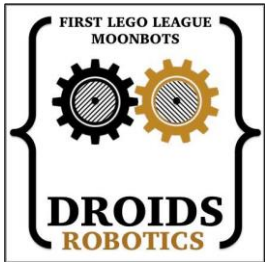


BEGINNER PROGRAMMING LESSON

Picking Up and Moving an Object



By Droids Robotics



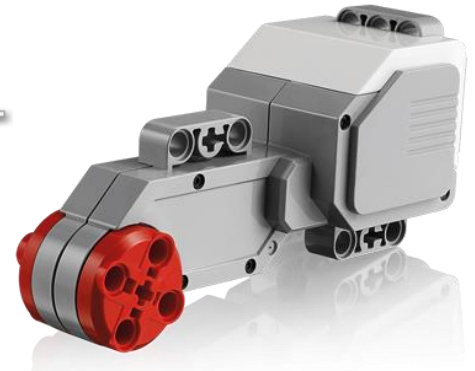
Objectives

- Learn how to program a robot to move an attachment arm – a powered attachment
- Learn how to make useful attachments

New Tool: Motor Blocks

- You can use the Large EV3 Motor or the Medium EV3 Motor for attachment arms
- Move Steering vs. Motor Block
 - For moving your wheels you should use a Move Steering Block that syncs both wheel motors (*see Intermediate lesson called Move Blocks to learn about sync*)
 - For moving your attachment your arm, you use either a Medium Motor Block or a Large Motor Block because you don't need to sync your motors.

Large Motor Block

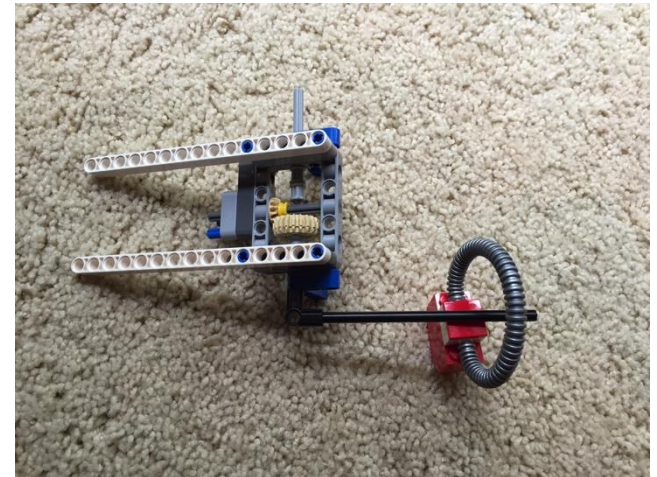


Medium Motor Block



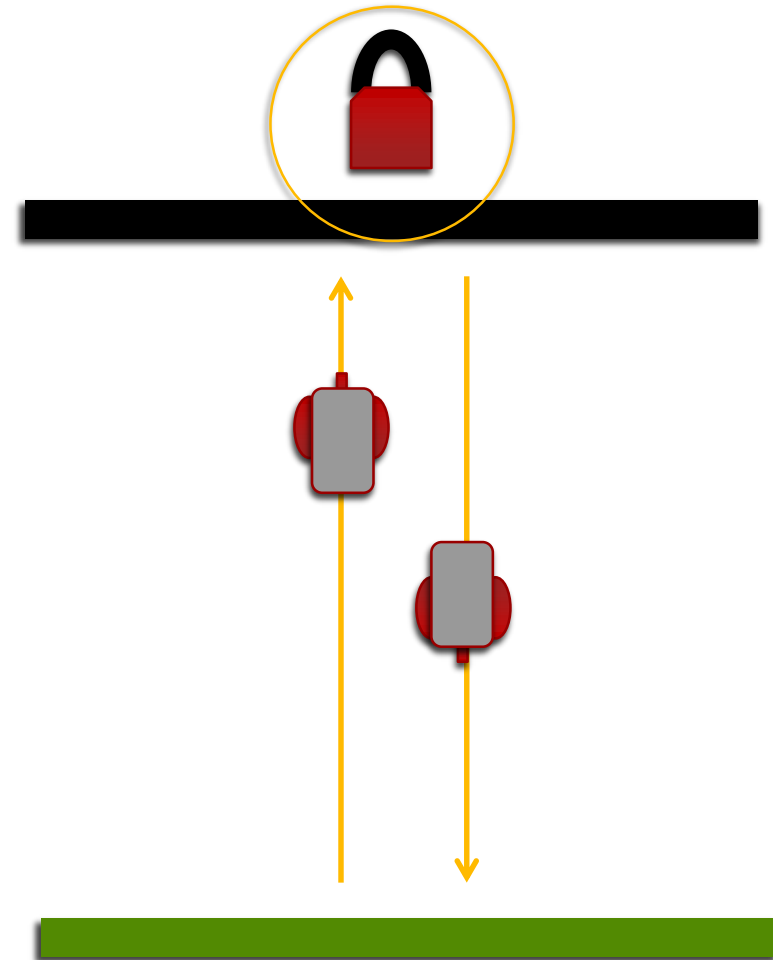
Using a Medium Motor

- Attach a medium motor to Port A or a large motor to Port D as needed
 - This is a generic set-up for the EV3
- Construct an attachment that can pick up or grab a hoop (object)
 - Look at the two examples on the right. They use the DroidBot's SNAP attachment
 - DroidBot's build instructions are available on the Robot Design page of EV3Lessons.com



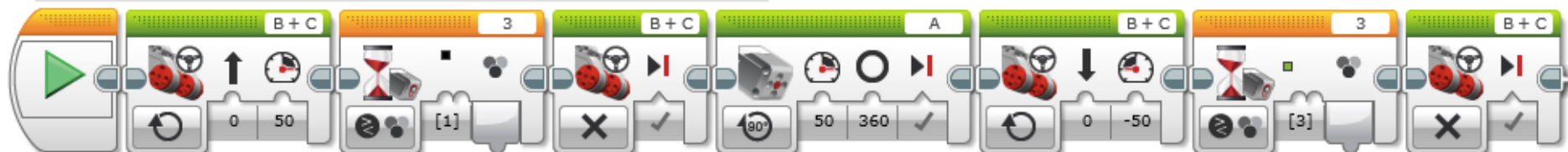
Pick Up and Move Object Challenge

- From the start line, move up to the black line
- Pick up the object and bring it back to the start line
- You can have the robot turn to come back or simply move backwards
- You can make the object a cube to grab (as in the Core EV3 kit) or an item with a loop on top depending upon the pieces you have available.



Challenge Solution

The goal of this program is to move from the start line till a black line.
The robot should stop at the line and pick up an object.
The robot should return to the start line with this object.



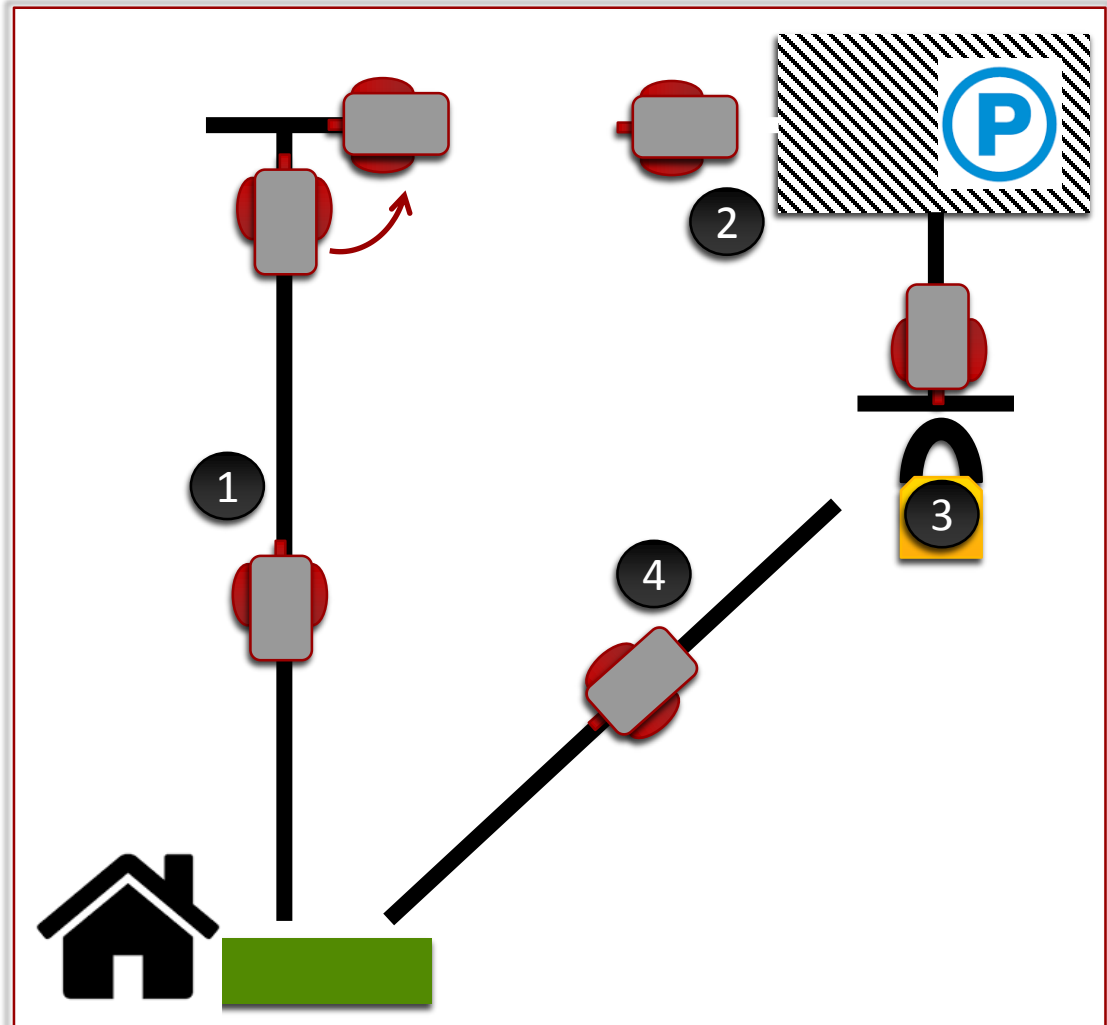
Move forward until black

Turn the medium motor the amount you need in order to pick up the object. You can measure how many degrees using Port View.

Move backward until green

Trip to the Grocery Store

1. Start at Home and drive to the grocery store
2. Have your robot turn and backup/reverse into the parking space
3. Stop to pick up groceries
4. Return home using the short cut





The next few slides have tips
on making attachments for
FIRST LEGO League

Powered and Passive Attachments

➤ Passive vs. Powered

- Passive attachments are sometimes more reliable (KISS principle)
- Powered attachments may be more complicated to attach

➤ Power sources

- Pneumatics – relatively powerful, but need to pump up in advance and be careful regarding pressure and leaks
- Rubberbands – compact and easy to use but can get lost/wear out over time
- Motors – can control in software and reusable across many missions but physically large

Attachment Tips

- Reduce errors/time wasted by avoiding adding/removing attachments. Design attachments that can stay on for entire time.
 - See Droids Robotics Food Factor run on YouTube for example of very few additions across multiple runs
- Removing attachments may be easier, less error-prone than adding them
 - See Droids Robotics Senior Solution run on You Tube for example of removing most complex attachments, but not adding more
- Reduce space and complexity of attachments by building attachments that can work for multiple missions
 - See forklift attachment used in Droids Robotics Nature's Fury run (You Tube) for its use in multiple missions

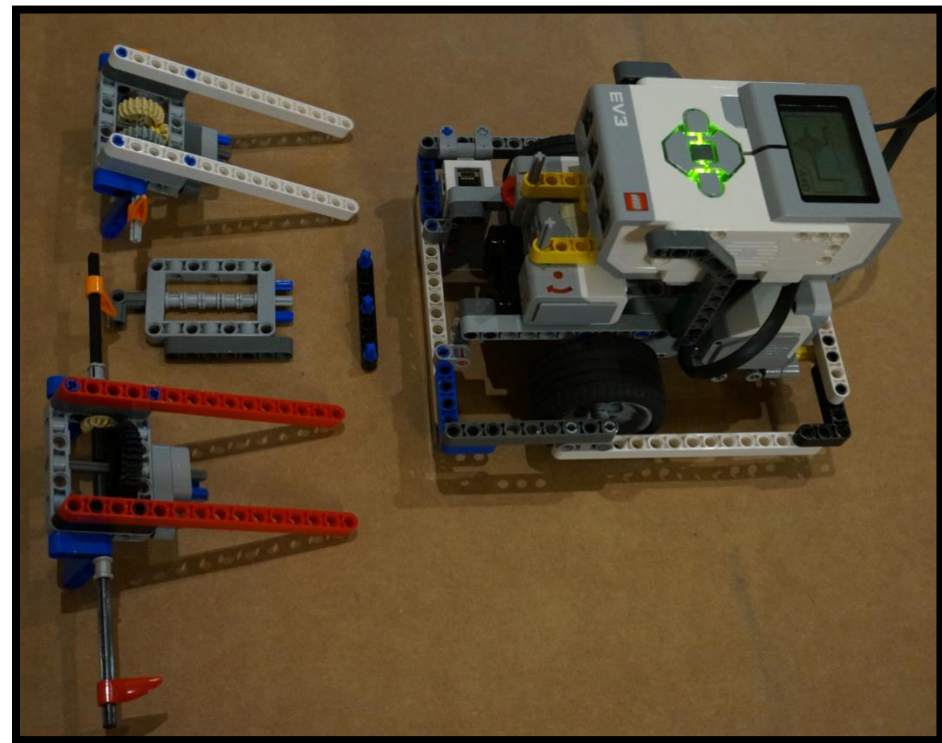
Attachment Tips Continued

- Use reliable and easy-to-add mechanisms to connect to motors/robot
 - Avoid hard to add/remove pins
 - Connecting directly to motor can be more reliable (avoids gear slip, etc.) but takes longer
 - Using gearing mechanisms to connect to motor can make it easy to add attachment but the connection may not be as reliable
- Use gears to deliver power to where you need it on the robot and in the direction that you need it
 - Look at various LEGO sets for inspiration on how to connect gears
 - Look at books by Isogawa to learn about gearing

S.N.A.P Attachments for Droid Bot

Some features to notice:

1. **S**wappable: Easy to put on and take off
2. **N**o Problem: Strong, reliable connection to motor (hard to remove accidentally)
3. **A**ttachments with **P**ower: Reliable gearing mechanisms to increase or decrease the power of the attachment
4. Gearing mechanisms to deliver power to either side of the robot



Next Steps

- Now that you know how to move an arm on a robot, can you move the arm while moving?
 - Check out the Parallel Beams lesson in Intermediate and Advanced
- Refer to the Move Blocks Lesson in Intermediate to learn more about the differences between Move Steering and Motor Blocks

Credits

- This tutorial was created by Sanjay Seshan and Arvind Seshan from Droids Robotics.
 - Author's Email: team@droidsrobotics.org
- More lessons at www.ev3lessons.com



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