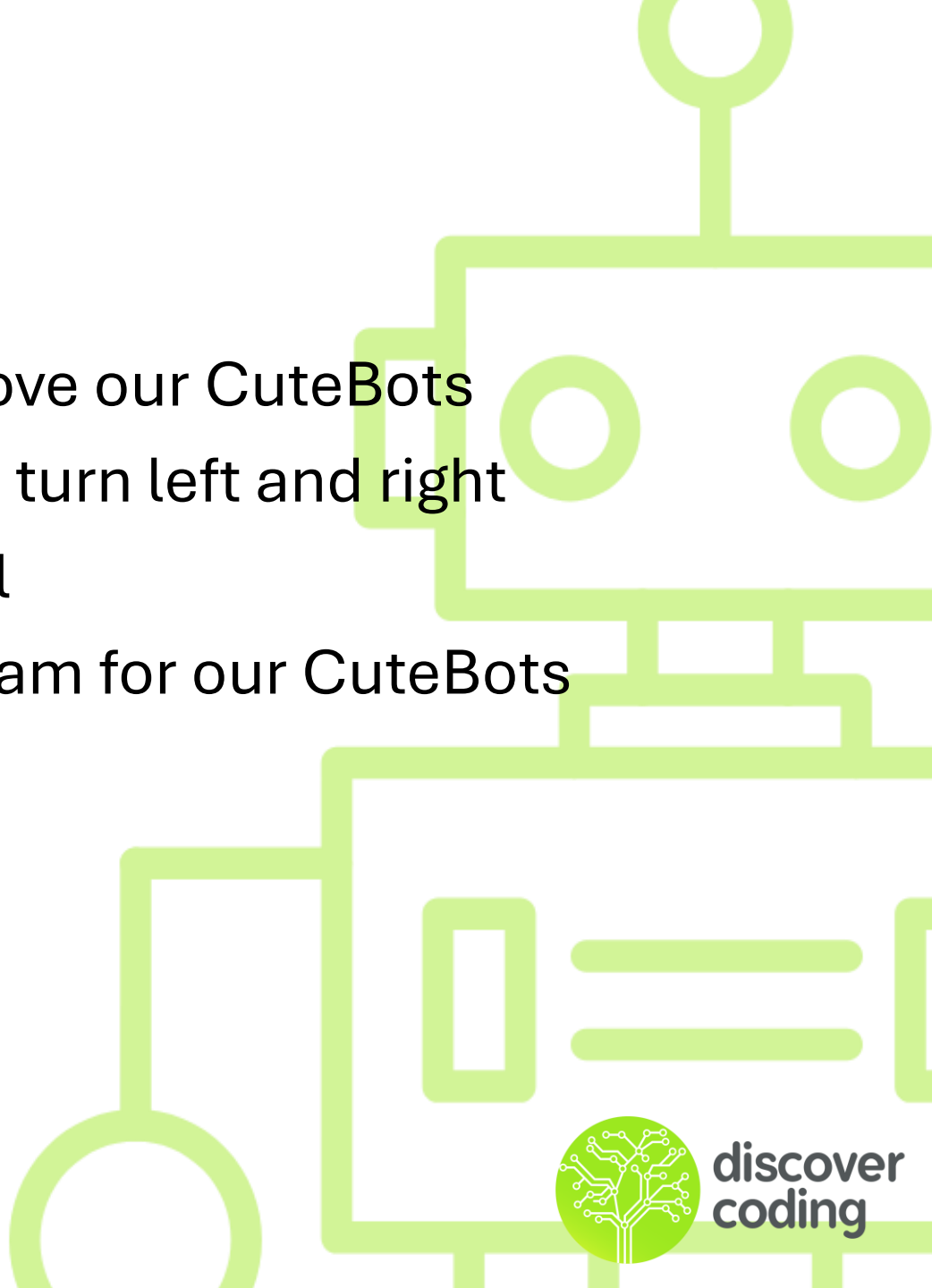
Lesson 3: Sensors and Data Collection

discover coding

CuteBots Review

- We learned how to write programs to move our CuteBots
- We can move forwards, backwards, and turn left and right
- We can change the speed of each wheel
- We can make patterns and write a program for our CuteBots to dance



CuteBot Rules:

1. Only run bots on designated mats
2. Limit speed to < 75% (unless otherwise specified)
3. Unplug batteries when not in use
4. Do not drop the CuteBots

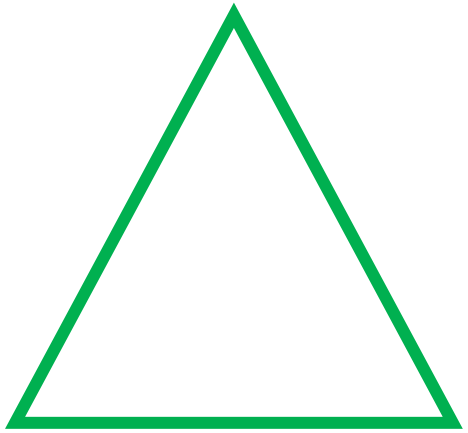
If you break any of these rules, you can choose:

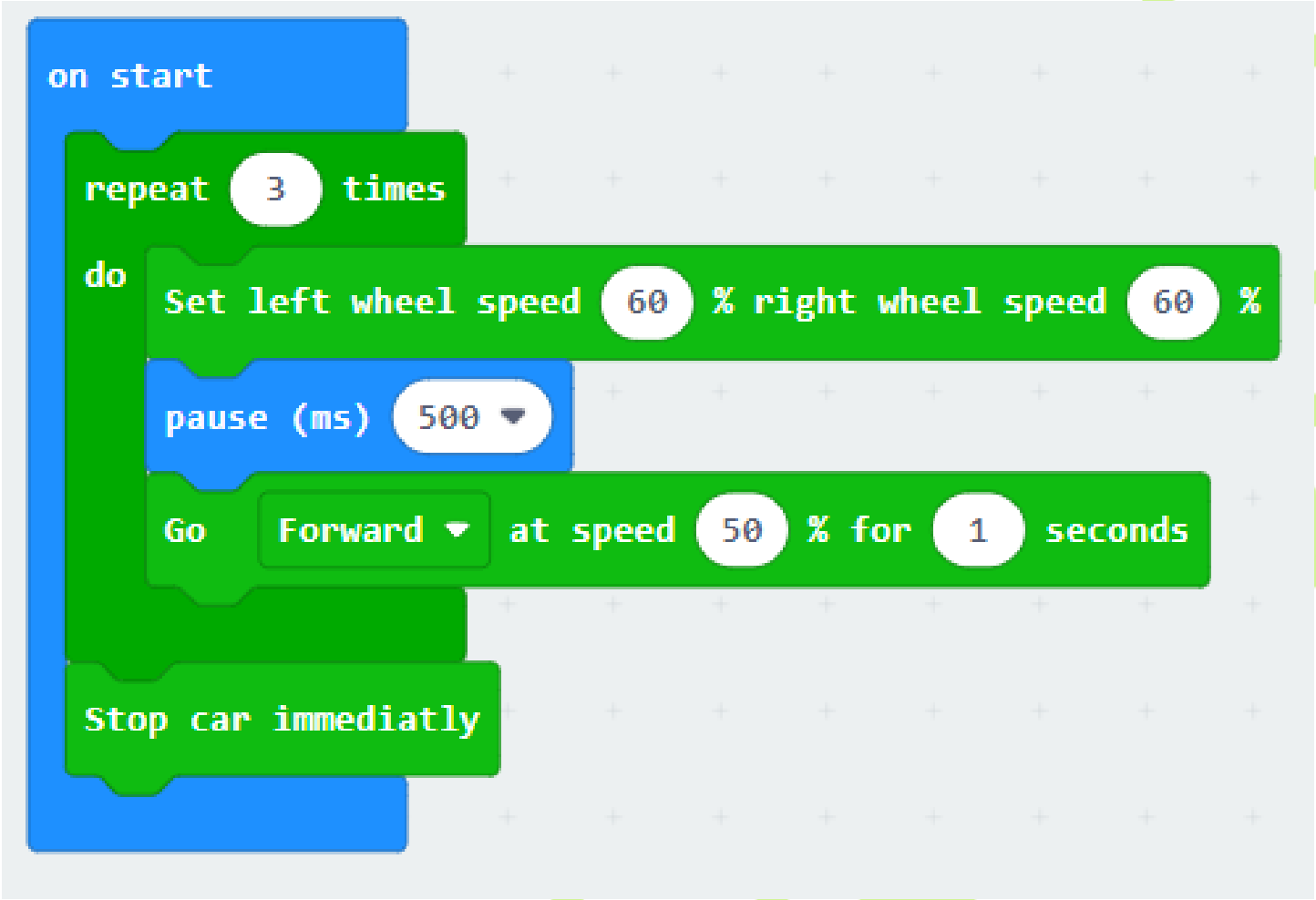
A. Do 3 burpees
B. Sing "I'm a Little Teapot" song
C. Do 10 jumping jacks

