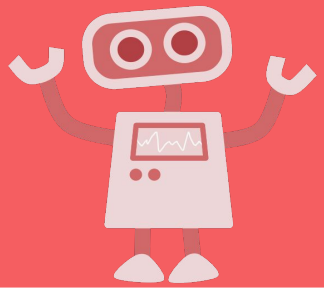
Day Three

Loops



Today's Plan

Learn about loops

Learn about simply line following algorithms using the color sensor

Relay Races

Lots of repeated actions

Annoying to say “do a jumping jack” 25 times

Better to say “do 25 jumping jacks”

How can we make our robots repeat actions?

What is a Loop in Programming?

Loops are a way of repeating the same code without having to copy and paste several times.

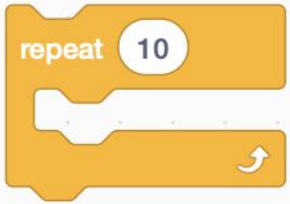
Many programs require repeating the same action multiple times or even indefinitely.

Loops are important because they save coding time and make code easier to read!

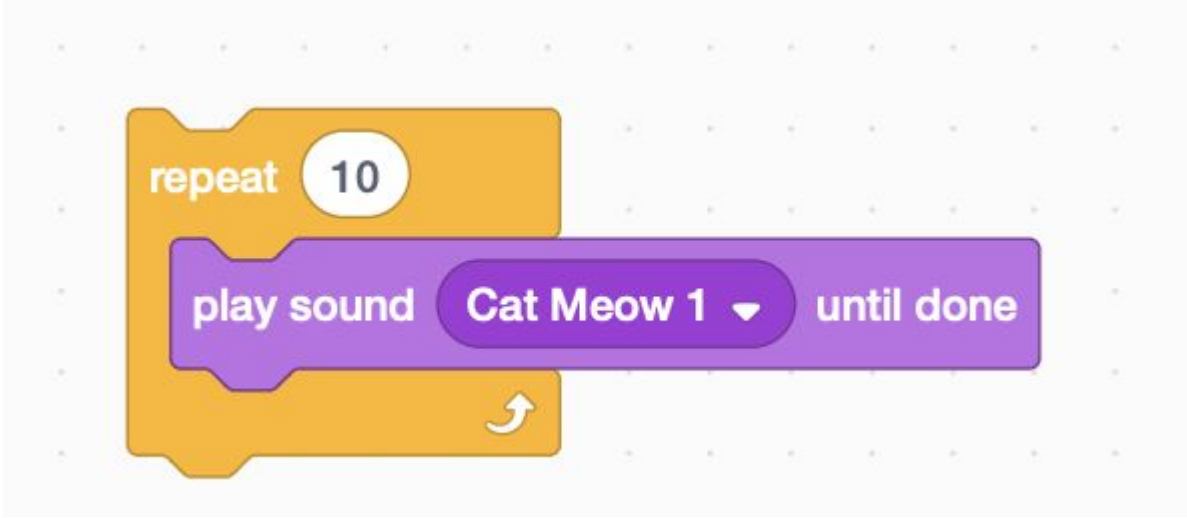
Types of Loops

There are three main types of loops in Spike:

- repeat num block
  - Repeats action specified number of times
- repeat until condition block
  - Repeats action until condition is TRUE
- forever block
  - Repeats action forever



What Does This Do?

