Instructors Guide to:

Capturing the Wind

In this activity, students are asked to build and program their own anemometers. Use this activity when teaching weather or power.

Here is an opportunity to incorporate engineering into other classroom lessons. When teaching weather and/or power, have the students build and program their own anemometers using LEGO™ kits, ROBOLab™, and cups/ index cards/ etc. This is also a great unit for introducing Investigator and rotation sensors.

In the Classroom:

Grade Level: 4-12 **Time:** 1 hr

Building Skills: Rotating parts **Programming Skills**: Rotation sensor

Capturing the Wind

What a windy day!! Capture the wind's power by building an anemometer using rotation sensors.

Challenge

Build and program an anemometer using a rotation sensor, LEGOs™, and cups/ index cards/ etc. Use your imagination!

Materials

RCX, rotation sensor, axle (long), bushings, plates (with holes), thick paper/index cards/cups/etc, tape/ paper clips

Skills Learned

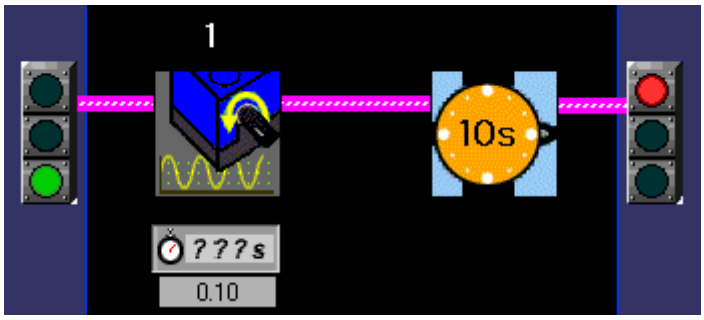
Programming with Rotation Sensors, Graphing and Interpreting Data

Procedure

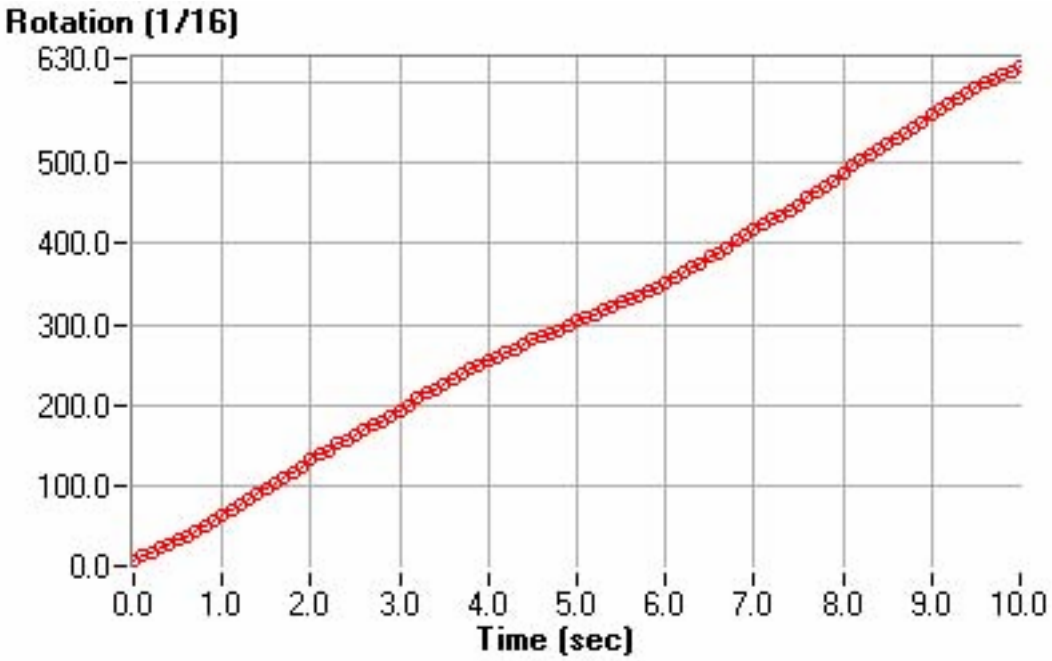
Many designs of wind sails can be used; this is a basic suggestion. Try changing the design- be creative!

1. Attach two plates in a 'plus-sign' design. Be sure the holes line up where they cross! Then take a bushing and attach it to the plates as shown. Make sure the smooth edge faces up and the notched edge is touching the plate.
2. Slide an axle through the plates and bushing. It is a good idea to secure the plates with a second bushing. Then slide the other end of the axle through a rotation sensor. Use bushings to secure the sensor also.

