Adaptable Simulations for Introductory Physics (ASIP)

Launching EJS

If you don't have the CD you can always get the latest version from

http://www.um.es/fem/Ejs/

Be sure to have the latest JDK (Java Developer Kit) from

http://java.sun.com/javase/downloads/index.jsp

Working with the CD

- 1. Drag EJS folder from CD to Desktop
- 2. Open the Easy_Java_Simulations folder
- 3. Double-click on EJSConsole.jar

4. A small window with the title "Easy Java Simulations console" should appear in the bottom left corner of your screen (your particular version may differ from the picture below)



5. If the box "Launch Ejs" is not checked, check it and click the bar titled "Launch Easy Java Simulations". After checking the box, EJS will start automatically the next time you click on EJSConsole.jar

👙 Easy Java Simulations console									
Basic options	Advanced options Output area								
Your operating s	system is: Windows Mac OS X								
Your Java VM is:	Your Java VM is: C:\Program Files\Java\jre1.5.0_06								
Lar Lar Lar Lar Lar Lar Lar Lar	nguage: Local 💌 Enable pages of external applications Allow server upload console's start-up: 🗹 Launch Ejs 🗋 Minimize the conso Launch Easy Java Simulations								

6. After a few seconds you should see the EJS working environment shown below

👙 Easy Java Simulations	_ 🗆 🔀
● Introduction ○ Model ○ View	
Click to create a new page	
You will receive output messages here	Clear output area

Start a new simulation

This simulation will consist of a ball moving across the screen with and without acceleration. We will start with a ball moving with a constant velocity, and then add the acceleration.

7. Click on "View". From the "Containers" panel in the "Swing" section on the right-hand side **click once** on the first item "Frame". This will highlight the icon. Then move your pointer to the left panel. The pointer should change to a "magic wand". Click on "Simulation View" to paste the Frame in the simulation. Click "OK".



A new window should open with the title "Frame (Ejs window)"

8. Using the same technique, drag a DrawingPanel to the left (click on the Frame in the tree on the left panel). Click "OK" whenever asked. Your view should now look like this.

👙 Easy Java Simulations		
○Introduction ○Model ●	View Drawing panel	
Tree of Elements	Elements for the view	
 definition View definition View definition Frame definition View d	Swing Containers Interface Menu	
	Drawables	> *
	Basic Bodies Fields • \checkmark \blacksquare T • \checkmark \blacksquare T • \checkmark \blacksquare T • \checkmark \blacksquare T	8 A 1

9. Now bring a ball from the left panel to the right panel and click on the Drawing Panel to paste it. Click "OK" whenever asked.

👙 Easy Java Simulations		_ 🗆 🗙
○ Introduction ○ Model	• View	
Tree of Elements	Elements for the view	
Simulation ∨iew Frame Particle Particle	Swing Containers Interface Menu Image: Strain	

This bare-bone structure will be sufficient for this exercise. More details can be added later.

We now need to define our model

The ball will move according to the following equation:

 $x = v_0 t + \frac{1}{2} a t^2$

(We'll assume zero initial position)

We need to provide that information to EJS.

11. Click on "Model" in the top panel then click anywhere in the middle of the panel to create a new page (say "OK" to choose the default name).

👙 Easy Java Simulatio	ins			_	
Introduction	Model	O View			
Variables O Ir	nitialization	Evolution	Constraints	Custom	_
¢	Click to c	Se create a n	lect "Mo Then ew page	del"	

12. In the variables page create the set of variables we will need for the simulation and set their numerical values as seen in the figure below

👙 Easy Java Simulations - example_lee.xml 📃 🗖									
○ Introduction ● Model ○ View									
● Variables O Initi	alization 🗢 Evolutio	n 🗢 Cons	straints 🗢 Custom						
Var Table									
Name	Value	Туре	Dimension						
t	0.0	double							
dt	0.01	double		as					
х	0.0	double							
v0	0.5	double							
V	0.0	double							
а	0.0	double		aA					
		double							
	·			i					

13. Switch to the "Evolution" panel and click on the upper half of the panel to open a new page.

👙 Easy Java S	Simulations	
○ Introd	uction	
○ Variable	s 🗢 Initialization 💿 Evolution	🗘 Constraints 🗢 Custom 📘
Frames		🤨 Select 🔄
per second		evolution 🔳
MAX		as
1	Click to create	e a new page 🛛 🚆
- 20		
		Click 🛋
- 15		1 and
		i
<u> </u>		
- 5 - - MIN	Click to create a n	ew page of ODEs

14. Type the code shown below in the evolution page

🖆 Easy Java	Simulations					
○ Introd	uction	Model	O View			
O Variable	s 🔍 Initia	lization 🤇	Evolution	○ Constraints	○ Custom	
Frames per second - MAX - - - - 20	Evol Page x = (v0 * t) t = t + dt;	+ (0.5 * a * t*	t) ;			

15. At this point we need to instruct EJS to make the ball move according to this equation. So go back to the "View" panel and double-click on the blue ball to open the properties panel for this object.