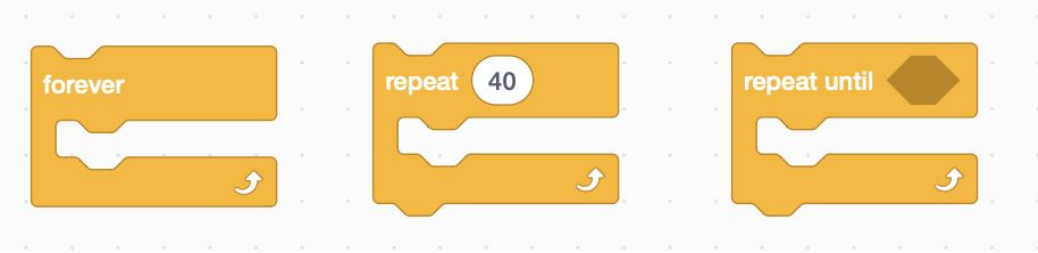


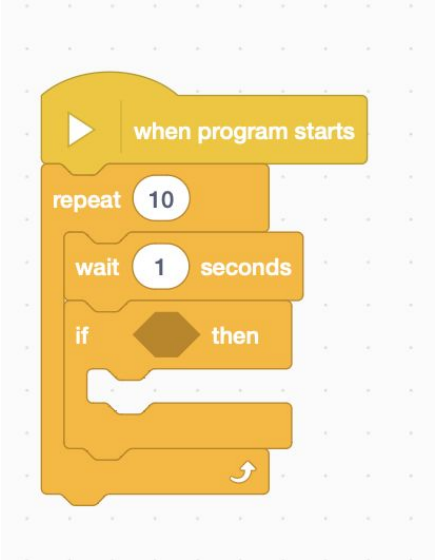
What Does This Do?

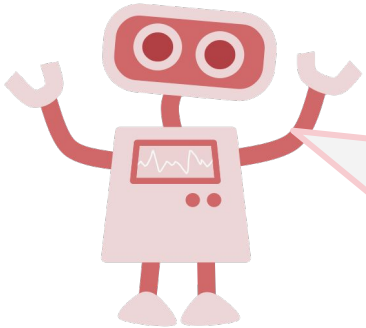
What Does This Do?

Loops in Spike

There are several ways to run your code repeatedly!





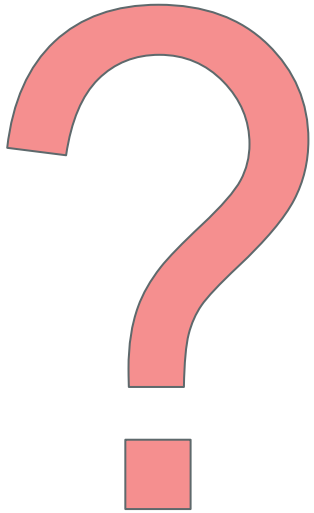


careful of programs that wait! the condition is only checked 10 times in 10 seconds.

Loops and Line Following

Today we are going to use loops to teach our robots to follow lines of specific colors

How are loops useful in this case?



Line Following

How do you follow a line?

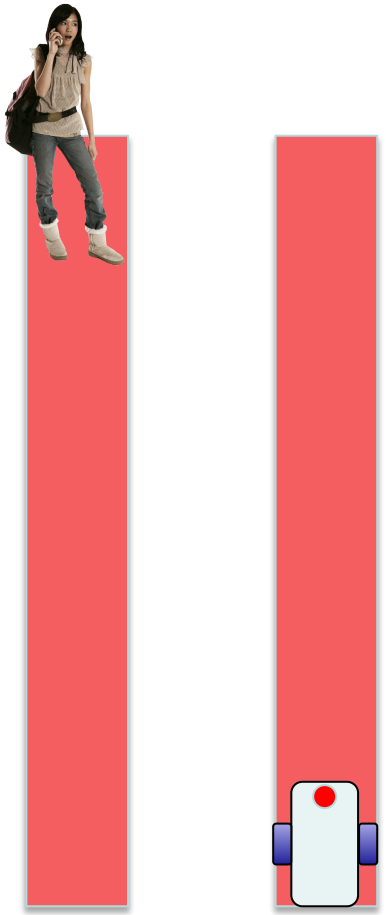
Humans want to follow the line in the middle.

Let’s have the robot do the same thing using the color sensor

What type of questions can we ask using this sensor?

Are you on the line or not?

Or are you seeing black?



