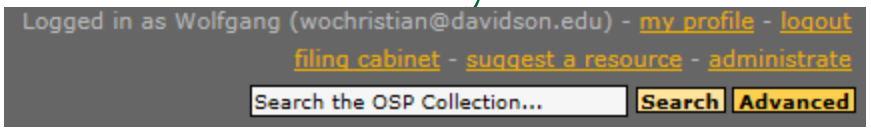
ComPADRE is an NSF-sponsored NSDL pathway that is supported by the American Association of Physics Teachers, the American Physical Society, and the American Institute of Physics. The ComPADRE OSP Collection distributes OSP curriculum material and EJS models.

Finding and Using Existing Resources

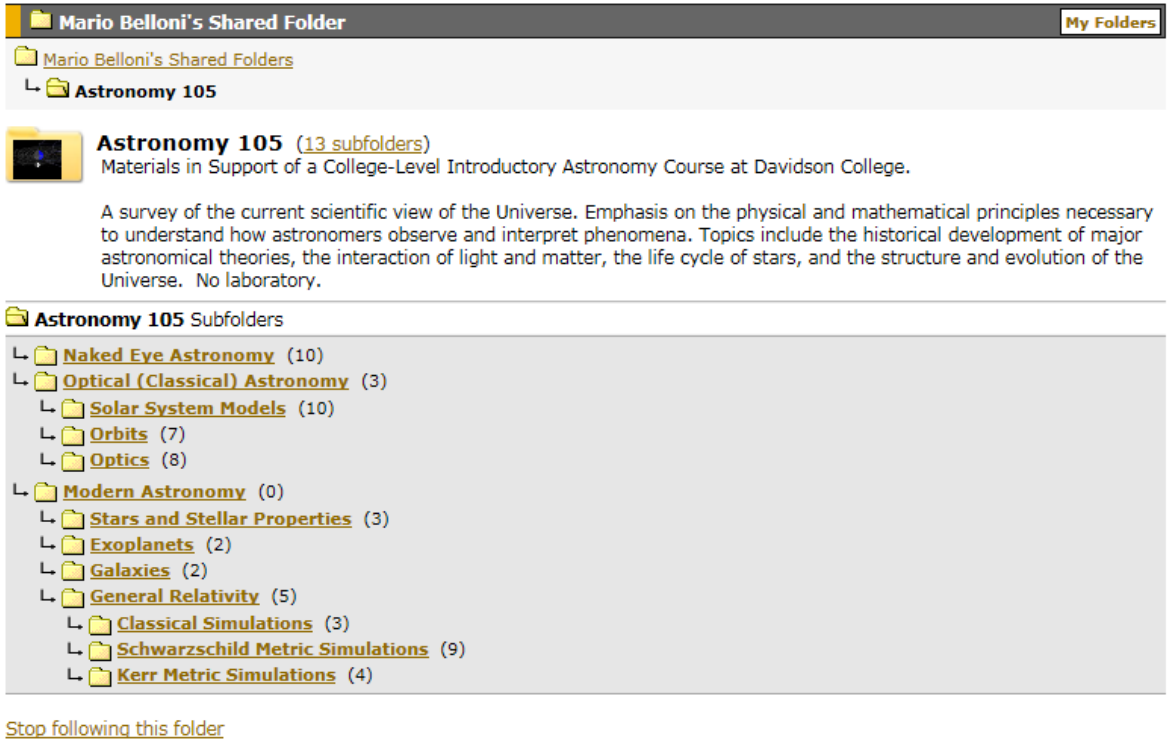
- Log into ComPADRE
- Search the OSP Collection using the search field and browse the collection using the browse button on the main page.
- Find and run two items within the OSP collection that you can use in your teaching. Rank and annotate these two items

Discussion: How should simulations be used in teaching? Describe the items you found and explain how you can use these items.

Filing Cabinet and Community Tools

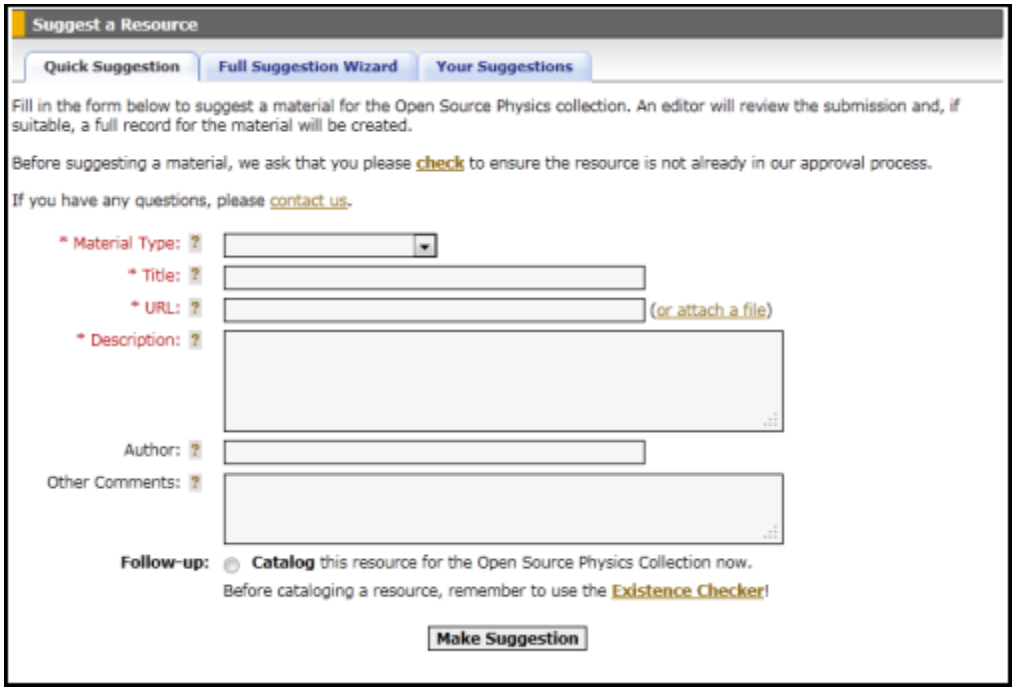


- Save the items you found in the previous exercise in a filing cabinet.
- Follow Wolfgang Christian's *Introduction to Computer Simulation Methods* shared g cabinet.

