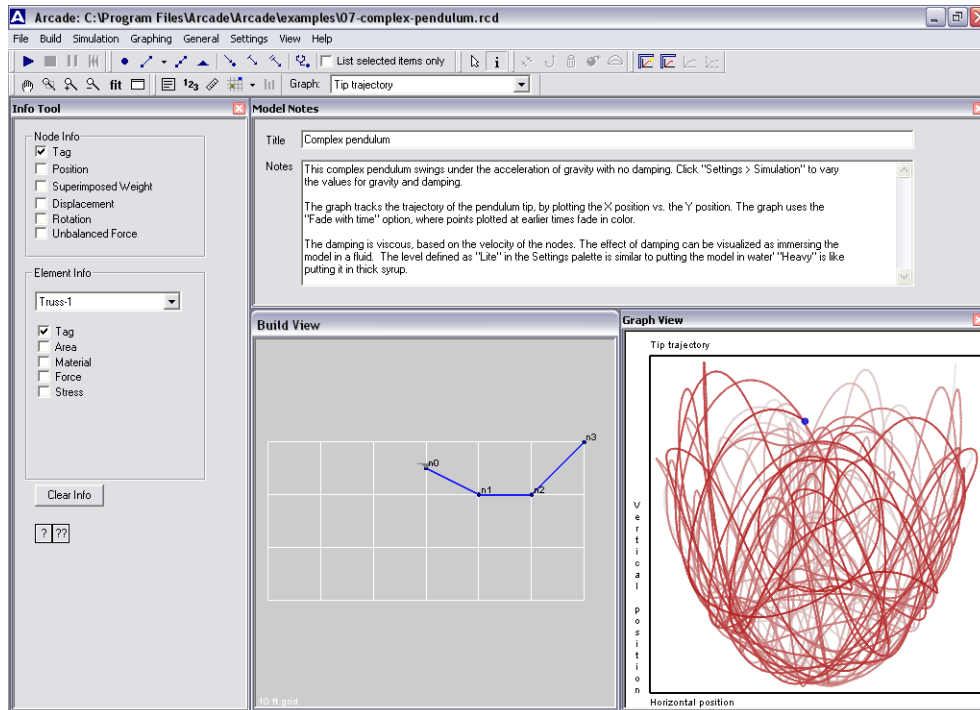


MAKING GRAPHIC PATTERNS WITH ARCADE

WORKSHOP EXERCISE FOR ARCH 567: PAINTING AS ETHICAL METAPHOR

GETTING STARTED

- Sit at a computer station with a partner and log in. Go to the start menu and click *All Programs > Architecture > Arcade > Arcade*.
The *Arcade* program will start up.
- Click *Help > Examples > 07-complex-pendulum.rcd*
The following model should appear.



- Click *Simulation > Start* (or click the blue-triangle play button in the upper left).
The graph on the right traces the trajectory of the pendulum as it swings. The physical model does not include damping (it can be added), so the motion does not diminish with time.

MODIFYING GRAPHING AND VIEWING OPTIONS

- Click *Simulation > Stop*.
- Click *Graphing > Edit Graph*.
New windows appear above and to the left of the Build View
- In the upper window, uncheck the box *Draw labels*.
The labels and graph frame disappear.
- Click *View > Toggle full view*.
The Build View and Graph now occupy the full work area.
- Click *Simulation > Start*.
- After watching the simulation for a while, click *Simulation > Stop*.
- Click *Graphing > Edit Graph*.
The Build View and Graph shrink down again, and the windows for graph editing reappear.

- Try out different graphing options in the upper window, including the following.
 - **Graphing as points:**
 - Check the box *Draw as points*.
 - Change the value labeled *Sample interval (sec)* 0.05.
With the *Draw as points* option, the graph is constructed by placing a point on the graph at the time interval defined by *Sample interval*. As the sample interval becomes larger, the points are more widely spaced.
 - **Fading with time:**
 - Uncheck the box *Draw as points*.
 - Uncheck the box *Fade with time*.
With the *Fade with time* option, the parts of the graph drawn most recently are drawn darkest, while earlier parts fade to light grey. This option often makes more clear the graphic organization of complex, overlapping patterns. Try clicking the option on and off while looking at the graph.
 - **Dynamic scaling:**
 - Check the box *Reset autorange with each simulation*.
 - Click *Simulation > Start*.
The boundaries of the graph expand dynamically as needed to fit the graph.