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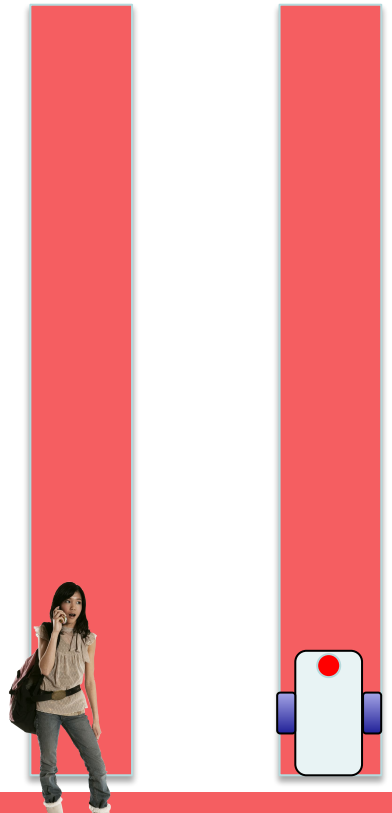
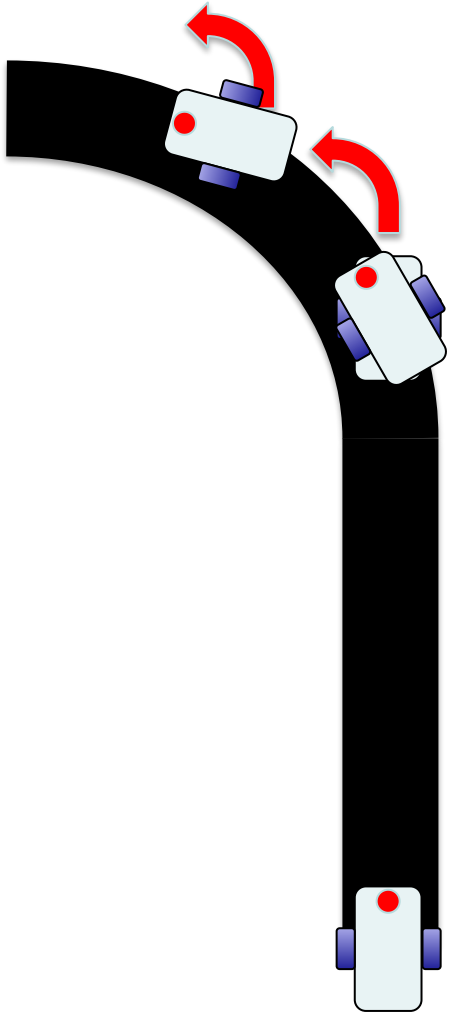


Follow the Middle of the Line

If we are on black, keep going straight

If we are on white, turn left to get back to the line

Seems like it will work fine here…



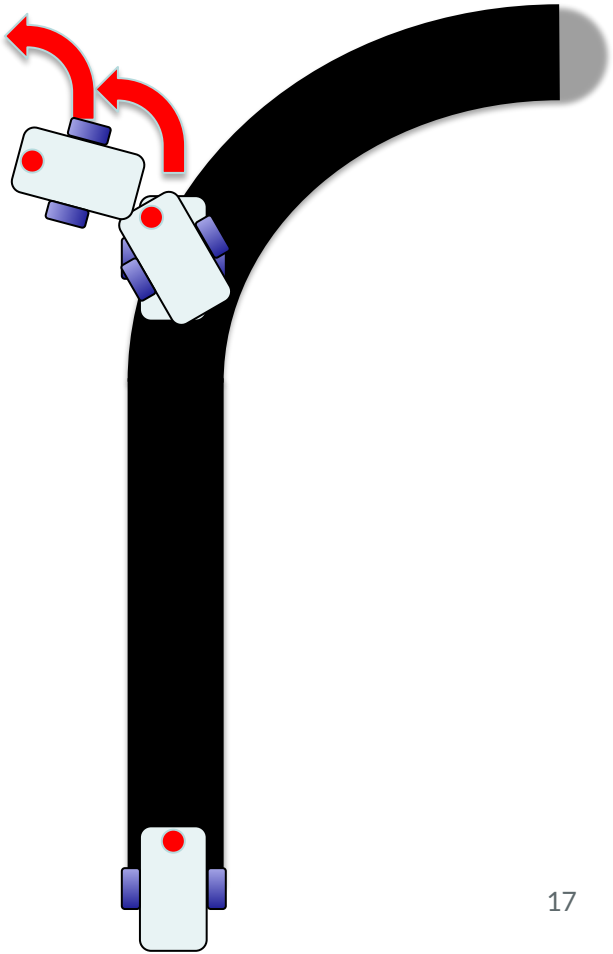
Follow the Middle of the Line

If we are on black, keep going straight

If we are on white, turn left to get back to the line

Seems like it will work fine here…

How about now?