discover coding

DEBUG

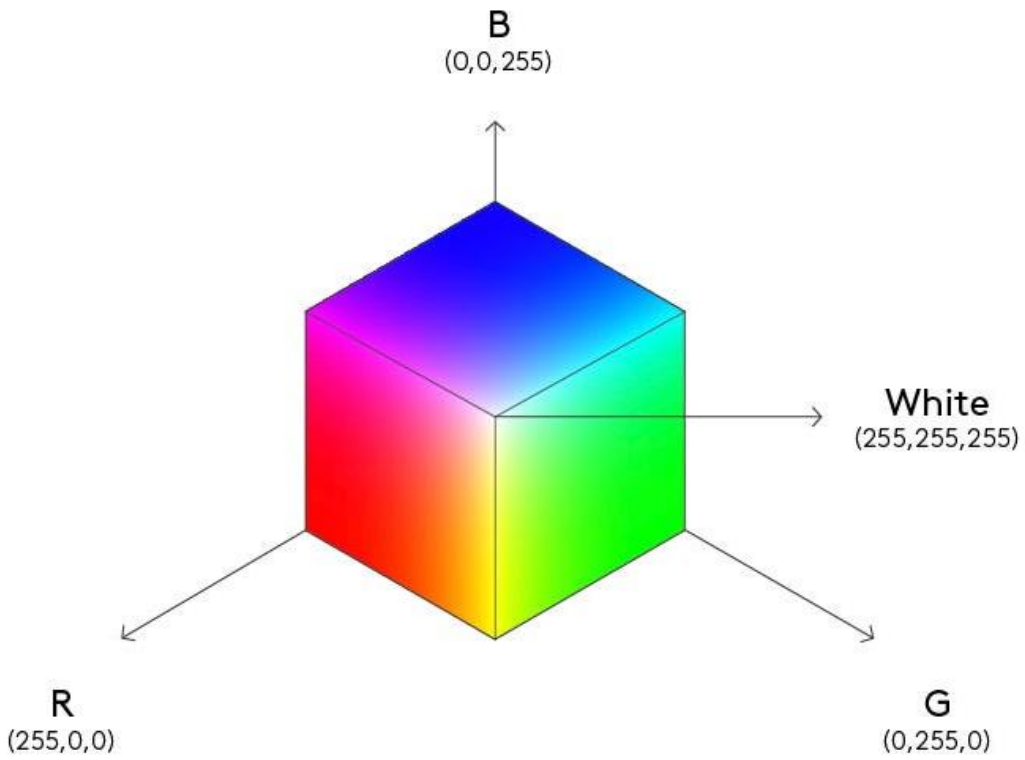
- We want the CuteBot to drive in a TRIANGLE shape, but it is not working as intended. What might we need to change in our code?





discover coding

LED and RGB



- **L**ight-**E**mitting **D**iode
- **R**ed-**G**reen-**B**lue
- An RGB light changes the output inside every single one of its diodes to "mix" your desired color using red, green, and blue as base colors
- Where do we see these lights in the real world?

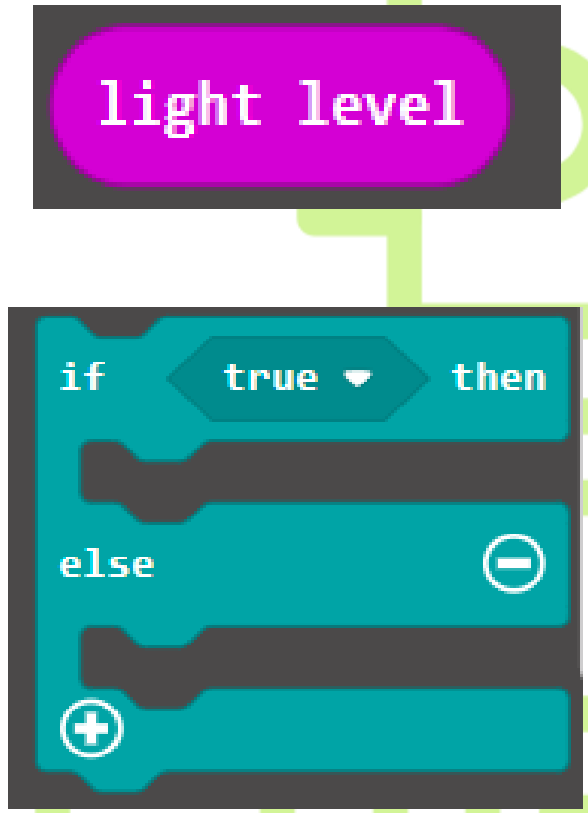
discover coding

Challenge: Automatic Headlights

- We will program our CuteBot to turn on its headlights automatically in the darkness (use https://makecode.microbit.org)

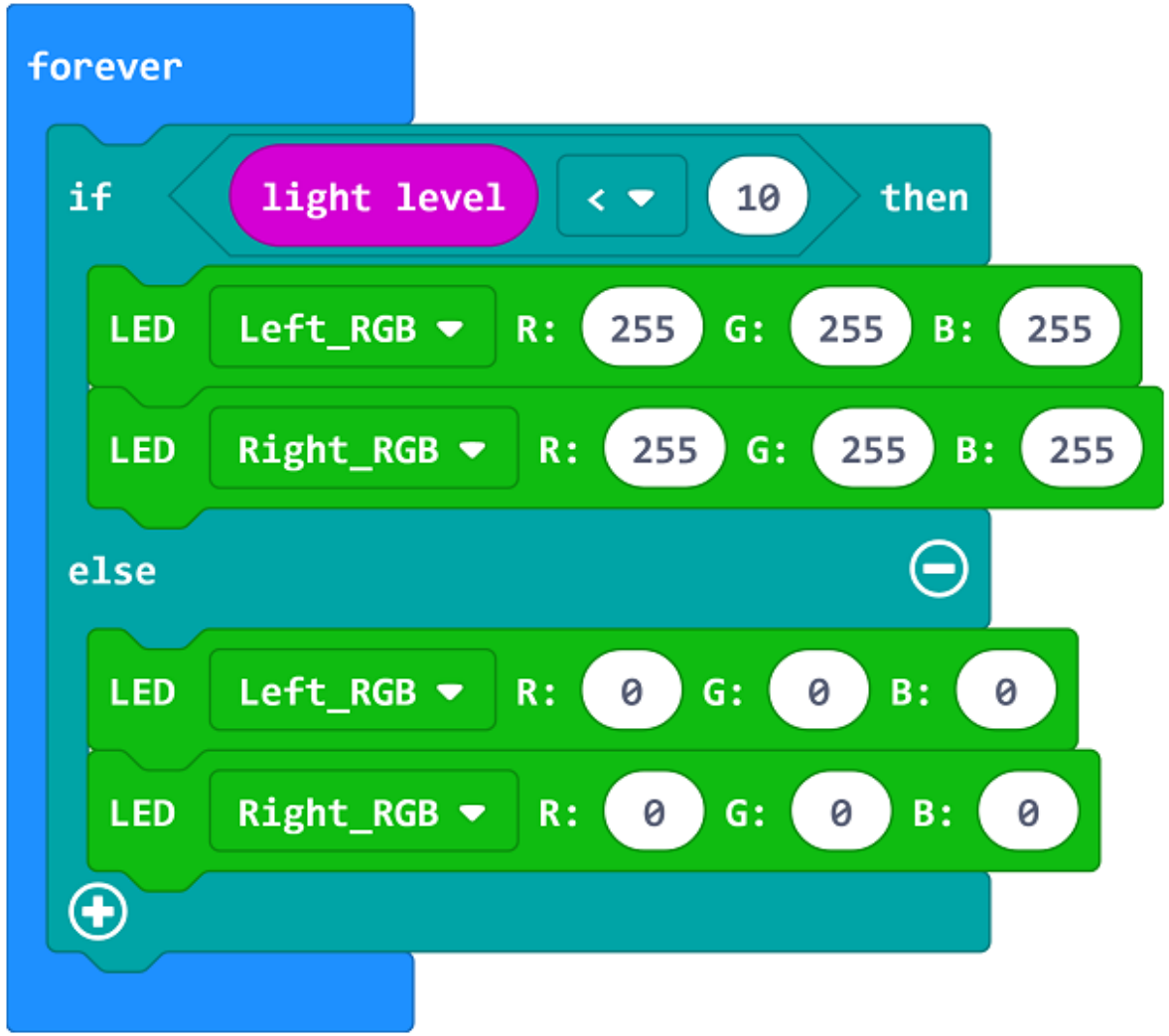
- How can we detect darkness?

- How can we tell the CuteBot to turn on its lights only when it is dark?
- Try writing a code yourself. (Solution on next slide)



discover coding

Automatic Headlights

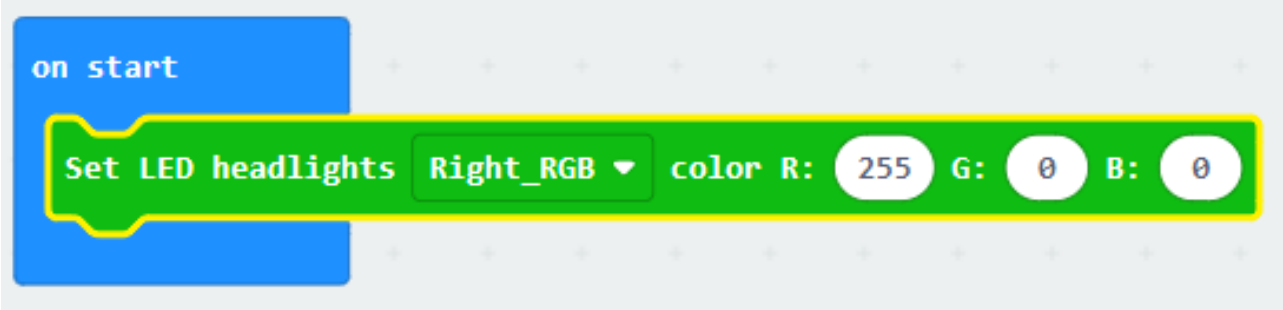


- Why forever loop?
- What happens if we change the value in the **"light level < 10"** statement?
- What does R:255, G:255, B:255 mean?
- What does R:0, G:0, B:0 mean?

