3. RUBBER BAND LAUNCHER: PROGRAMMING ANGLES WITH A SERVO MOTOR

A hobby servo is a small device that controls the position of flaps, rudders, and steering in many radio-controlled toy planes, boats, and cars. It is also useful in many robotics projects. Since it can both move to and hold a position, it is ideal for tasks like controlling the fingers of a robotic hand or even creating a rubber band launcher.

Goals

- Investigate and successfully program a servo motor based on angles.
- Use inputs from the //code.Node to trigger physical outputs from the //control.Node.

Materials and Equipment

- Computing Device
- //code.Node
- //control.Node
- Servo motor and 4-prong horn
- Motor bracket

- Screwdriver
- Mounting bolts and nuts for motor
- Rubber bands (4)
- Wire
- Goggles

Safety

Follow these important safety precautions in addition to your regular classroom procedures:

- Wear safety goggles when working with rubber bands.
- Do not launch rubber bands without teacher's instruction.
- Do not launch rubber bands towards another student.

Research

Programming Angles with a Servo Motor

The standard hobby servo in this kit has an approximate movement range of 90 degrees in both directions. This is also referred to as its movement arc. A servo on its own cannot do much, accessories connected to the drive shaft are necessary. Included in your kit are 4 servo horns.

1. Select Sensor Data in SPARKvue.
2. Connect your //control.Node to your computing device.
3. Disable the //control.Node On-board Sensor.

4. Select any template to access Blockly. Click on the code tool 🔵.

5. Plug the servo motor into #1 servo port. The servo must connect with the black wire on the right side, as indicated by the dark dot on the label. See Figure 1 to ensure proper placement. *Note: Image shows wire going into port 2. You will use port 1 for this activity.*
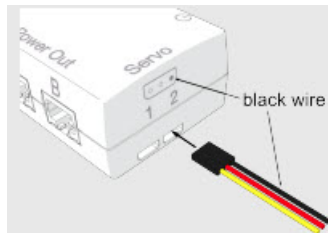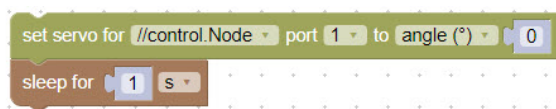

Figure 1. How to connect servo motor to //control.Node

6. Under Hardware, select the servo block.

7. Attach wire to two of the horn prongs. Do not place it on the servo motor just yet. See Figure 2 for how to attach wire.

Figure 2. Wire attached to 4-prong horn

8. Start the program. When complete, place the 4-prong horn on the servo motor. Refer to Figure 3 for proper placement. This is the position of the horn for a 0° angle.

Figure 3. Servo motor set to 0° angle

9. Recreate the following servo test code below.

10. Execute the program. If done correctly, you will see the wire move to the left (90°), back to start (0°), and to the right (-90°).

Prototype

Using your knowledge of how to program the servo motor, create a program that launches a rubber band. The launch should be triggered by an input from the //code.Node, such as sound or pushing a button.

1. Start a New Experiment. Connect both the //control.Node and //code.Node to your computing device.

2. Attach the servo motor to the motor bracket. See Figure 4 for set-up.
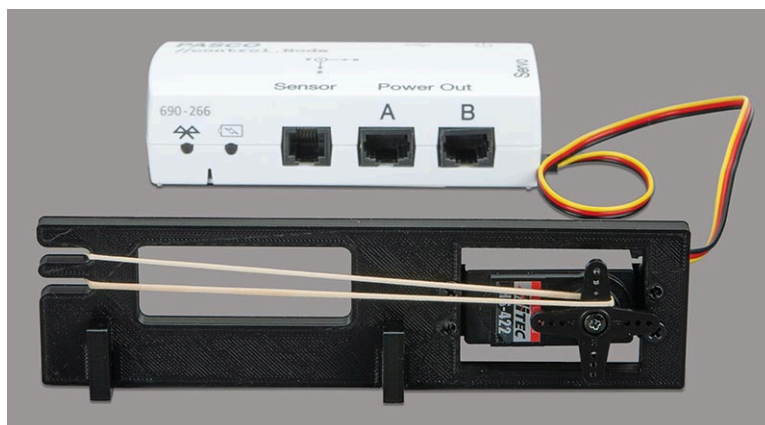
Figure 4. Rubber Band Launcher Set-up

3. Put on your safety goggles and complete the challenge. Find a safe area to test out your launch or follow your teachers directions.

Test

Once you complete your prototype program, execute the code and test to see if it works. If done correctly, the rubber band should launch once you trigger the condition with your selected //code.Node input.

1. When your prototype is complete, share your program and explain your process below.

Improve

- Use the //code.Node as the target for your launcher. Program the //code.Node to react if is it hit or falls over.

- Can you launch more than one rubber band at a time? Create a program that launches two rubber bands.