WiiExperiment – Lab/Demo Sketches

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http://wiiexperiment.org

Learning How the Wiimote works

Ingredients: one Wiimote, one computer

Instructions:

Open one display.

Set the Wiimote on each of its six sides and note the readings.

Wiggle the Wiimote in various ways and adjust the horizontal (time), vertical (acceleration not force) scales and the data rate.

Drop and catch (please!) the Wiimote.

Swing the Wiimote in a circle at various speeds.

What is the largest acceleration you can get the Wiimote to read?

What indication do the traces give when you have gone off-scale? Note that the exact off-scale value seems to differ from device to device.

Tossing the Wiimote

Ingredients: one Wiimote in protective armor, one computer

Instructions:

Open one display.

Toss the Wiimote back and forth while observing all three accelerations.

How much acceleration do you seem to naturally use?

How does this change with the distance you are tossing?

If you toss the Wiimote so that it spins in midair, how do the accelerations change. What are typical values?

Mass on a Spring

Ingredients: one Wiimote, one computer, spring, stand (base, vertical, clamp, horizontal)

Instructions:

Use Wiimote strap to tie it to one end of the spring. Loop the other end of the spring over the horizontal rod.

Where in the oscillation does maximum acceleration occur?

How is maximum acceleration affected by how far the spring is stretched before being released?

Pendulum

Ingredients: one Wiimote, one compute, stand (base, vertical, clamp, horizontal), bit of string, long 1x2, tape

Instructions:

Open one display.

Attach Wiimote to 1x2 and hang 1x2 by string from horizontal pole. Try to get length of Wiimote aligned with rod.

Explain why each of the three traces is oscillating and their relative phases.

You may want to save data to a file and then open Excel and use Excel to open the file (comma delimited).

Minimizing Damage

Ingredients: one Wiimote, one computer, one cart, short track, foam, foil, tape

Instructions:

Open one display.

Tape Wiimote to cart. Make sure the cart is taking the impact but that the Wiimote doesn't slide on the cart.

Determine how to stop the cart using the smallest maximum deceleration within a stopping zone no more than 6cm long.

Head-on Collisions

Ingredients: two Wiimotes, one computer, two carts, long track, masses for carts

Instructions:

Open two displays and line their horizontal axes up together.

Tape one Wiimote to each cart. Make sure the cart is taking the impact but that the Wiimote does not slide on the cart.

Compare the accelerations of the two carts when they collide. Equal masses will be easiest to see.

Does it matter whether both carts are in motion before the collision,

whether their speeds are the same,

whether there is a spring between the carts,

which cart the spring is attached to?

What happens of you start with the two carts together with a spring (or two) compressed between them?

How can you calibrate two Wiimotes for this sort of experiment?

You may want to save data to a file and then open Excel and use Excel to open the file (comma delimited). Try taking ratios of accelerations.

What do you see?

What is this ratio equivalent to?

Where is the accelerometer?

Ingredients: one Wiimote, one computer, lazy susan, tape

Instructions:

Determine where in the Wiimote the accelerometer is located.

Circular Motion I

Ingredients: two Wiimotes, one computer, lazy susan, tape

Instructions:

Open two displays and line their horizontal axes up together.

Tape two Wiimotes to the lazy susan at different radii. Try to get one axis of each exactly radial for convenience. (If you do not get an axis radial, how could you deal this if you were taking data into a spreadsheet for analysis instead of doing real-time observations?)

Spin the lazy susan. Compare accelerations and radii.

Are the results what you expected?

Can you get the dependence of centripetal acceleration on radius without having a uniform rotation rate?

You may want to save data to a file and then open Excel and use Excel to open the file (comma delimited). Try taking ratios of accelerations. What is this?

Circular Motion II

Ingredients: one Wiimotes, one computer, lazy susan, tape

Instructions:

Open one display.

Tape the Wiimotes to the lazy susan off center. Try to get one axis exactly radial for convenience. (If you do not get an axis radial, how could you deal this if you were taking data into a spreadsheet for analysis instead of doing real-time observations?)

Spin the lazy susan at a very non-uniform rate. Explain the behaviors of all three accelerations.

Two-dimensional Motion

Ingredients: one Wiimote, one computer, giant air hockey puck, tape, spacers, short pieces of 1x2, clamps

Instructions:

Open one display.

Tape Wiimote to top of hockey puck so weight is distributed as evenly as possible. Clamp 1x2s down to make a wall for the puck to collide with.

What happens when the puck collides with an obstacle at something other than normal incidence?

Does it matter whether the puck is spinning?

Does it matter which way?

Coefficients of Friction

Ingredients: one Wiimote, one computer, plane to slide along, props to incline plane

Instructions:

Open one display.

Figure out how to measure both static and kinetic coefficients of friction. (Remember what the Wiimote shows when sitting still and when dropped.)

Fan Cart

Ingredients: one Wiimote, one computer, fan cart, tape, string?

Instructions:

Open one display.

Tape (or tie) the Wiimote to the fan cart. Try to get one axis aligned with gravity for simplicity.

Turn the fan cart on and let it run along the table (or floor).

What can you see?

Can you see the effects of the fan?

Can you see the effects of stopping the cart and pushing it back to start again?

You may want to save data to a file and then open Excel and use Excel to open the file (comma delimited). Can you think of a simple way to get rid of the noise to see a small, constant signal?