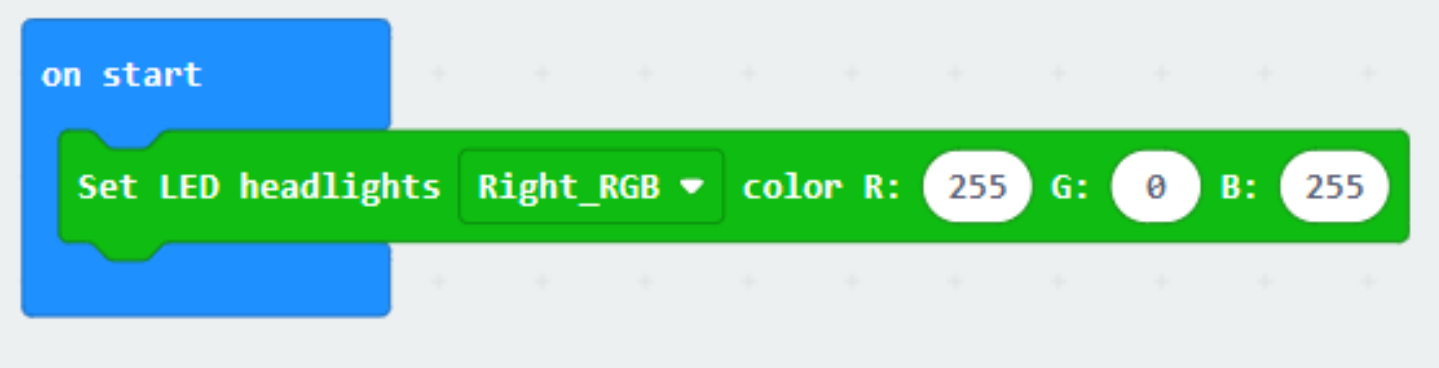
discover coding

Changing the values for RGB

- How can we make different colors?
- What color is this?



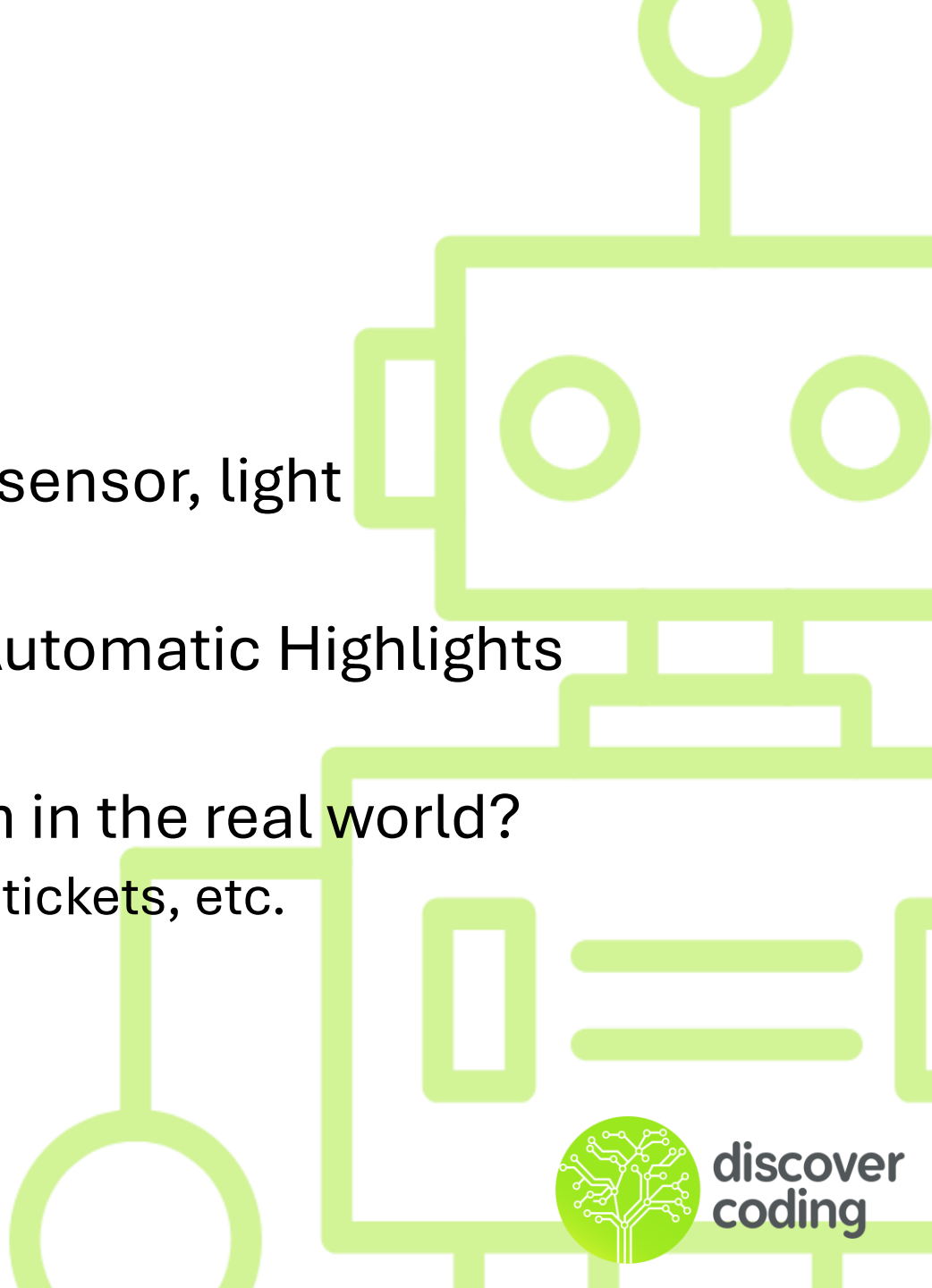
- What color is this?