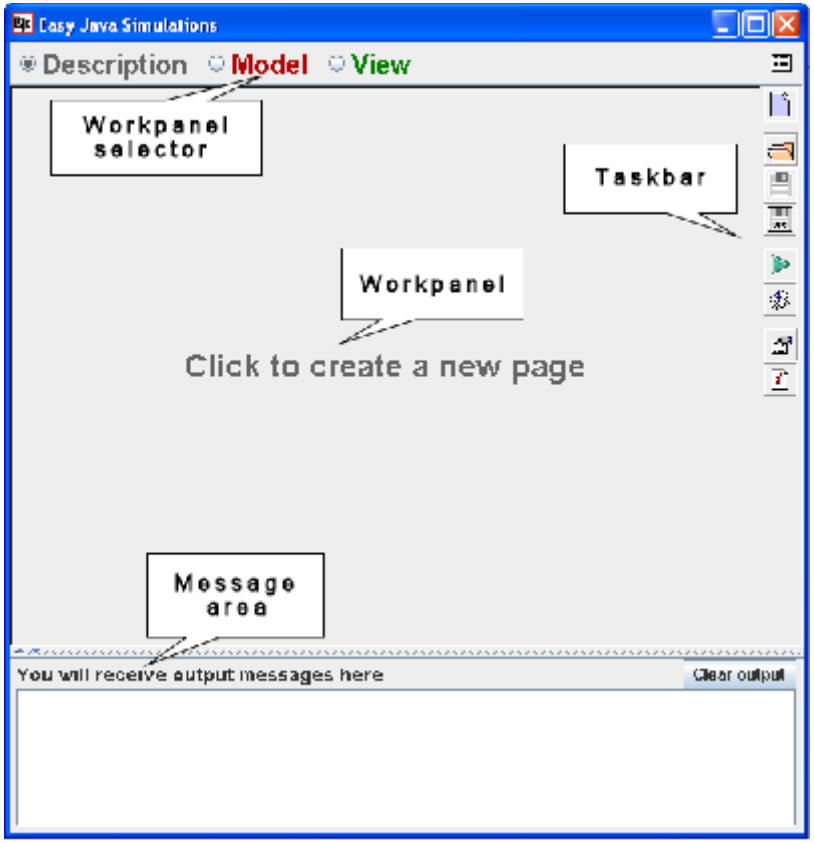


How to Contribute:

- Join an OSP user group and post to its discussion board.
- Rate material and add comments.
- Suggest material.