MODIFYING THE INITIAL MODEL

- Click *Simulation > Stop*.
- Click *Build > Nodes*.
A table listing node coordinates and properties appears above the build view. Nodes are the points of mass whose position defines the geometry of the model.
- In the table, in the row for node *n1*, click on the cell corresponding to the *Y coord*. Type in the number 10 and then press the *Enter* key.
The Build View shows the modified model with the new position of *n1*.
- Click *Simulation > Start*.
The graph now traces out a quite different pattern than before, because the pendulum now has different dimensions.

TWEAKING THE MODEL DURING SIMULATION

- **Shake Tool:**
 - As the simulation is running, click *Simulation > Shake model* (or click the salt shaker button in the middle of the toolbar).
 - Click in the Build View, and while holding the button down shake the mouse back and forth quickly.
The shake tool effectively subjects the model to an earthquake. Note how the support at the top of the pendulum moves as you shake. The effects of strong shaking are immediately visible in the graph.

- **Hook Tool:**
 - As the simulation is running, click *Simulation > Pause* (or click the pause button in the upper left toolbar).
 - Click *Simulation > Hook node*.
 - Click on the node at the tip of the pendulum.
The node is drawn larger, indicating that it is the target of the hook tool.
 - Click *Simulation > Pause* to unpause the simulation.
 - As the simulation is running, click and drag in the Simulation View.
Clicking with the hook tool, forms a stiff spring between the mouse cursor and the target node. As you click and drag the mouse, you can push and pull on the node. The effects should be clear in the graph.
- **Notes**

When you tweak the model as the simulation is running, the pattern of the graph becomes something unique that cannot be reproduced. Without such tweaking, the graph produced is the same every time you run the simulation, but since the tweaking will never be exactly the same, the pattern will be unique each time.

SAVING IMAGES

Use the following steps to take a pattern you have produced into Photoshop.

- If you don't want to include the blue-dot leading point in your image, Click *Graphing > Edit Graph*, and then in the upper window, uncheck the option *Draw leading point*.
- If it is not already, put Arcade in Full View Mode (click *View > Toggle full view*).
- Press the *Print Screen* key on the keyboard (it's usually in the upper right).
This puts a copy of the current screen (often called a screen dump) into the clipboard.
- Start Photoshop (From the *Start* menu in the lower left of the screen, click *All Programs > Graphics and Web > Adobe > Adobe Photoshop CS*).
- In Photoshop, click *File > New*. Click OK in the dialog box that appears.
- Click *Edit > Paste*.
- Click *Layer > Merge down* (it's at the bottom of the menu).
- Use the crop tool to isolate the part of the screen dump that you want to keep.
- Save the file.

MORE STUFF (IF YOU HAVE TIME)...

The model is set up to graph the position of the tip of the pendulum, but there are other things you can graph. Here are a couple of examples.

Graph Velocity of the tip.

- Stop the simulation, if it is running.
- Click *Build > Node monitors*.
- In the window to the left of the Build View, set *End time* to 180 seconds, and set *Quantity* to *vel. X*, then click on node *n3*.
This adds a monitor to the node which records the X component of the node's velocity. The data from the monitor can then be graphed.
- In the window to the left of the Build View, set *Quantity* to *vel. Y*, then click on node *n3*.
This adds another monitor, recording the Y component of velocity.
- Click *Graphing > Add graph*.
- In the window to the left of the *Build View*, in the *X Axis* area, set the first quantity to *node n3 vel. X*.
- In the same window, in the *Y Axis* area, set the first quantity to *node n3 vel. Y*.
- Click *Simulation > Start*.
The graph plots the X and Y velocity of the tip of the pendulum, rather than the position, creating a very different pattern.
- To see the pattern more clearly, uncheck the following options in the upper window: *Draw labels, Draw grid, Draw axes*.

Graph the difference in position between two nodes.

- Stop the simulation, if it is running.
- Click *Build > Node monitors*.
- In the window to the left of the Build View, set *End time* to 180 seconds, and set *Quantity* to *pos. X*, then click on node *n1*.
- In the window to the left of the Build View, set *Quantity* to *pos. Y*, then click on node *n1*.
- Click *Graphing > Add graph*.
- In the window to the left of the *Build View*, in the *X Axis* area, set the first quantity to *node n3 pos. X*.
- Just below that, set the next quantity to *node n1 pos. X*, and then click the button +/- to the right of that quantity.
Pushing the +/- button changes the scale factor for the *n1* monitor to -1 . What it means is that the X axis of the graph will be the X position of node *n3* minus the X position of node *n1*.
- In the same window, in the *Y Axis* area, set the first quantity to *node n3 pos. Y*.
- Also in the Y axis area, set the second quantity to *node n1 pos. Y*, and click the +/- button to its right.
- Click *Simulation > Start*.

Free play

- Play around with the model and the graph. Change the graph settings, try using the shake tool. Try different combinations of node monitors for the X and Y axes.