Follow the Middle of the Line

If we are on black, keep going straight

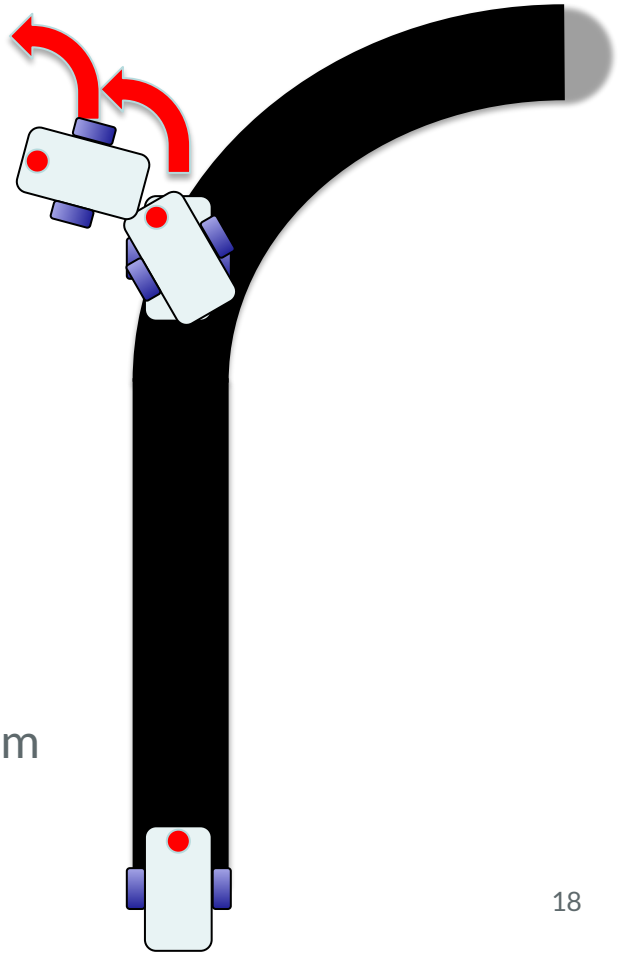
If we are on white, turn left to get back to the line

Seems like it will work fine here…

How about now?

Our robot is running away!

When the robot leaves the left side of the line, our algorithm no longer works!



Line Following Revisited

Why are humans able to follow the middle?

They can see! They can see both sides of the line and know which is which.

Why can't the robot do the same thing?

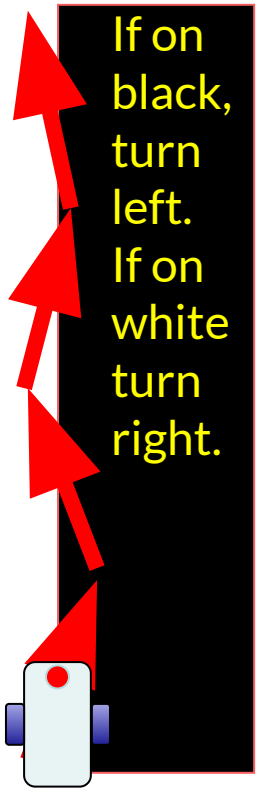
It doesn't know if it's the right or left side of line

How do we make sure the robot always veers off on the SAME SIDE of the line?

Instead of the middle, have the robot follow and *edge*

Robot will always fall off only the same side

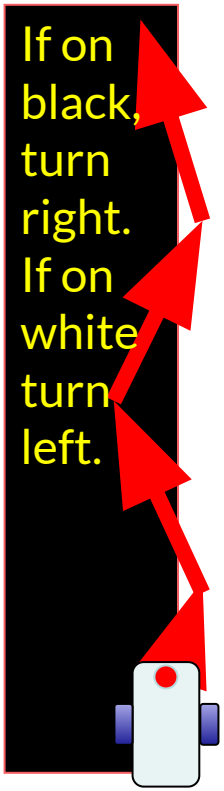
Following the Edge of a Line



Left side line following

The robot has to choose which way to turn when the color sensor sees a different color.