👙 Propert	👙 Properties for element Particle 🛛 🔀										
	Position and Size			Visi	bility and Interactivit	У			Graphical Aspect		
×		2	e	Visible		r	e	Style		r	6
Y		2	@	Enabled	true	r	@	Position		P	e
z		2			Actions			Rotate		2	
Size X		2		On Press		đ	Ф.	Fill Color			
Size Y		2		On Drag		r	*	Edge Color		P	
Size Z		2		On Release		r	*	Stroke		P	
Scale X		Þ		On Enter		r	<i>щ</i> ,				
Scale Y		2		On Exit		r	<i>е</i> р				
Scale Z		2	e								

16. To link the x position of the ball to the x variable in the equation click on the "link" icon on the right of "X" in the "Position and Size" section of the panel.

🔮 Propert	ies for element Pai	rticle	5								
	Position and Size			Visi	bility and Interactivity	y			Graphical Aspect		
×		Ť	@	V ible		P		Style		P	@
Y				Enabled	true	P	@	Position		P	@
z		Ì	e		Actions			Rotate		2	e
Size X				On Press		r	1	Fill Color		P	
Size Y	Click	2	@	On Drag		P	*	Edge Color		P	
Size Z		2		On Release		P	8 <mark>89</mark>	Stroke		P	
Scale X		2		On Enter		P	-				
Scale Y				On Exit		P	<i>е</i> р				
Scale Z		2	@								

Then select x by clicking on it and click "OK".



Close the properties panel by clicking on

17. The simulation is now ready to go. Click on the green arrow on the far right.



You should see the blue ball zoom across the screen. To slow it down we will modify the frame rate of the simulation 18. Go back to the Model panel and select the Evolution page. On the left-hand side panel, in the "Frames per second panel" move the slider down to 15



Run the simulation again (click on the green arrow). This time you should see the ball slowly move across the screen.

The simulation runs as soon as you click on the green arrow. We are now going to add controls that will allow us to run, stop, or reset the simulation.

19. Go back to "View" and drag a "Panel" from the "Containers" area to the tree. When the "magic wand" appears, use it to click on "Frame" (not on Drawing Panel). When you are asked for the position, select "Down" before clicking on "OK".

Introduction OModel	• View	
Tree of Elements	Elements for the view	
Simulation View Frame DrawingPanel Particle Panel Link panel to Frame	Swing Containers Interface Menu Image: Strategy of the stra	

20. Now add 3 buttons to the Panel. To do this, switch to the "Interface" tab in the "Swing" area. You can use the default names, but when asked to select the positions, choose left, then center and right in succession.



21. Change the name of the buttons. Right-click (Windows) or Control-click (Mac) on a button to activate its menu. Select "Rename" and type "Play" for the first button. "Pause" for the second button. "Reset" for the third button.

22. Now assign a role for each button. Double-click on the first button to open its properties panel. Change the text to Play. Change the "Action" property by clicking on the "wheels" to open the panel that shows a list of possible actions. Select _play () and click OK.

👙 Properti	es for element But	ton	-T	vpe Play	👙 List of Actions 🛛 🛛 🔀				
Main Graphical Aspect								_alert("Element","Title","Message") : Display message in a dialo	
Text	Play 🖌	2	@	Size		P	6	_clearMessages() : Clears the TextArea _clearView() : Initialize the view	
Image		P		Background		r	e	format(value,"format") : Format a double value	
Mnemonic		2		Foreground		P	e	_getParameter("parameterName") : Return an applet paramete	
Alignment		P	@	Font		P	B	_initialize() : Read view values and initialize isApplet0 : Whether the simulation runs as an applet	
Enabled		P	e	Tooltip		2	e	isPaused() : Whether the simulation is paused	
Action	_play()	r	е р				C	si Taying() . Whether the simulation is playing _pause() : Pause the simulation	
С	lick on "whee	els"	↑ to	1 open th	play() : Play the simulation phat(in/"Message") : Pertimessages in a TextArea readText("filename") : Read a text from the given file readVariables("filename", "variablesList") : Read a list of variat readState("filename") : Read previously saved model state ✓				

23. Repeat the previous operation for the other two buttons using the _pause() and _reset() functions.

24. Finally we need to uncheck the Autoplay function to prevent the simulation from running on its own. To do this go back to the Model/Evolution/ panel and uncheck the "Autoplay" box at the bottom of the "Frames per second" panel.



25. Run the simulation again (Click on the green arrow) You should get something like this:

