Figure 4-7: The improved Brick Program to follow dark lines

making ROV3R follow walls

Let's make ROV3R explore a space and return to its starting point. How? By making it follow walls!

As you can see in Figure 4-8, the robot can explore any environment (your room, your house, your school) by trying to keep a constant distance from walls or any other objects (such as furniture, shoes, cats, and so on) that it sees with the IR Sensor.

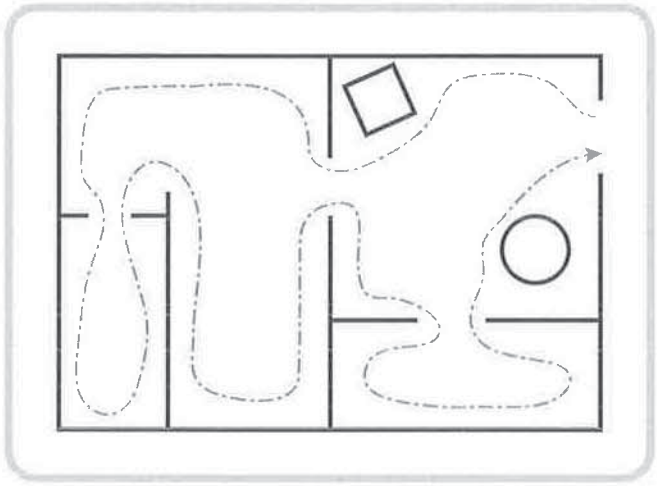

Figure 4-8: ROV3R can explore a space and return to its starting point if its path is not too cluttered.

The method for wall following is similar to the method used for line following, as shown in Figure 4-9. The robot turns toward the wall until the measured distance drops below a certain threshold (a), at which point it turns away from the wall until the measured distance rises above the threshold (b). The resulting movement is a wiggling path at an average constant distance from the wall (c). As long as the robot keeps a good distance from the wall, it can deal with corners and edges without getting stuck (d).

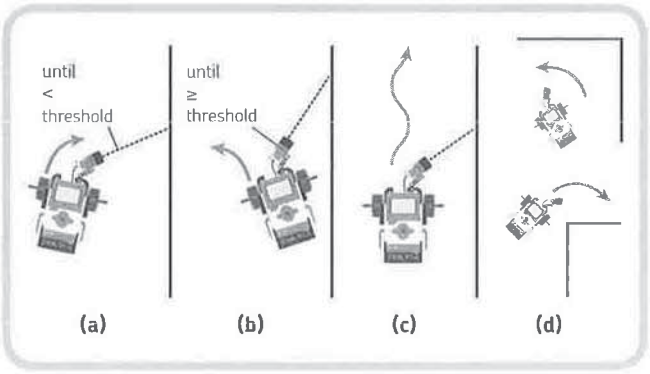

Figure 4-9: ROV3R using a simple wall-following strategy

Build ROV3R with the IR Sensor mounted as a wall-following sensor, as shown in Figure 4-10 (see "Wall-Following ROV3R" on page 32). The IR Sensor placed diagonally on the right side of your robot will see objects ahead of it. For the program, just replace the Wait Reflected Light Sensor blocks used in the line-following program (Figure 4-6) with Wait IR Sensor blocks to produce a program that looks like the one in Figure 4-11.

improving the motion

As in the line-following program shown in Figure 4-6, this wall-following program uses Move blocks to drive the motors attached to ports B and C, and the resulting movement is quite abrupt. To smooth out ROV3R's path, try the program shown in Figure 4-12. As in the program in Figure 4-7, you can use separate blocks to set the motors on ports A and D to run at slower speeds and thereby avoid stopping one wheel in order to turn.

If you lower the thresholds to <25 and ≥25, the robot will follow the wall more closely and will try to explore narrow passages, but it could get stuck when passing near edges (convex corners) or going around thin walls. If you increase the thresholds to <75 and ≥75, it will stay farther from walls and objects, which will smooth out its travel around corners, but it could end up traveling through the middle of a room and may skip narrow passages.

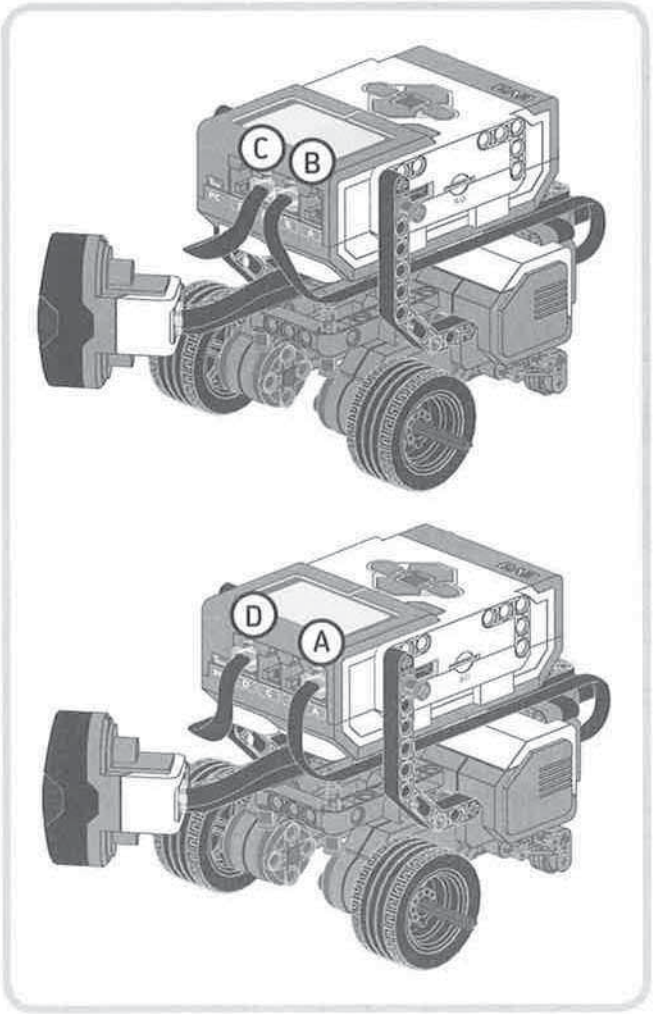

Figure 4-10: ROV3R equipped with the IR Sensor assembly for wall following. The motor cables should be attached to ports B and C or A and D, depending on your program.

EXPERIMENT 4-3

Build a frame to hold a video camera facing forward. Then switch recording on and let ROV3R explore. When your robot returns, you'll have a video of the trip. If you use a smartphone with video chat software (for example, Skype), you can even transmit the live video of ROV3R exploring its environment!

conclusion

In this chapter, you learned how to make ROV3R drive in patterns and follow lines and walls. A wall-following robot can explore any environment autonomously, transmit video back to the base, and even help get you out of trouble. What trouble? Read on!