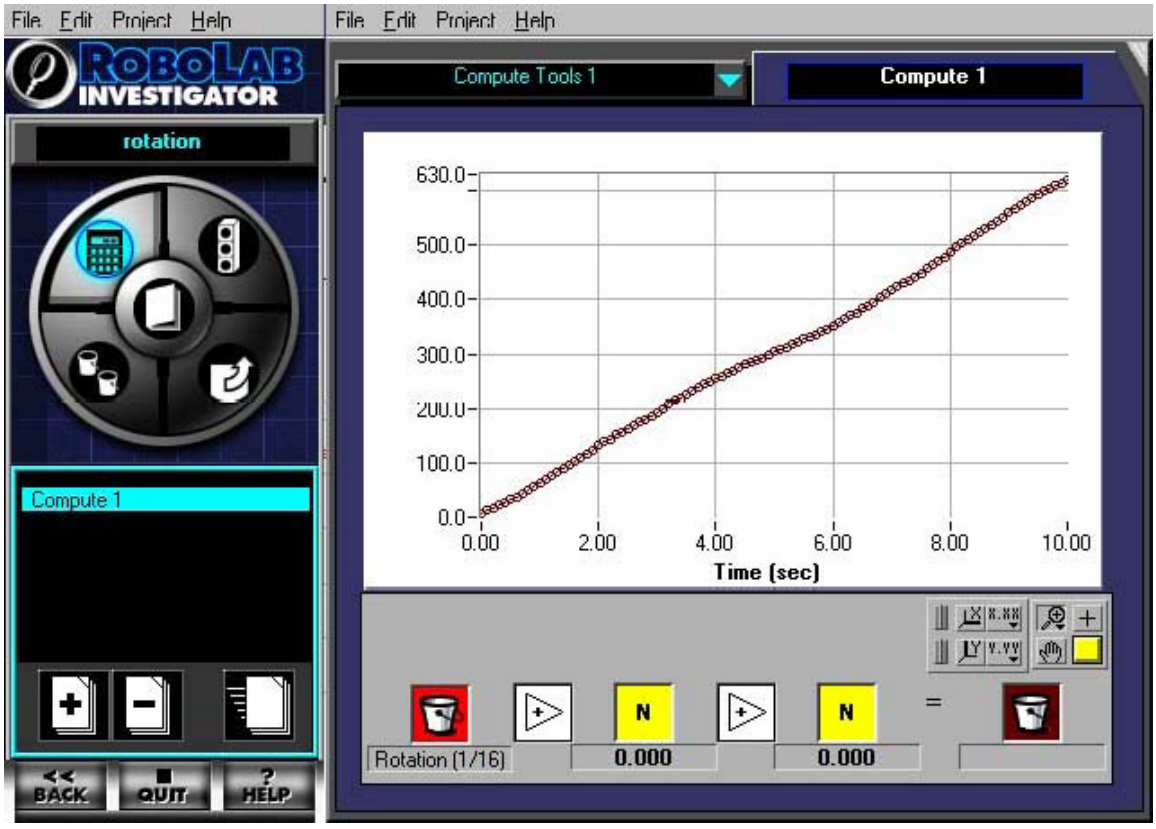
3. Use thick paper, index cards, or cups to create sails. Tape or clip these to the plates. Attach the rotation sensor to the RCX. Make sure to plug the sensor into port 1.
4. Open an investigator project. Write a program in level 1 to record rotation sensor data for a certain length of time. (Be sure to choose rotation not angle.) Adjust your sampling rate to something fast (a small decimal number). Your program will look like this:



5. Now you are ready to run your program. Download your program to the RCX and go measure the wind speed. Be sure your sails are spinning before you hit the RUN button.
6. Upload your data. If the wind speed was constant, the graph will look like this:

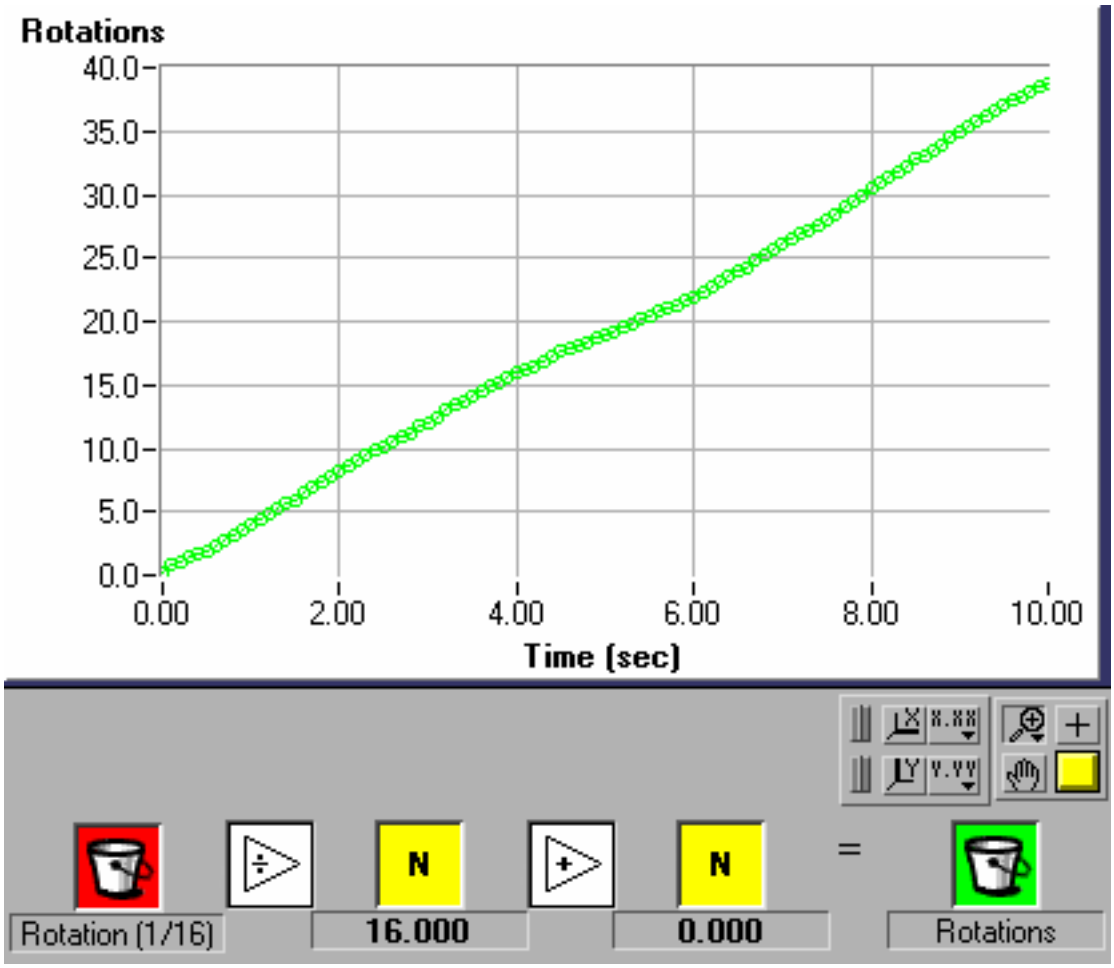


7. The rotation sensor measures in sixteenths of a rotation. (One full rotation of the axle would give you a reading of 16). In order to convert the data from sixteenths, go to the compute page. Your screen will look like this:



8. Now use the compute tools to divide the red bin (where your data is) by 16. This will make the y-axis the number of rotations.

9. Now you can change the color or label of your graph as you wish. To do this, click on the bin after the equal sign. Select the color you would like. To change the label, click on the box below the bin. Type a new name for that bin. For example:



Lego Tips

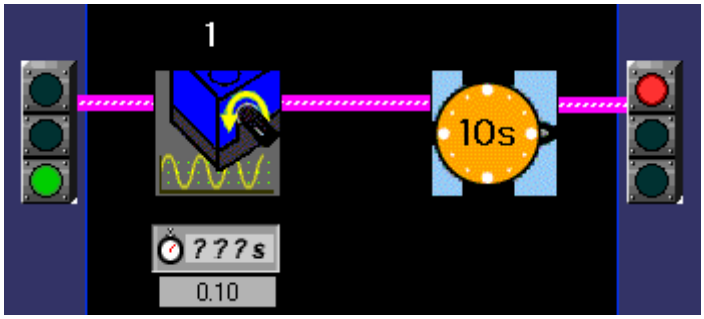
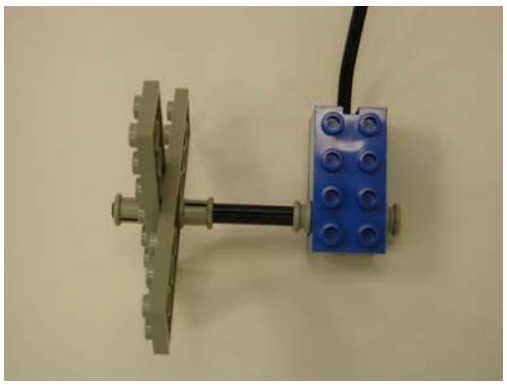
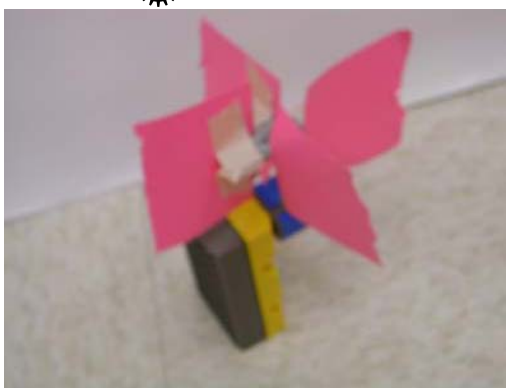
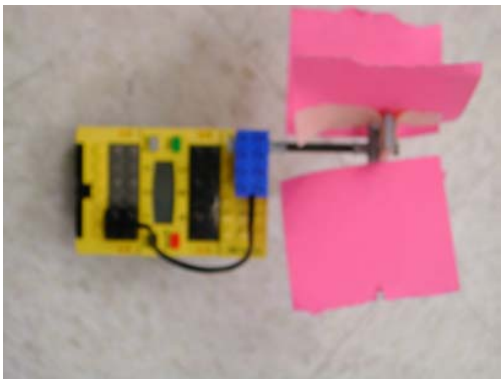
Building:

- Your anemometer's arms should be slightly angled to catch the wind best.

Extensions

1. Experiment with different types of arms to see what works best.
2. Once you've selected a type, try different sizes.

Sample Program



Sample Project