

Lab5: Robot Grip and Carry

Pre-Requisite Knowledge and Skills

1. Understand basic structure of robot programming
2. Be able to write C code.
3. Be able to compile and upload a code.
4. Be able to move Sparki move forward, backward, and making turns.
5. Be able to use Ultrasonic range finder sensor.

Learning Objective:

1. Understand how the gripper works in Sparki.
2. Understand how to use a step motor to control gripper.
3. Be able to program the Sparki robot to grip the object.

Recommended Running Environment and Software:

1. Computers Running Windows OS, OSX, or Linux
2. SparkiDuino IDE

Instructional Material:

1. Sparki Robot
2. Instructions of this activity
3. Semple codes

Video Demonstration:

1. to be developed

Lab Assessment:

1. Exercises
2. Quiz

Lab Instructions

Before lab starts, check the batteries of Sparki and remote controller.

Sparki has a gripper controlled by built in step motor, open and close as shown in Figure 1.

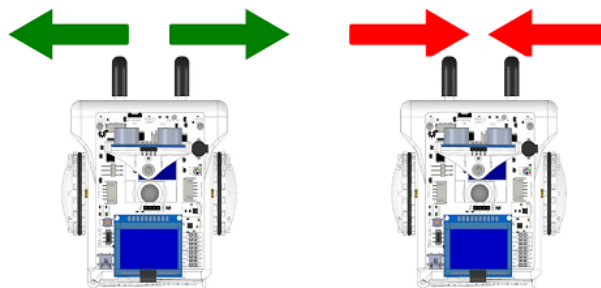


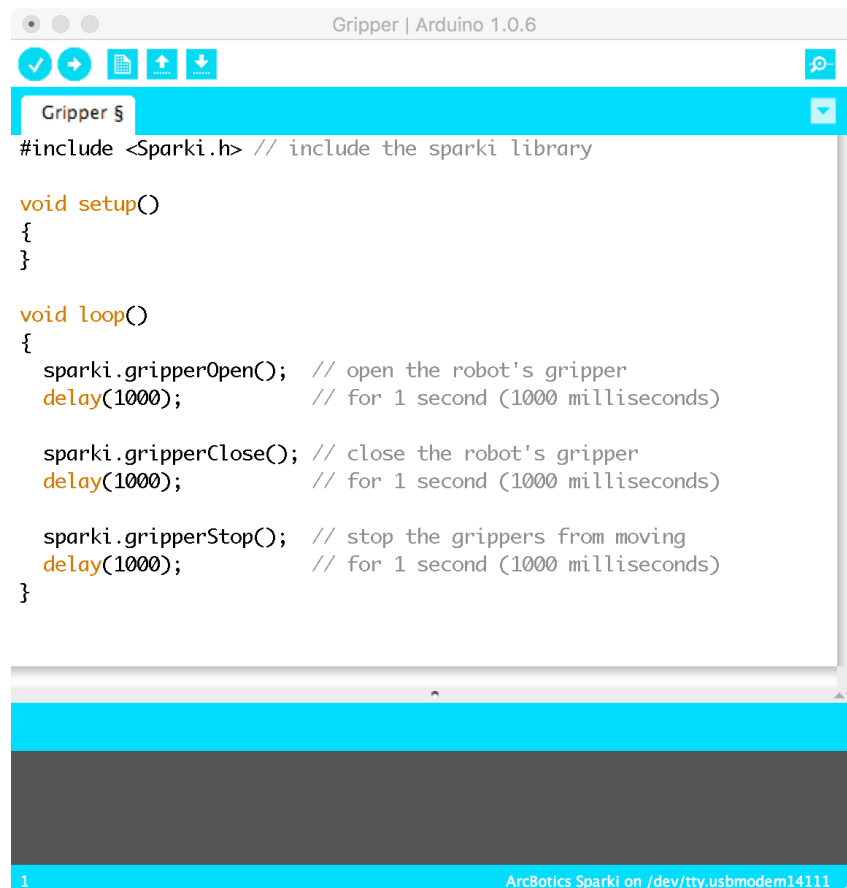
Figure 1. Gripper open and close

The functions to control the gripper are followings.

```
sparki.gripperOpen()
sparki.gripperClose()
sparki.gripperStop()
```

Controlling the width of gripper (i.e., close and open) can be done by argument in the function or delay function. We will use delay function in this lesson.

Step 1: Let's move Gripper. Write the code shown in Figure 2.



```
Gripper | Arduino 1.0.6
Gripper §
#include <Sparki.h> // include the sparki library

void setup()
{
}

void loop()
{
  sparki.gripperOpen(); // open the robot's gripper
  delay(1000);          // for 1 second (1000 milliseconds)

  sparki.gripperClose(); // close the robot's gripper
  delay(1000);          // for 1 second (1000 milliseconds)

  sparki.gripperStop(); // stop the grippers from moving
  delay(1000);          // for 1 second (1000 milliseconds)
}

1 ArcBotics Sparki on /dev/tty.usbmodem14111
```

Figure 2. Gripper code

Step 2: Compile and upload the code. Then, disconnect the cable and turn the Sparki on. Observe and discuss what Sparki does.

Step 3: Place a small block in front of the Sparki and write a code to pick up the block.

Step 4: Set up the Sparki, block, and wall as shown in Figure 3. Then, write the code to make Sparki do the following.

Move Sparki and pick up the block

Turn back
Move forward 10 cm
Release the block

Step 5: Compile and upload the coded. Then, disconnect the cable and turn Sparki on. Observe what happen to Sparki.

Step 6: In above step, Sparki will repeat same thing described in Loop function. Now discuss how it can make Sparki STOP once it releases the block.

Discussion

- **Why do we need to separate the distance reading and grip operation?**

It is about operation procedure. Sparki should measure the distance to the wall first before grip the block. So, it will measure distance first then take an action when the wall is in the range. These processes should be separated since they are separate processes.

- **Sparki robot is doing the same job over and over. Why and how we can stop?**

Since Sparki uses “loop()”, lines of code in loop() will repeat.

In loop, use either flag and condition statement or exit(1), which enforce it to exit (not recommended). For more detail, see sample codes, “Grip_Go_Stop-samaple2” and “Grip_Go_Stop-samaple3”.

Use setup() instead. It requires hard coding without using Ultrasonic range sensor. See sample code, “Grip_Go_Stop-samaple1”.