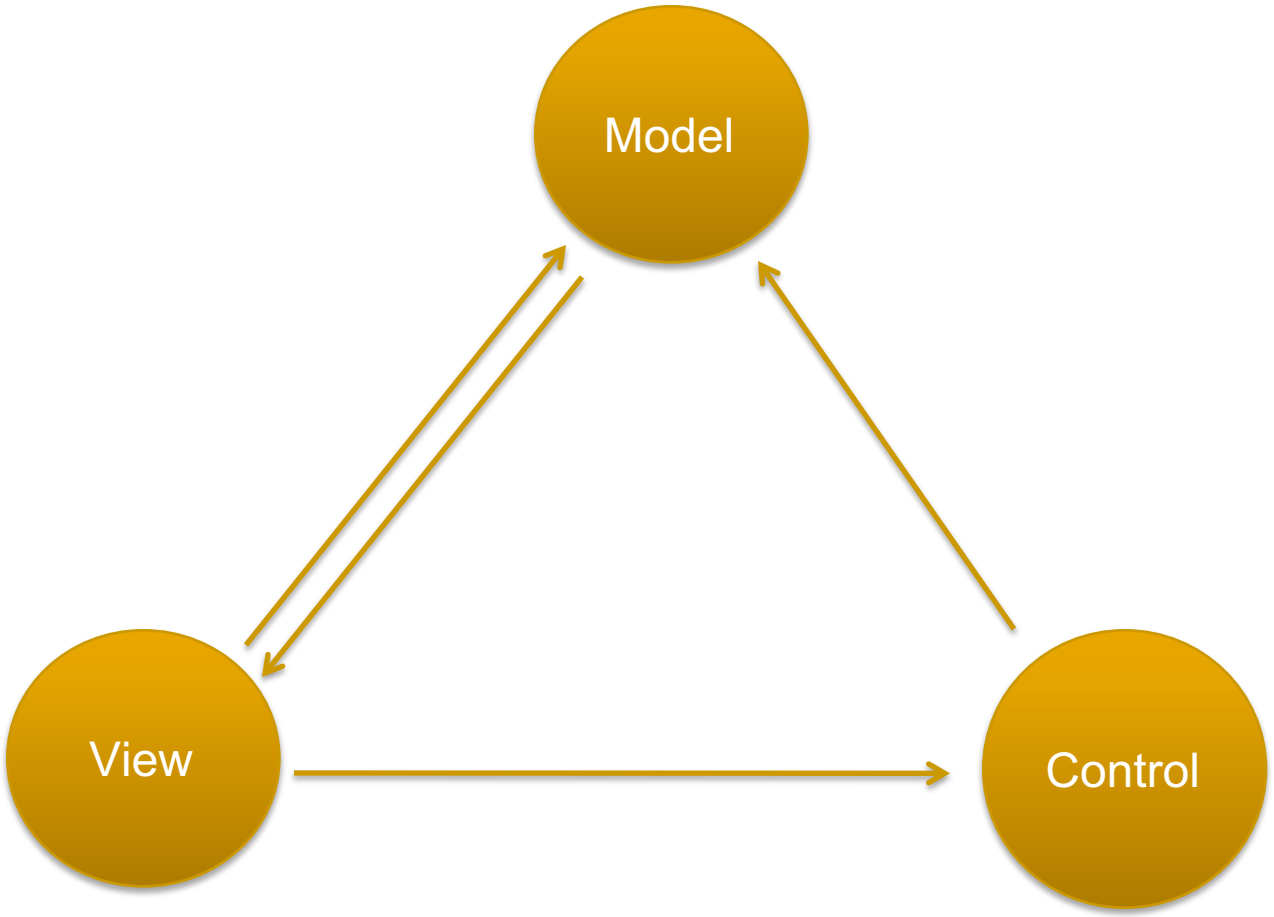


Easy Java/JavaScript Simulations

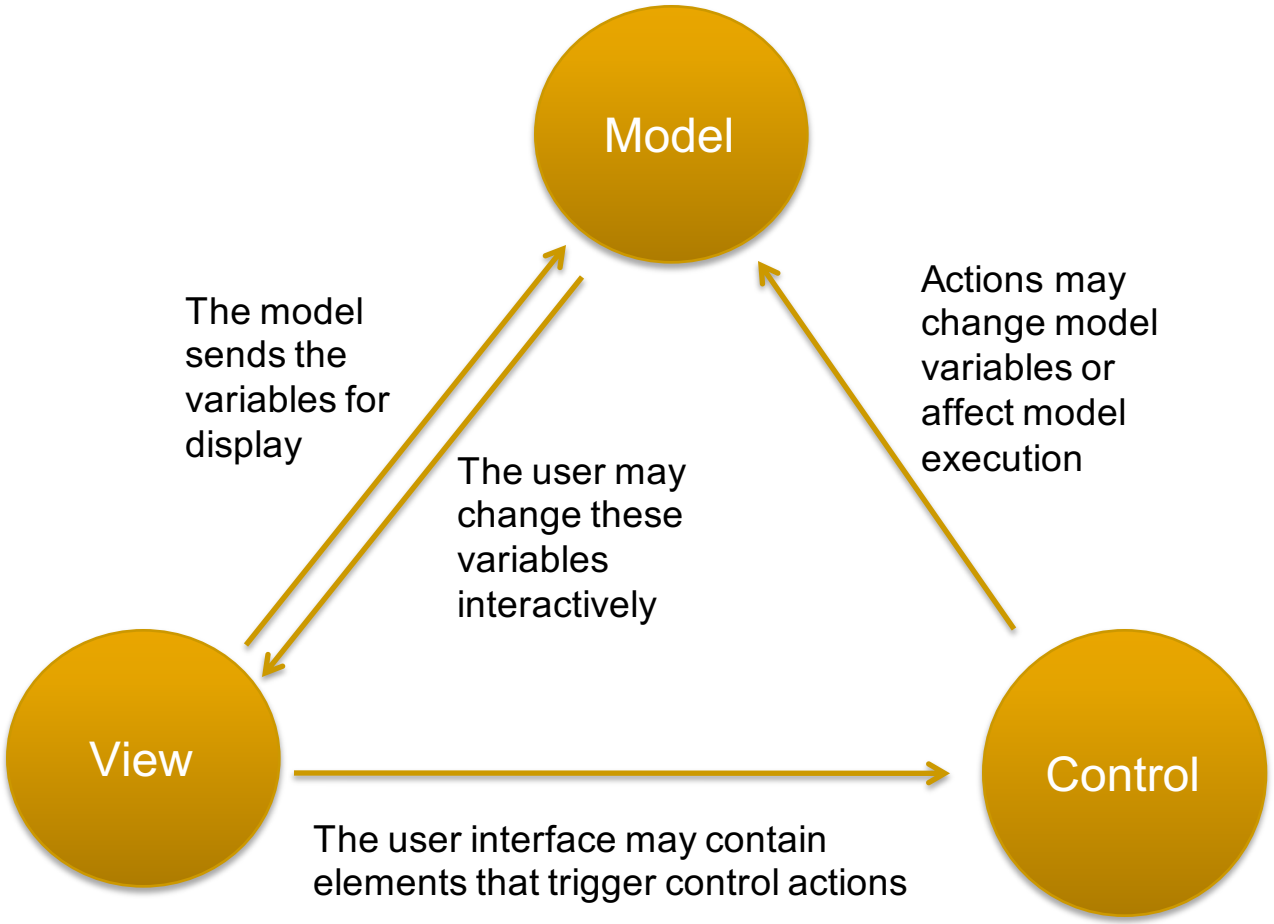


Load, modify, and save a model. [SHO]