discover coding

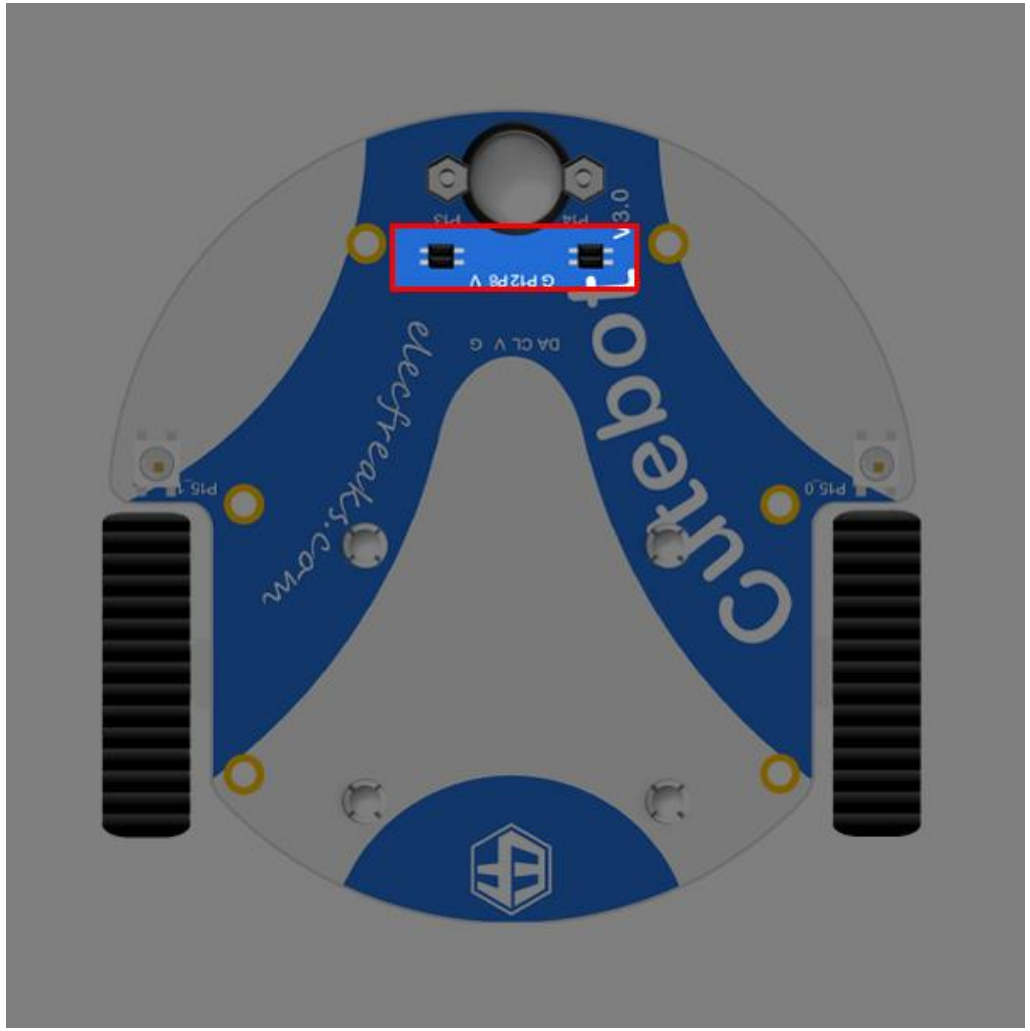
Sensors

- Sensors "measure the environment"
- Different kinds of sensors: temperature sensor, light sensor, speed sensor, etc.
- What type of sensing did we use in the Automatic Highlights exercise?
- What kind of sensors do we interact with in the real world?
  - Ex: thermometer, photo-radar for speeding tickets, etc.



discover coding

CuteBot Sensors



- The CuteBot has two line-tracking probes connecting to P13&P14 on the Micro:Bit
- These are used to detect the black line and its edges.
- Why might we want to detect black lines/edges?

discover coding

Challenge: Run Along the Black Line

- Goal: program our CuteBots to drive along a **smooth** black line
  - The CuteBot may not be able to detect sudden sharp turns
- There are four statuses for the line tracking sensors:

○● left probe doesn't detect black line, while the right probe does.

