

Scribbler

Summary

In this activity, students will use a graphical user interface (GUI) program to program a robot to light up, following a specific design criterion. Once students learn the basics of programming lights, they will be open to create their own lights to “robot light up”.

After completing this activity, students should be able to:

- Program the Scribbler Robot to move forward and backward
- Use the Move Action tile in the Program Maker Software Tool
- Measure the distance the robot moves
- Estimate the amount of time needed to move the robot a particular distance
- Modify the Motion Action tile to change wheel speed, direction, and time
- Use the Pause Action tile to insert time delays in the program
- Describe what devices make the robot move
- Define Encoders and describe why they are important
- Describe how to make the robot move forward, backward, and turn
- Define speed and how it is measured
- Define velocity and how it is different than speed
- Define the math formula used for calculating distance
- Calculate the rate of the scribbler robot movement
- Using rate and distance, calculate the time for scribbler robot movement

Setting the Stage

Before the students start working, initiate an introduction/discussion about the topic using some of the following open-ended questions.

1. What a robot is?
2. Where robots are used?
3. Are you ready to be a roboticist (a person who builds and operates robots)?
4. Introduce the S2 robot and its parts (LEDs, wheels, light sensor, obstruction sensor)
5. What programming is?
6. Play the [simple move robot concept video](#) (6:30)
7. Discuss and write in groups the definition of a velocity and speed.
8. What happen if one wheel turns faster that the other?
9. Play the [move on video](#) (3:30)
10. Discuss and write the difference between incandescent light bulbs and LED light bulbs

Materials

- A TV with sound system
- A PC or laptop per team with installed [GUI software](#).
- A white board or paper to write on, white board is desirable so you can wipe off marks easily.
- Writing materials, i.e. dry eraser markers or sharpies if using paper.
- Robot S2 plus USB/serial cable connector.
- 6 AA charged batteries
- Ruler.

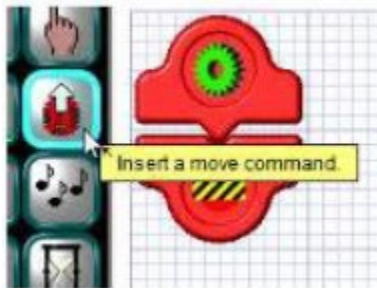
Activity Procedure

Pre-Activity Check List:

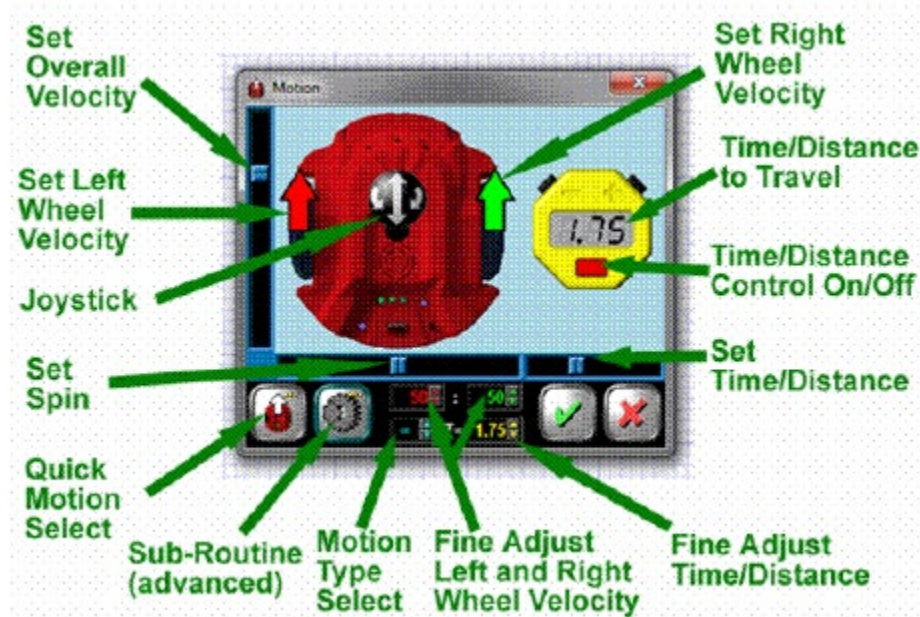
1. Fresh/Charged Batteries installed into the Scribbler 2 robot.
2. Scribbler Connected to your computer via USB cable and USB to Serial Adapter. Note:
3. Review the Getting Started section to see how to properly connect the Scribbler to the computer.