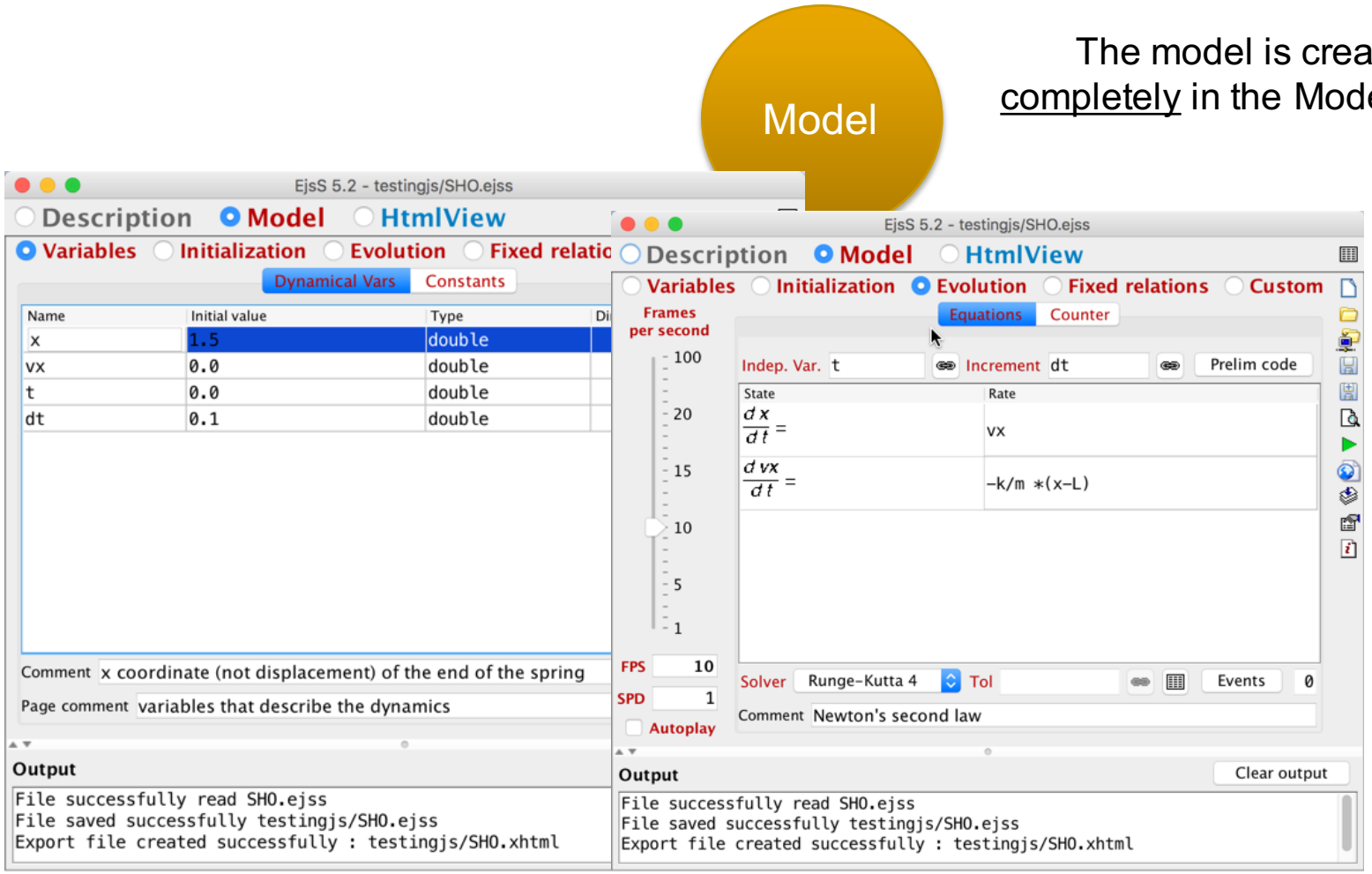
Structure of a model in EjsS



Structure of a model in EjsS

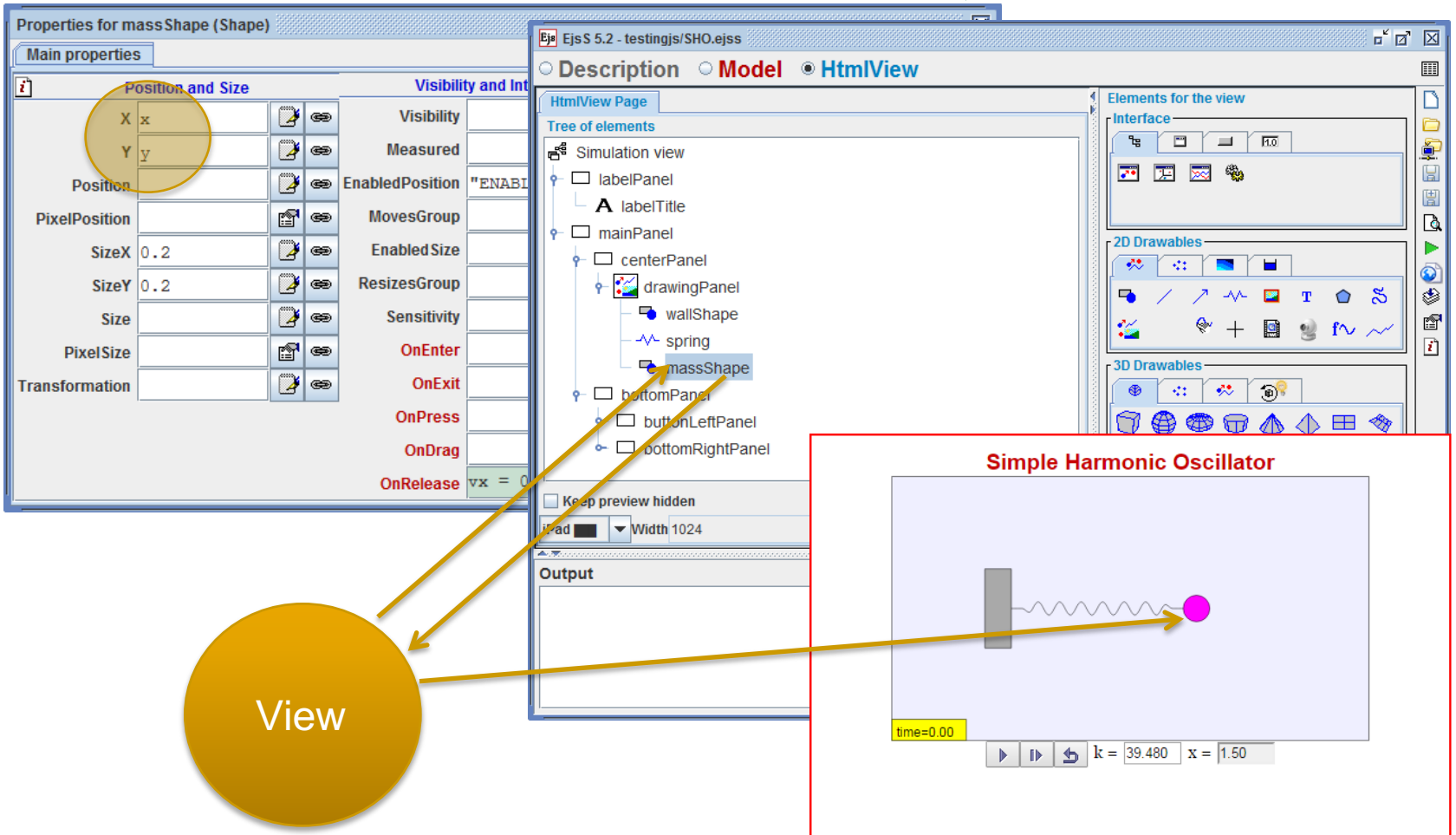


Structure of a model in EjsS



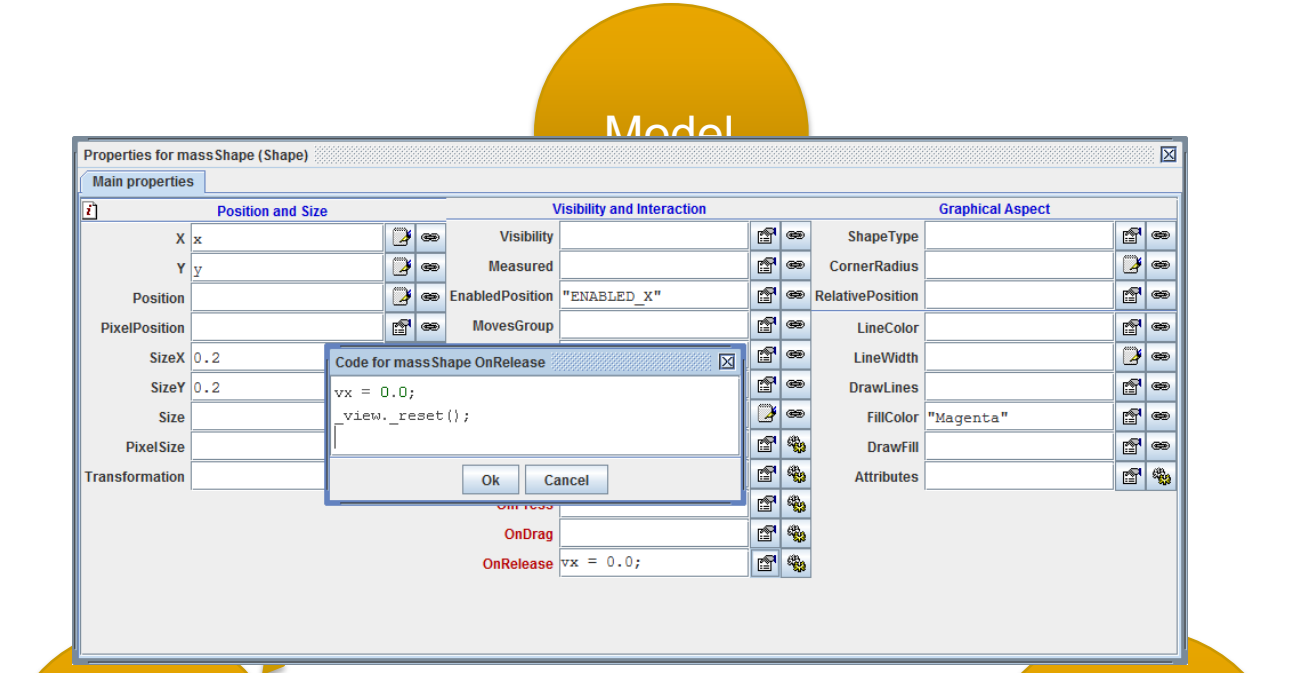
The model is created completely in the Model panel