●○ left probe detects black line, while right probe does not

●● both probes detect the black line

○○ neither probe detects the black line

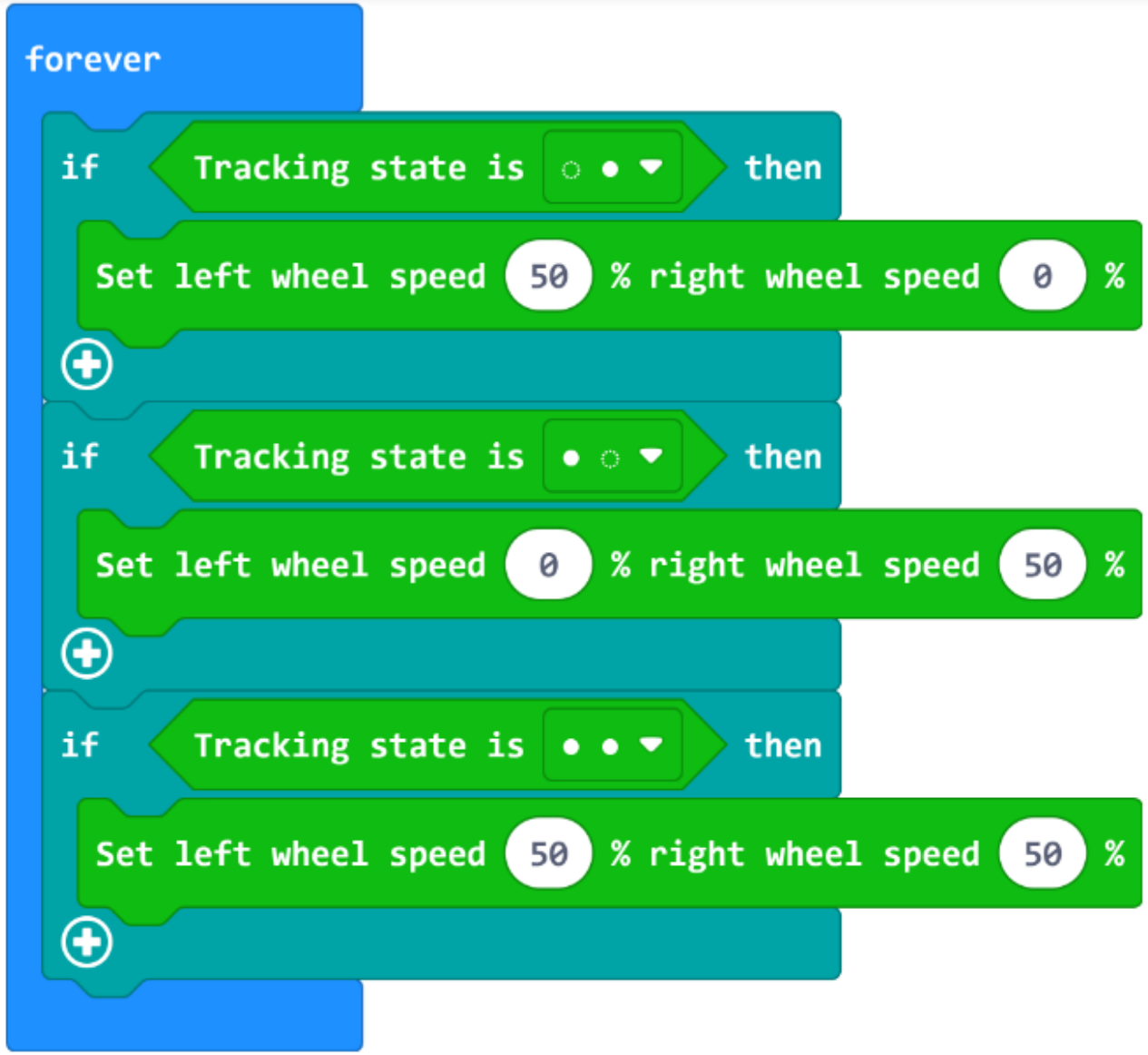
- REMIX: experiment with the code. Try running your code on different tracks.

discover coding

Challenge: Run Along the Black Line

- For this challenge we consider 3 situations: ○●, ●○, and ●●
- We will use 3 if statements!
- If ○● (only right probe detects black line), what should we do?
  - Line is slightly to the right of robot
- If ●○ (only left probe detects black line), what should we do?
  - Line is slightly to the left of robot
- If ●● (both probes currently detect black line), what should we do?
  - Robot is currently on the line