Activity Steps:

1. Open the Scribbler Program Maker on your computer. The icon looks like a little Scribbler Robot, and the name is "S2"
2. Using a new program, insert a Move Tile into your program.



3. As soon as you drop the Move Tile into your program, the Motion Panel will open. There are a lot of items that can be adjusted, but it is not really that complicated. Remember, if you want a more in-depth look at the Motion Tile, you can review the Insert a Move Command Section of the Help Documentation.



Even with all the settings, there are only two things we are adjusting on this Panel: How Fast each wheel is turning and for How Long. That's it!

- The easiest way to adjust the settings is to grab the Joystick (the black circle in the center of the scribbler) and drag it to where you want to go. All of the other settings are a way to fine-tune the speed. To adjust the time you want the Scribbler to move, use the Time/Distance 'Stop watch' to add or remove time.

IMPORANT: There is no setting for how far (distance) to move Scribbler, only the time and speed. Can you think of a way we could find out how far Scribbler will move if we know how fast (speed) and how long (time) it is moving?

- Let's move the Scribbler forward at 50% power for 2 seconds. To do that, make your panel settings match the picture below. Click the Green Checkmark when you are done.



6. The Motion Tile will be inserted into your program.



7. Now, before we send this program to the Scribbler, we want to be able to have time to position our Scribbler before it starts rolling away. As we have it now, Scribbler will just start rolling as soon as we copy the program to it. Let's add a new Tile into the program that will have it pause for 5 seconds to give us a chance to move it into position.

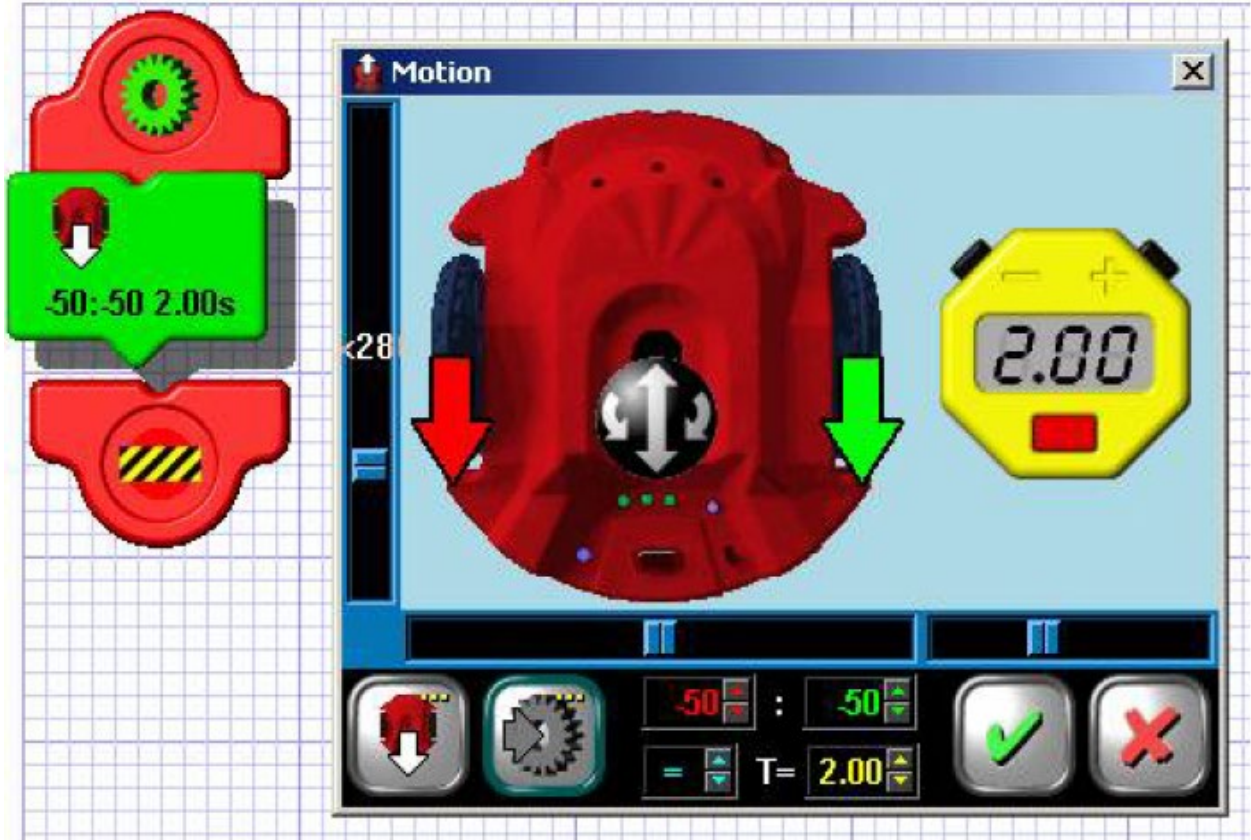
- Look for the Pause Tile (it looks like an hour glass) and insert it above the Motion Tile we just inserted.
- Once you insert the Tile, the Wait a While Panel will appear. Adjust the time to 5 seconds using the bar on the side, and then click the Green Checkbox.
- Your program will look like this.