Structure of a model in EjsS



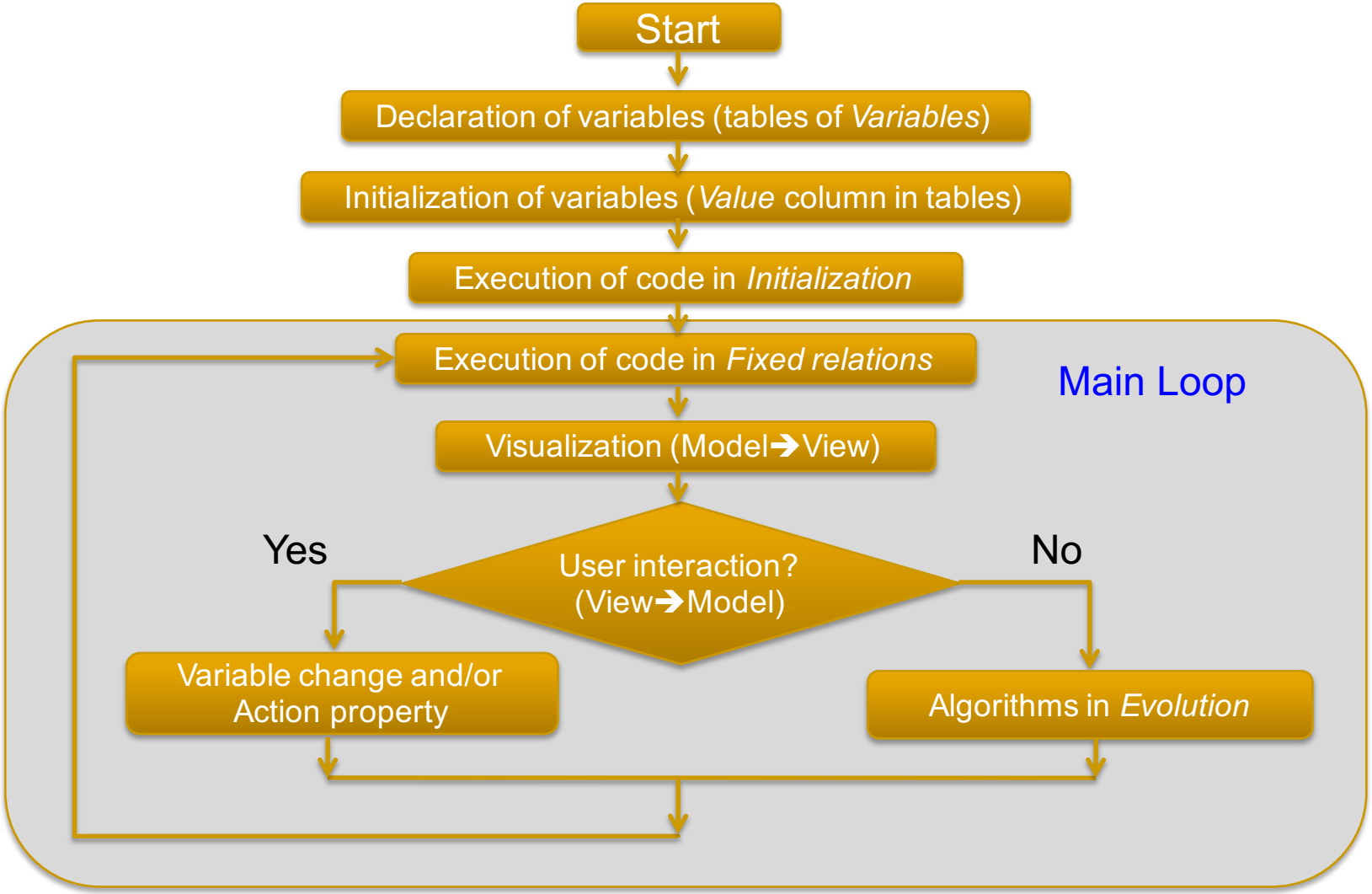
The view is created in the View panel and the dialogs set properties

Structure of a model in EjsS



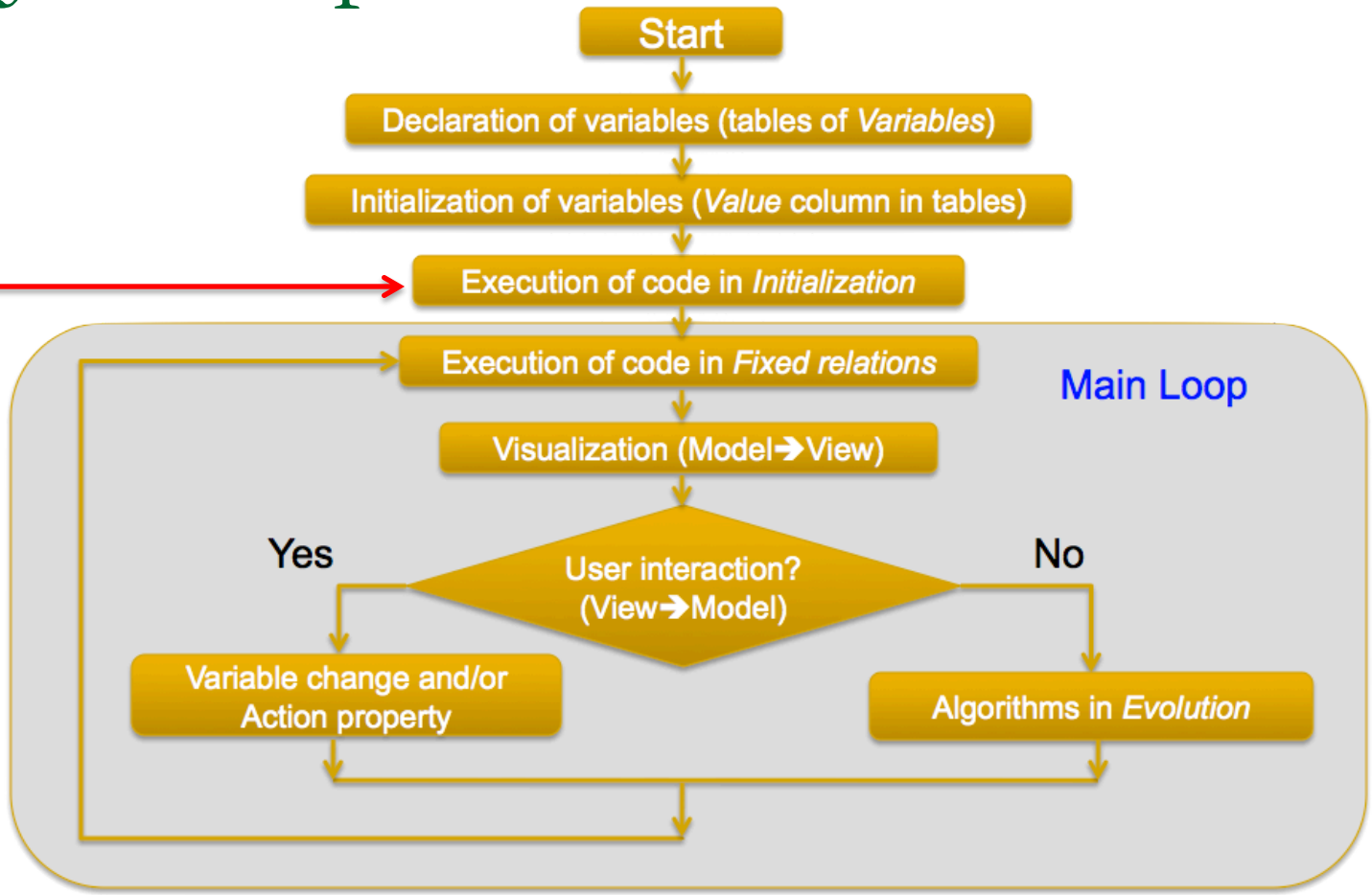
The control is embedded in the view, through action properties

Structure of a model in EjsS

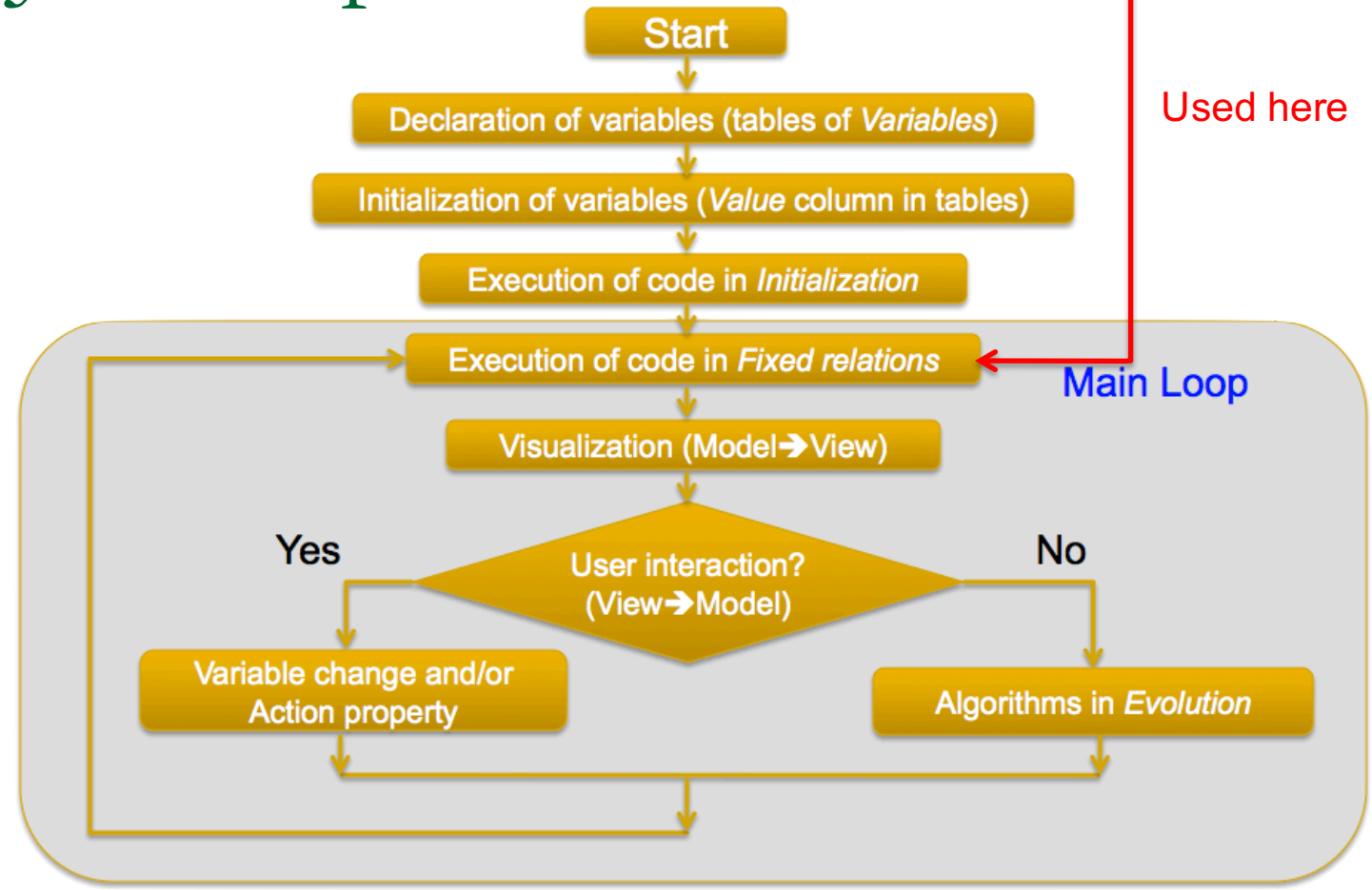


Initialization, fixed relations, and custom JavaScript code

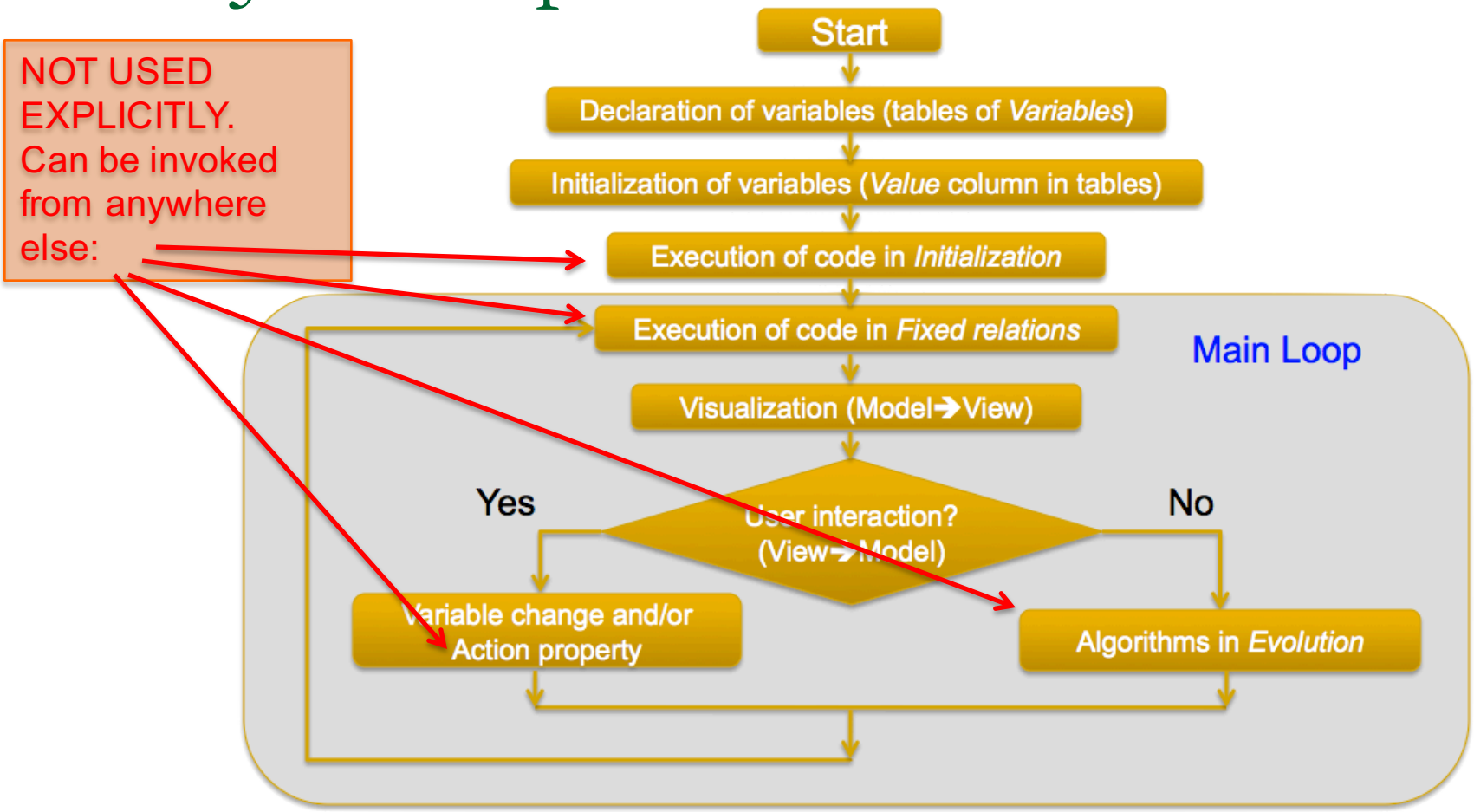
Used here



Initialization, fixed relations, and custom JavaScript code

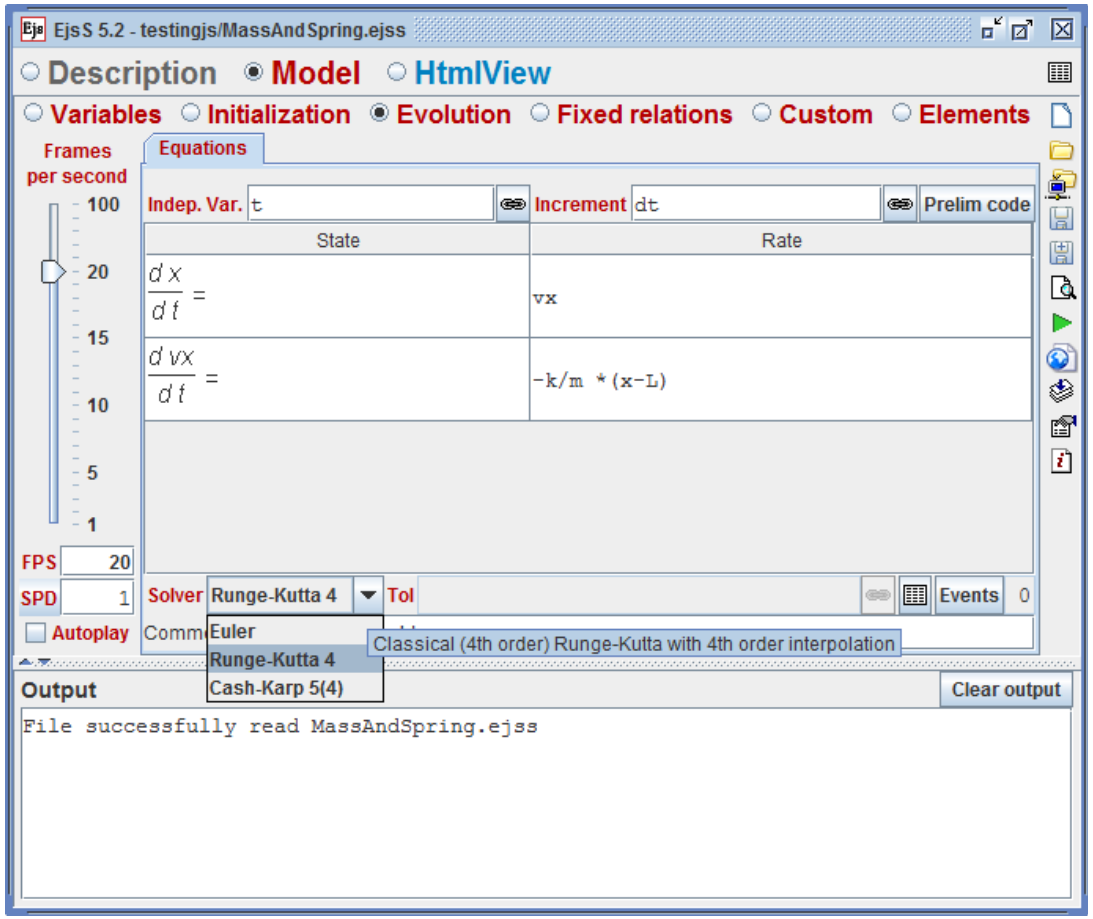


Initialization, fixed relations, and custom JavaScript code

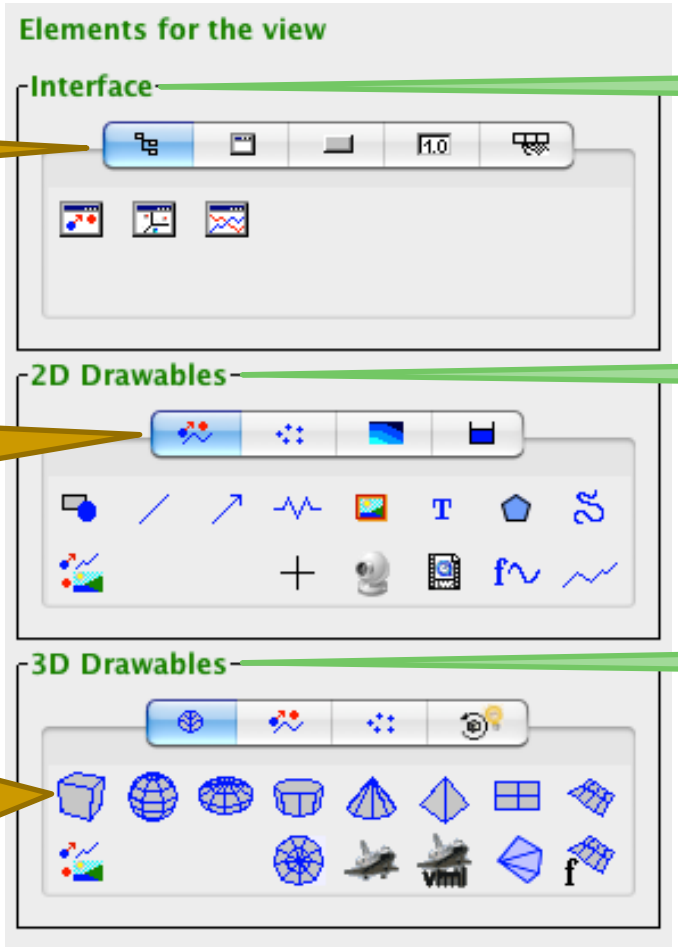


Introduction to the ODE editor and the Prelim code page

1. Indep. Variable
2. Increment
3. (Preliminary code)
4. Equations
5. Solver
6. (Tolerance)
7. (Advanced)
8. (Events)



Elements and Properties



Tabs with subgroups

Swing interface elements

Mouse-over shows subgroup hint

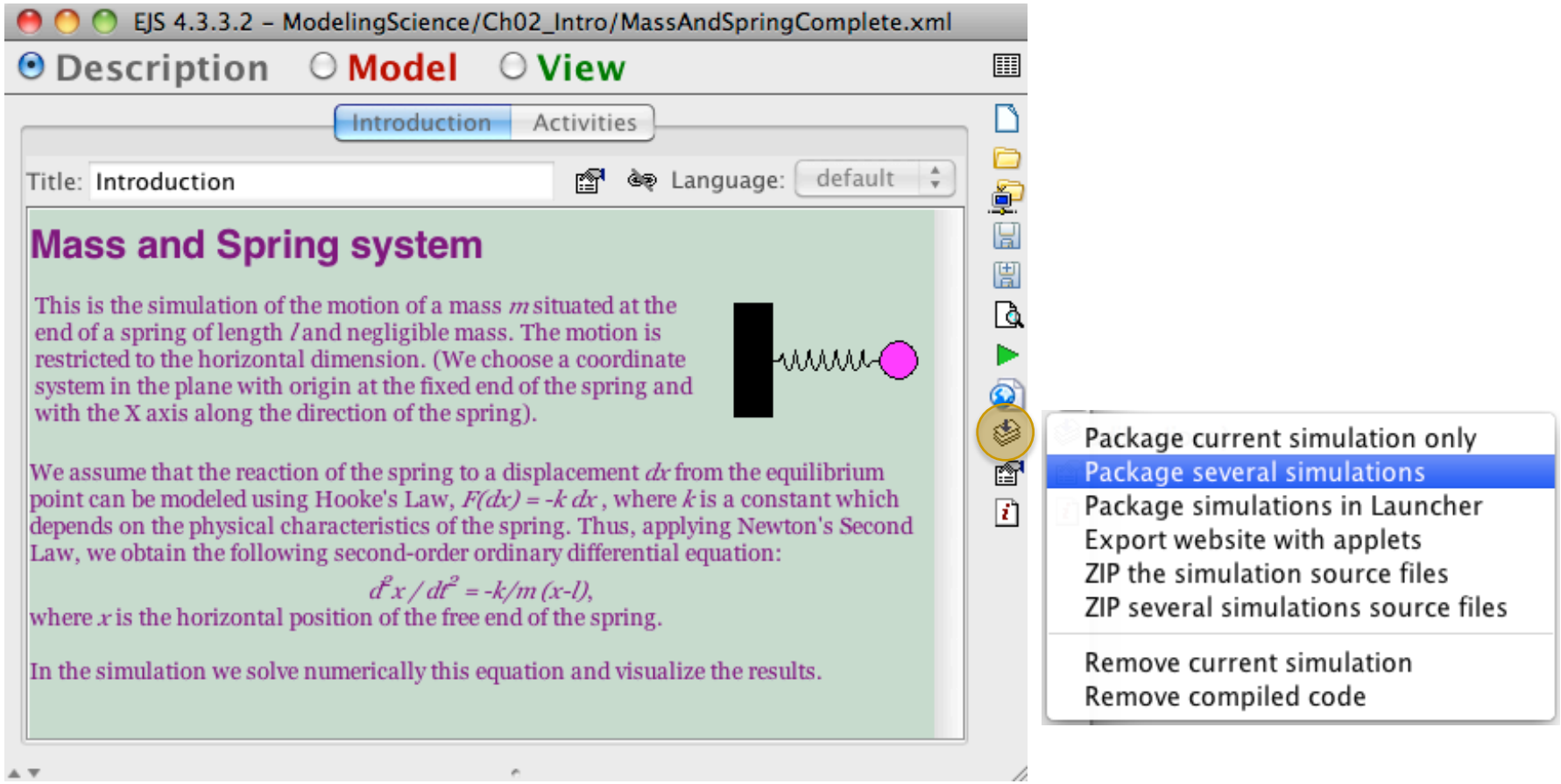
2D OSP elements

3D OSP elements

Mouse-over shows hint and name. Right-click for help.

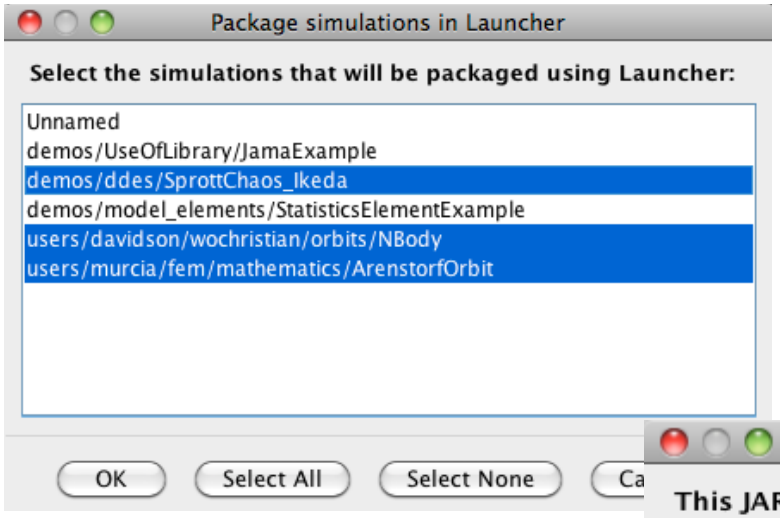
Click an icon to select it for addition to the view tree

Creating and distributing models.

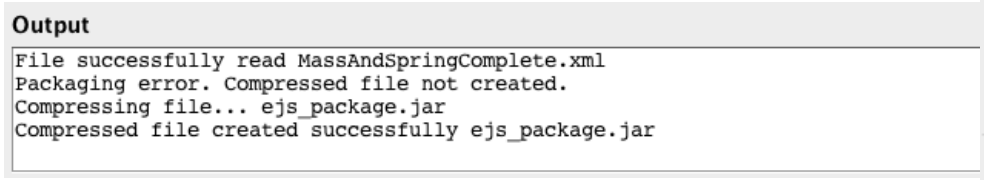


Creating and distributing models

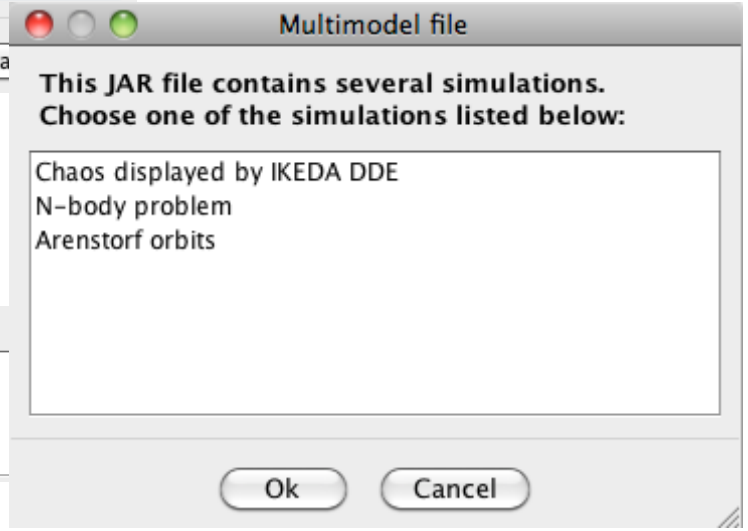
1. Choose the simulations to package



2. Choose the destination file



3. Double-click the generated file



Break

Building a JavaScript model

Complete EjsS Tutorial