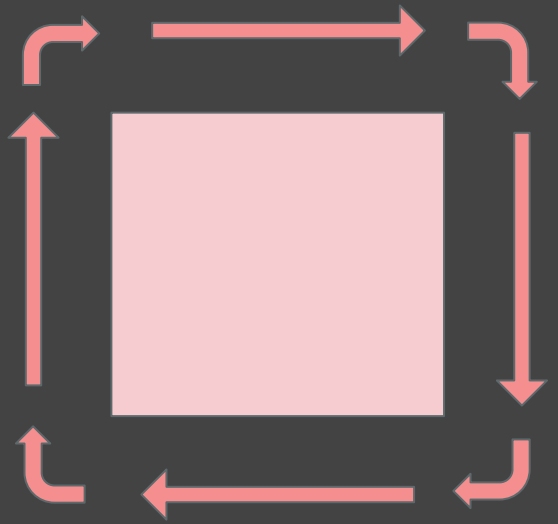
The answer depends on what side of the line you are following!

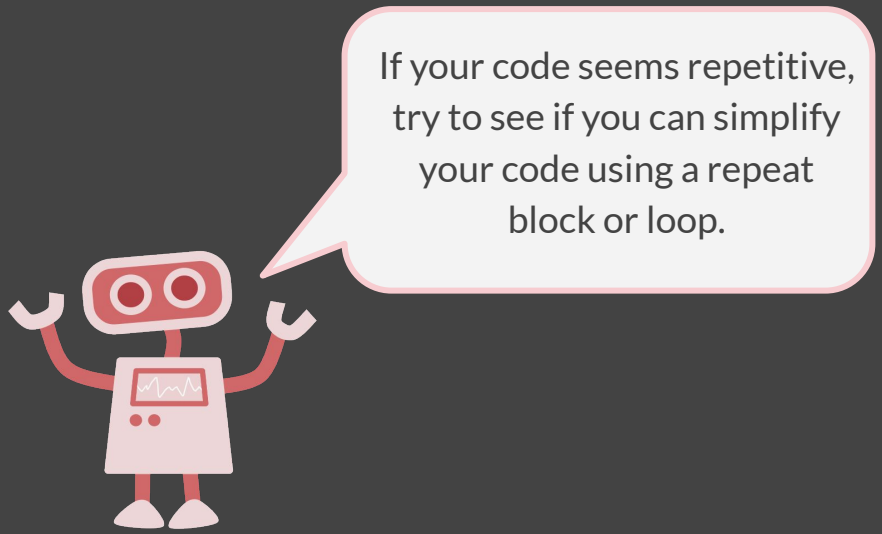


Right side line following

Pre-Lab

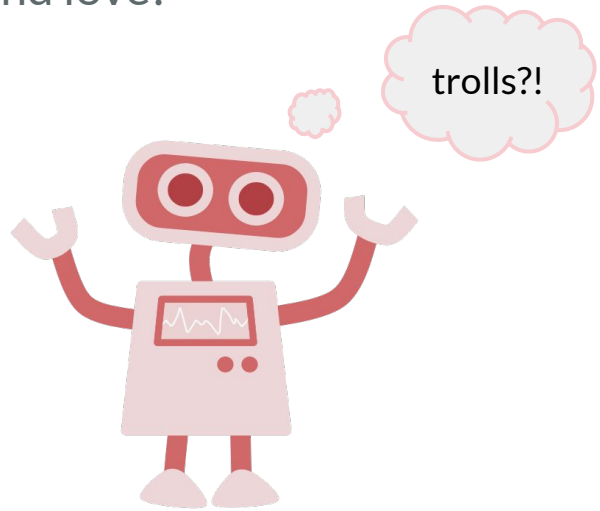
Build the driving base for Mr. Grabs. Then write a program for it to travel in a square and return to the same starting position.

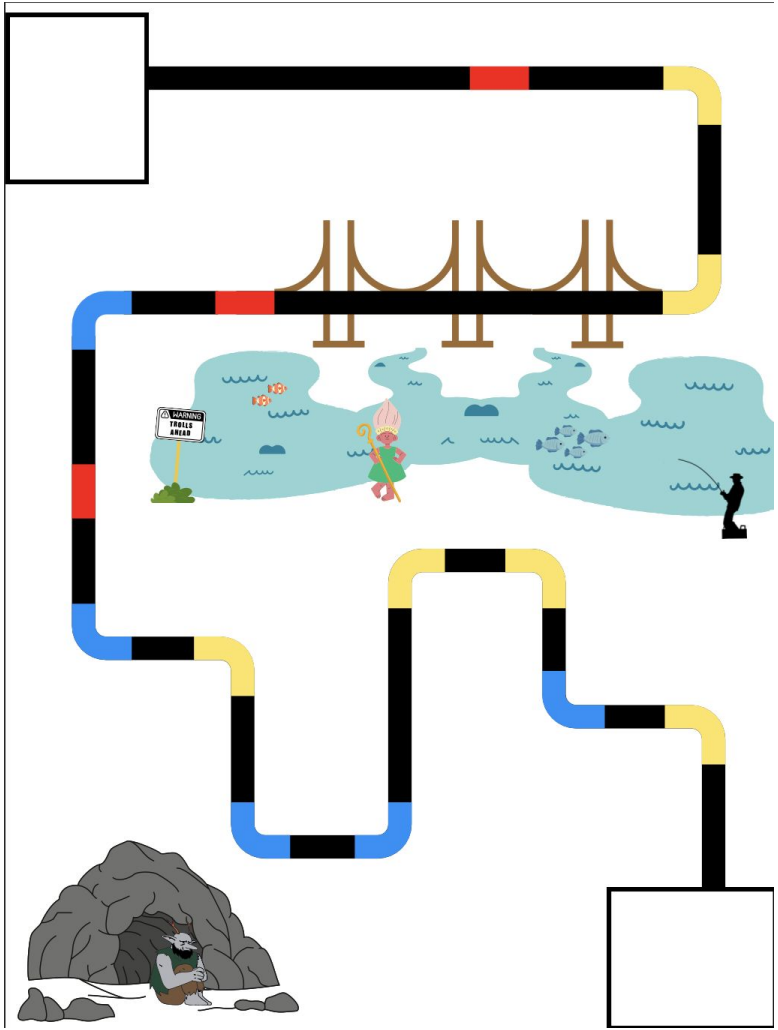




Lab - Mr.Grabs

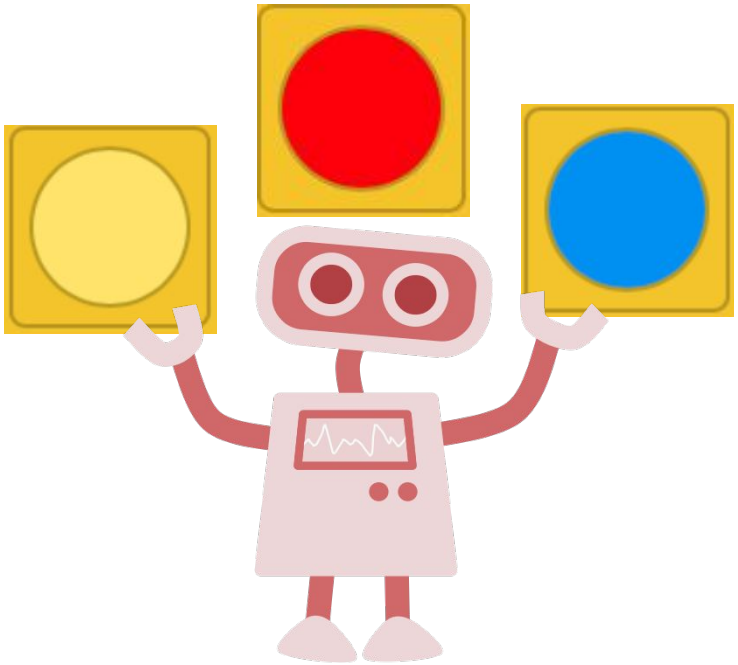
Today you will be using **Mr. Grabs** and a **line following algorithm** with **loops** and **conditionals** to clear the road of any obstacles, and to help the trolls find love!