Challenge: Run Along the Black Line



Line is to the right, so we turn right

Line is to the left, so we turn left

Continue straight

discover coding

Challenge 1: Count Down and Go

- Have your CuteBot change its LED lights from red to yellow to green, and then have it follow the black line.
- Change lights back to red once it is finished moving
- Add sound effects for start and stop

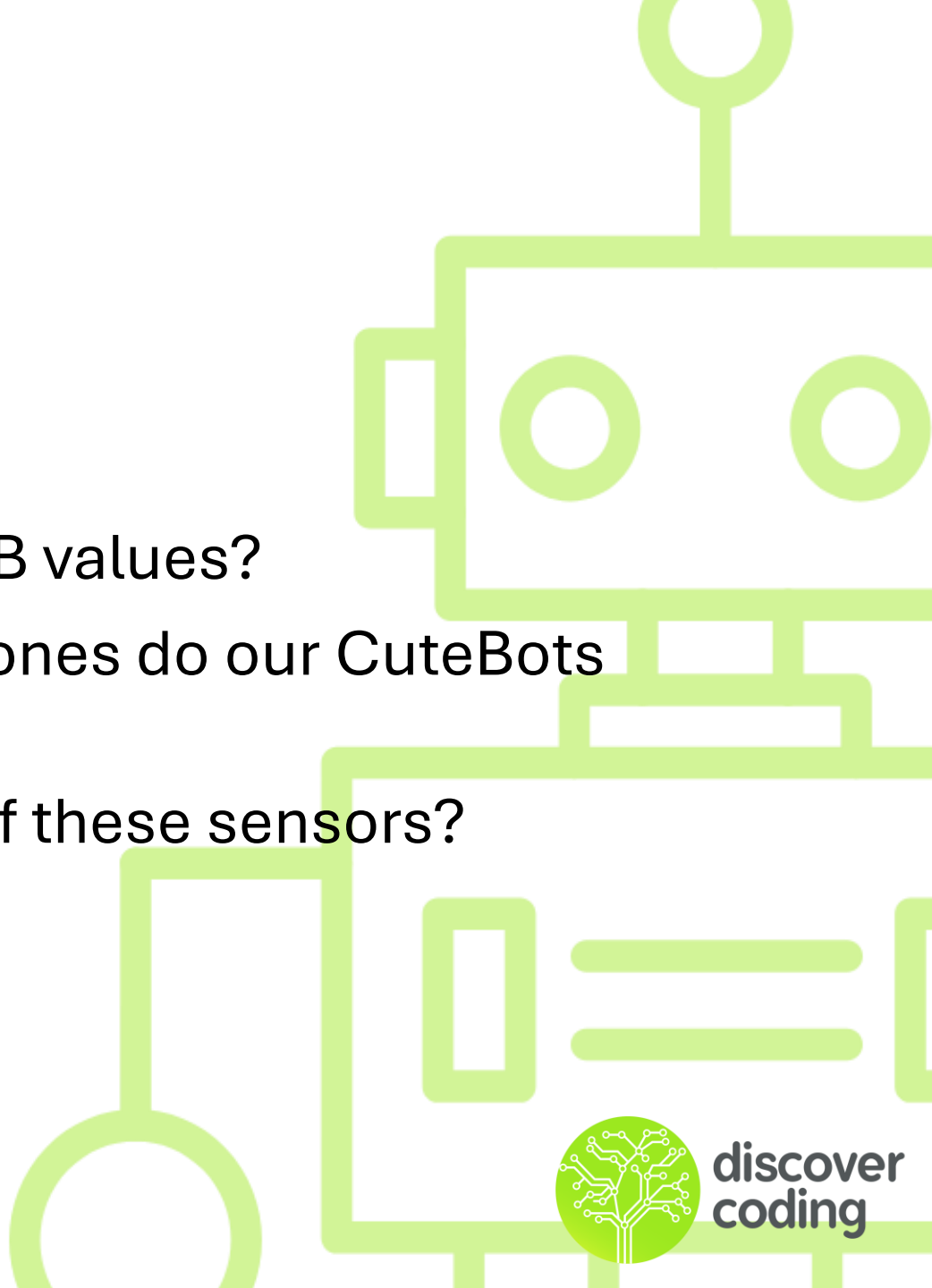
discover coding

Challenge2: Stop and Start

- While the lights are on, have your CuteBot follow the black line
- When the room lights turn off, your CuteBot should turn on its headlights (use your favorite color) and wait
- Once the room lights are turned back on, your CuteBot should turn off it's headlights and continue following the black line

Q&A

- What does RGB stand for?
- What does LED stand for?
- How can we get the color yellow with RGB values?
- What kinds of sensors are there? Which ones do our CuteBots have?
- What are some real-world applications of these sensors?



discover coding