8. Once you have the program set correctly, you can program the Scribbler.
 - NOTE: You will have 5 seconds from the time the Upload Successful window appears before the Scribbler starts moving. Plan ahead and be ready for it, so you can disconnect the robot from the computer quickly and place it in a safe area to move.
 - Optionally, you can turn the Scribbler OFF after the Upload Successful message appears. Then disconnect the robot and place it where you want it to roll. When you are ready, you can turn the robot back on and it will run your program.

Did your robot move like you thought it would? Place a mark at the start spot of the robot. Press the Reset button to rerun the program. Then mark the end spot. (Make sure you marked the same wheel location or the same location of the scribbler both times). Use a ruler to measure the distance. Then, try the experiment 3 more times. Does it go the same distance each time? What do you think would happen if we told the Scribbler to go for 4 seconds instead of 2 seconds? Let's try some experiments.

9. Try each of settings and record your results. Hint: Once you try a few tests, you will be able to predict how far the Scribbler will move.
 - Modify the program to run for 2.5 seconds instead of 2 seconds. Leave the wheel speed at 50. Measure the distance and record your results.
 - Do the same as above, but change the time to 5 seconds. How far did Scribbler go compared to when it was at 2.5 seconds?
 - Now, modify the Speed of the wheels. Set the speed to 100 for each wheel and set the time to 2.5 seconds. How far did Scribbler go? Record the results. How did it compare to when you had the wheel speed set at 50 and the time at 5 seconds? Do you think you can estimate how far the Scribbler will move without having to run another program?
 - How far do you think the Scribbler will move with a speed of 75 on each wheel for a time of 2 seconds?
10. Modify the Motion Tile so that instead of moving forward, Scribbler is moving backwards. Move the Joystick the opposite direction for 2 seconds at a wheel speed of 50.



Did the Scribbler move as expected?

Complete this table in your worksheet. These values will make it MUCH easier when you are working on future programs, as you can just look up the values to see how far scribbler will go.

Distance (inches)	Speed	Time	Distance (in centimeters)
1			
2			
4			
6			
12			

Congratulations, you have now used programming to make a robot move. You are well on your way to becoming a robotics expert! Go ahead and play with other commands such as controlling the music or lights of the robot. Remember Have fun! Engineering is cool!

Follow-up Questions

1. How does a robot work?
2. Can you make the robot turn 90, 180, 270 degrees?
3. Can you make the robot move in circular motion?
4. Can you determine the speed of the robot in mm/sec based on the numerical speed (0-100) of the coding.
5. Were you able to guess how far the robot will move based on the settings? If not, why not?

Vocabulary

- **AC/DC power** – electricity can be transmitted through alternative currents (AC) and direct currents (DC), they have different advantages and disadvantages, AC is the most common used in a household (can kill us), DC is the common way to power electronics (safer than AC).
- **Programming/coding** – the process of preparing an instructional program for a device.
- **Robot** – a machine that resembles a living creature in being capable of moving independently (as by walking or rolling on wheels) and performing complex actions (such as grasping and moving objects).
- **Speed** – the rate of movement of an object with respect to time.
- **Speed units** – linear speed units examples are kilometer per hour (km/hr), inches per second (in/sec). Rotational speed units examples are revolutions per sec (rev/sec), degrees per minute (deg/min)
- **Velocity** – similar to speed but this one considers the directions, such as forward, backward.