Meet the trolls

Lab Hints



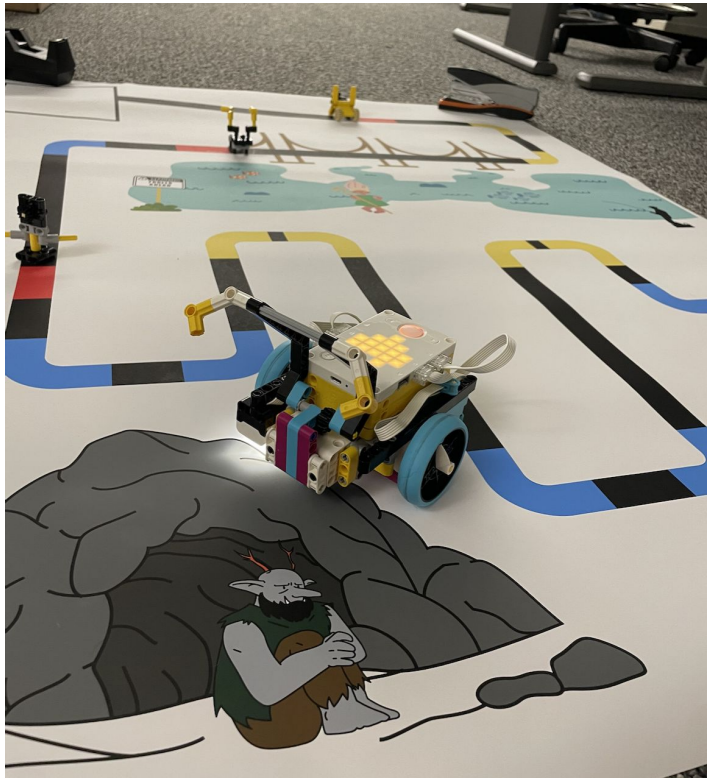
Yellow indicates a left turn

Blue indicates a right turn

Red indicates an obstacle

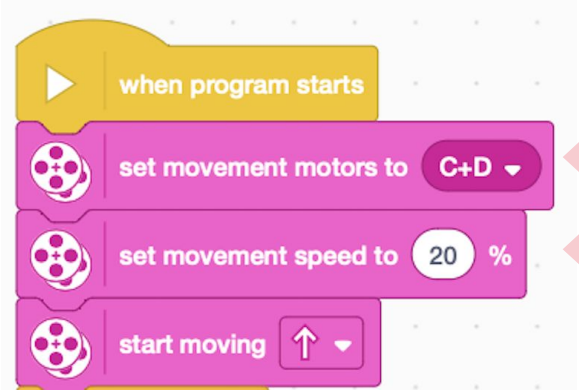
Build

you will build mr. grabs and 3 obstacles to remove from the road!



Lab Hints

First, we want to move the robot.

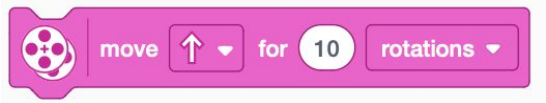


Specify which ports are connected to the motors/wheels

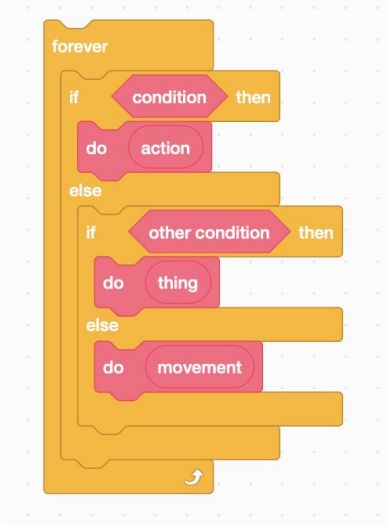
Begin with a slow movement speed!!

these blocks are different!

this one won't progress in the code until all 10 rotations are done



Then, we will **forever** ask if a condition is met to perform an action.



line following uses these blocks to wiggle left and right

Lab Hints

Add pieces to the “arms” if you need to secure the obstacles better.

Try altering the degrees left/right and the number of rotations that **Mr. Grabs** moves.