Build a model of your choice such as:

- A simple driven harmonic oscillator model with damping.

$$\ddot{x} = -kx - b\dot{x} - \sin \omega t$$

- A rocket model.
- A bungee jump model.

Lunch

You are cordially invited to attend

Free Admission

The Public Lecture on Tracker Video Analysis and Modeling Tool and Open Source Physics

Date: October 28, 2015
Time: 3 – 5 pm
Venue: Lecture Theater LT31, (S16-03), Faculty of Science, Lower Kent Ridge Rd, NUS

Douglas Brown is an Emeritus Professor (Cabrillo College, USA) and a Java Programmer. He obtained his PhD in Physics from the University of Colorado, Boulder under Howard Berg in 1974. He was a former Program Chair of the Physics Department at Caribllo College where he extensively created and developed courses based on the Tracker Video Analysis and Modeling Tool. He manages the Tracker-based curriculum resources and he is also the Resource Editor for ComPADRE Open Source Physics Collection. He has also published extensively in Physics Education Research.

Douglas Brown, creator of Tracker video analysis and modeling tool

Wolfgang Christian, creator of Open Source Physics

Wolfgang Christian obtained his PhD in 1976 from North Carolina State University at Raleigh and he is currently the Brown Professor of Physics at Davidson College, North Carolina, USA. His research interests are in the area of computational physics and instructional software design and he has led dozens of national and international faculty development workshops in this area. He has published several books on open source physics and Physlets® as well as numerous papers on open source software and other topics related to physics education. He is the elected secretary for the national American Association of Physics Teachers (AAPT) and he is past President of the NC Section of the AAPT. He is a Fellow of the American Physical Society and AAPT and he received the AAAS Science Prize for Online Resources in Education (SPORE) Award.

This public lectures are jointly organized by the Department of Physics, National University of Singapore; the Ministry of Education, Singapore; the National Institute of Education; Institute of Physics Singapore and funded by National Research Foundation

NUS National University of Singapore | Ministry of Education Singapore | NIE National Institute of Education Singapore | Institute of Physics Singapore | National Research Foundation Prime Minister's Office Singapore Research . Innovation . Enterprise