

Lab: Drive the Line Challenge

OBJECTIVES

- Draw the system diagram for making the motors spin
- Connect components to make the wheels spin

DRIVE THE LINE CHALLENGE

Goal

The **goal** of today's challenge is to pass two levels of DriveBot control challenges.

- Challenge #1: Drive your DriveBot within a marked off area, so that your DriveBot crosses the "finish line."
- Challenge #2: Park your DriveBot on the designated "X" marked on the course.

Materials

You and your partner will be given the following materials, to make your wheels spin and hence drivable: a 9V battery, alligator clips, DC motors, wheels, and your DriveBot chassis (Figures 1 and 2).

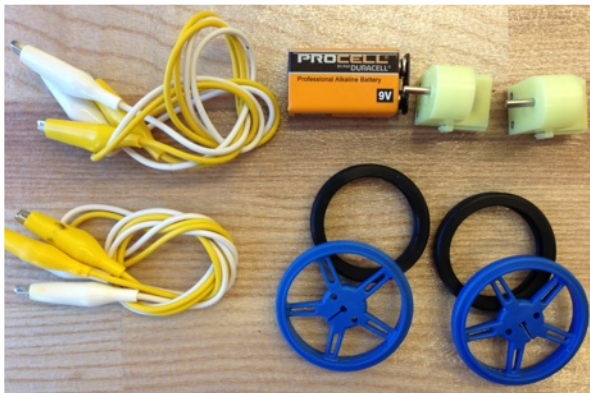


Figure 1: Drive the Line Materials



Figure 2: DriveBot chassis

Instructions

1. **System diagram.** In your lab notebook, first draw a *system diagram* depicting the connections between the provided materials (listed above).
2. **Make a plan.** Next, draw a sketch of the components and how you plan to connect them to each other, all with the goal of making the wheels spin so you can drive your robot.
3. **Checkoff.** Explain your plan to an instructor.
4. **Start building and connecting.** When your plan aligns with suggested steps, an instructor will give you the materials and an "okay, go!" signal to begin realizing your plan (i.e. following the steps you determined fit for this challenge).

LAB***Make DriveBot wheels spin so you can Drive the Line!***Instructions [working as a student pair]

1. Unwrap the motors and wheels from their respective packages.
2. Assemble the wheels (Figure 3).



Figure 3: Assembled wheels

3. Insert each motor into a motor well on the chassis (Figures 4 and 5). *Be careful not to bend the leads coming from the motor!* Take note:
 - The motors are a tight fit into the wells, so make sure the motors are perfectly straight when aligning them into the wells.
 - If you have trouble getting either of the motors into the motor wells, *notify an instructor.*

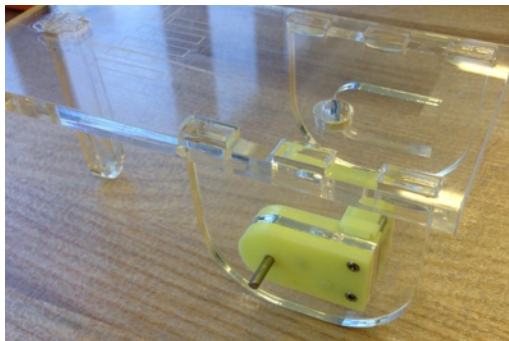


Figure 4: Inserted motor

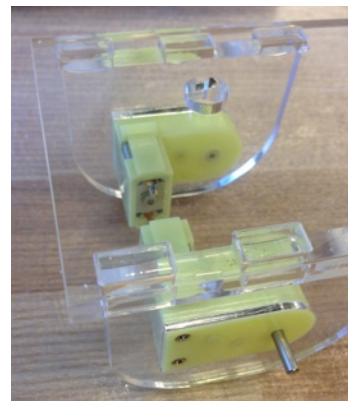


Figure 5: Both inserted motors

4. Attach the wheels to the motors. Note:
 - Do *not* make the wheels touch the plastic (acrylic); you should see some metal between the motor case and the wheel.
5. Using electrical tape, tape the battery to the top of DriveBot (Figure 6).



Figure 6: Taped battery

6. Attach alligator clips to each motor, as shown for one motor in Figure 7.

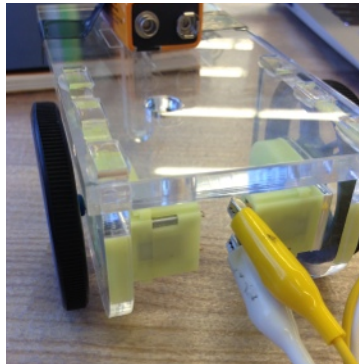


Figure 7: Alligator clips connected to one motor

7. Tape alligator clip wires to the top of your chassis, as modeled in Figure 8, *such that the wires are no longer touching the lab table surface. We do not want the wires to drag against the floor when DriveBot is driving.*

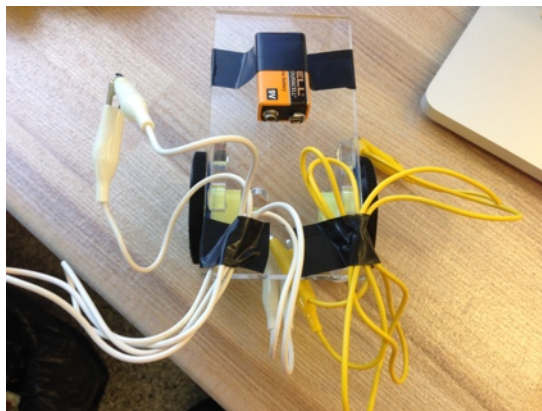


Figure 8: Alligator clip wires taped to chassis

8. Attach **one** alligator clip to **one** terminal on the battery (Figure 9). **DO NOT WORK AHEAD HERE! FOLLOW ONE STEP AT A TIME, SO YOU DO NOT CREATE A FIRE.**



Figure 9: Alligator clip to battery

9. Now take either dangling alligator clip from **the other motor** and clip that alligator clip around the alligator clip you just attached to the battery (SEE FIGURE 10).



Figure 10: Alligator clip to alligator clip on battery

10. Similar to **steps 8 and 9**, but **this time with one partner holding the DriveBot in the air (not resting on the table)** attach one remaining dangling alligator clip to the other battery terminal, and the last dangling alligator clip to the lone alligator clip on the battery.

Lab Questions [answer in your lab notebooks]

1. List your observation for the direction of your spinning wheels, as well as the direction of one wheel compared to the other wheel.
 - Are they spinning forward or backward?
 - Are they spinning in the same direction or opposite directions?
2. What happens to the direction of the motor spin when you change the polarity of the leads? (i.e. if you swap the alligator clips on **one motor**).

TIME FOR DRIVE THE LINE CHALLENGE!

Cleanup

1. Disconnect the alligator clips and the instructors will collect them from each lab table.
2. Both partners: place your chassis in your plastic bag, for locker storage. *Yes, you can keep the battery taped down, and the motors and wheels attached.*