

Ocean Research Sensor Teacher Guide

Overview

Students will act as engineers investigating the use of Sphero as a prototype for a sensor to be used by team of ocean researchers.

They will be provided with a basic OrbBasic collision detection program to simulate the detection of impact and effect of currents and other objects encountered by robotic devices being used for research in extreme locations, such as the floor of the ocean.

These forces/collisions will be detected as Sphero is pushed and pulled. Students will track Sphero's movement on an X-Y axis and categorize impact levels based on thresholds.

Students will then be challenged to modify the program so that Sphero responds to a significant force, while "ignoring" minor bumps.

Estimated Time: 1.5 - 2 hours

Student Organization:



Objectives

- Think critically about a real-world problem that can be investigated with a technological device and some of the criteria for those devices in extreme situations.
- Understand and interpret information provided by a sensor.
- Use information about number ranges and thresholds and integrate them into programmatic decision-making.
- Consider practical applications for robotic technology as it is used in scientific research.

Materials Needed

- Rulers
- Sample Program
- Student Worksheets

FAQs:

Q: How can students read the output?

The sample program provides a continuous output. It is a good idea to have one partner move the Sphero as the other documents the output on the **Gather Collision Data** worksheet.

Screen shots can also be taken when collisions occur to document each instance for future reference. This can be helpful because each pair's data will be different.

Encourage students to practice this process a few times before beginning their official data collection.

Q: What should different "bump values" signify?

This can be discussed with students or predetermined. See the suggestions below:

- a low impact event (<1000)
- a moderate impact event (1000 – 2500)
- a high impact event (>2500)

Q: How can the program be modified to signal a moderate or high impact event?

In the sample **Moderate Impact Response** program, the X and Y positions have been removed from the program to focus on the force of impact (one output, every 0.2 seconds).

Once a threshold has been determined, a loop can be built into the program to check if that threshold has been met. If the condition has been met, the program may move to a new line of programming to perform an action, such as flashing a particular color. If the condition has not been met, the program will loop back to the process of checking the threshold every 0.2 seconds.

NOTE: Remember that Sphero's heading is relative to the user. Each time Sphero is turned on, the tail light needs to be "aimed" to set the direction that will be used for a heading of 0 degrees.



Extension:

- Investigate robotic devices and technology currently being used for underwater or deep sea research. Consider their characteristics (both physical and programmatic) and why they are well-suited to this environment.
- Create a program that reacts to three different levels of impact (e.g., above, within, and below a given threshold (e.g., glows green if impact is gentle, orange if impact is moderate, and red if impact is significant).
- Create a program in which Sphero reacts to an impact with movement. (e.g., when bumped moderately, will move to a new location or change directions to simulate moving back into position).