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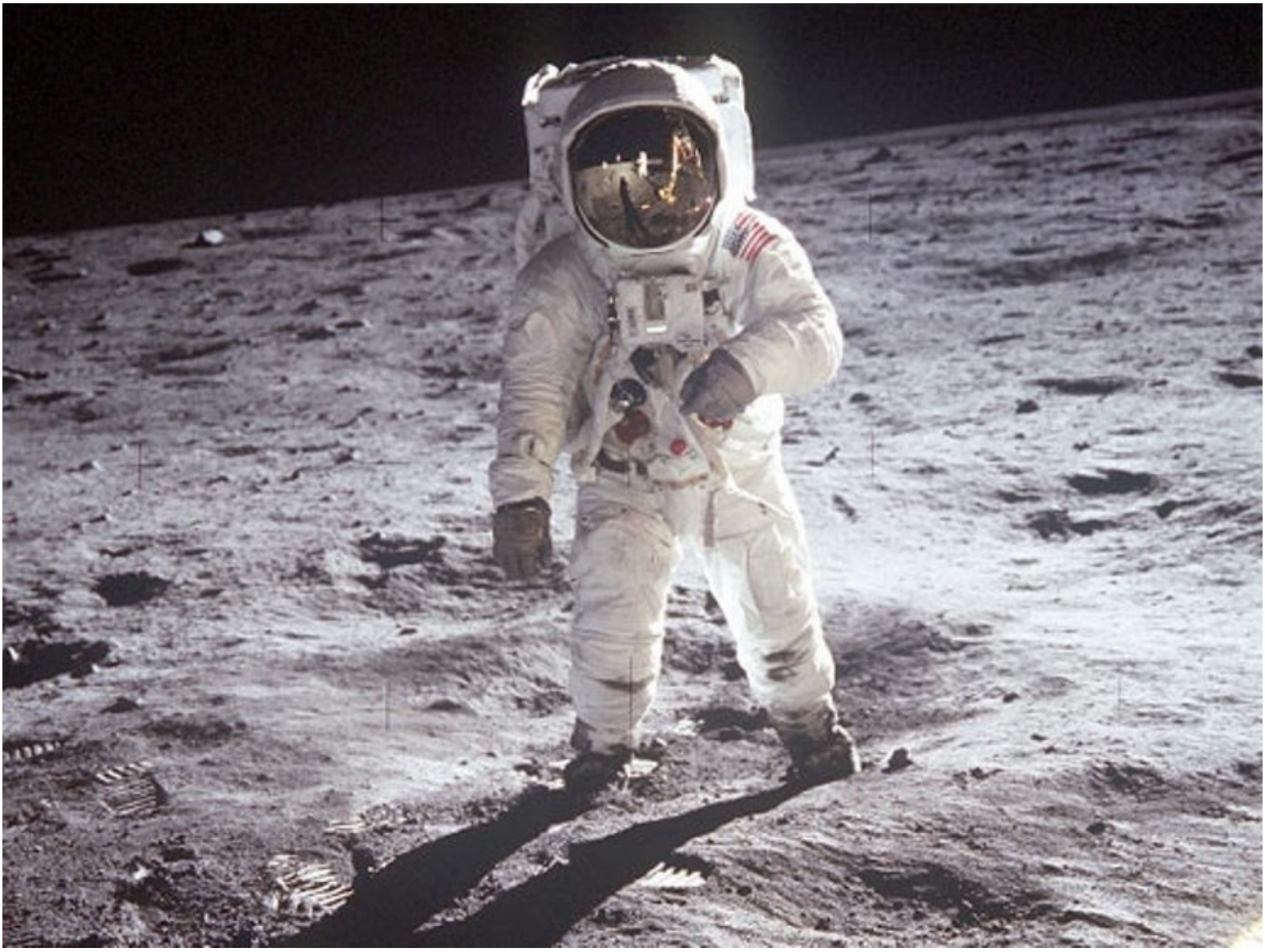
# A - Save the Astronaut!

You are the chief programmer for a mission to Mars that has crash landed, and one of your crew is stranded on the other side of the planet!

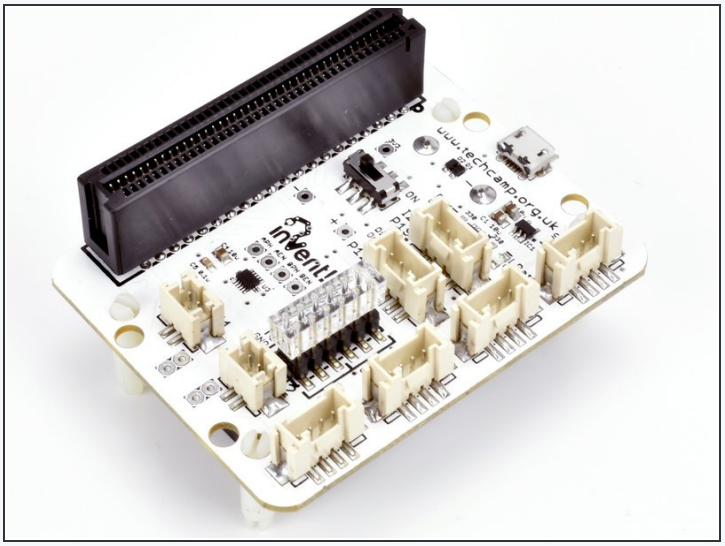


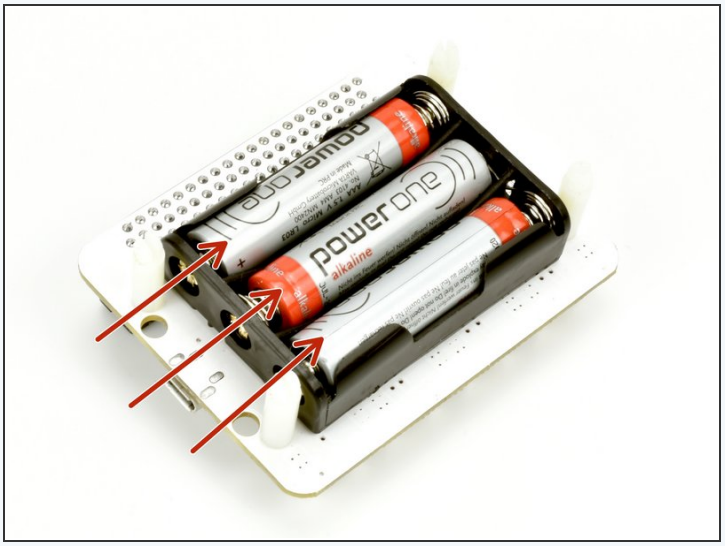
# INTRODUCTION

You are the chief programmer for a mission to Mars that has crash landed, and one of your crew is stranded on the other side of the planet! Let's learn how to make our robot move so we can save them.

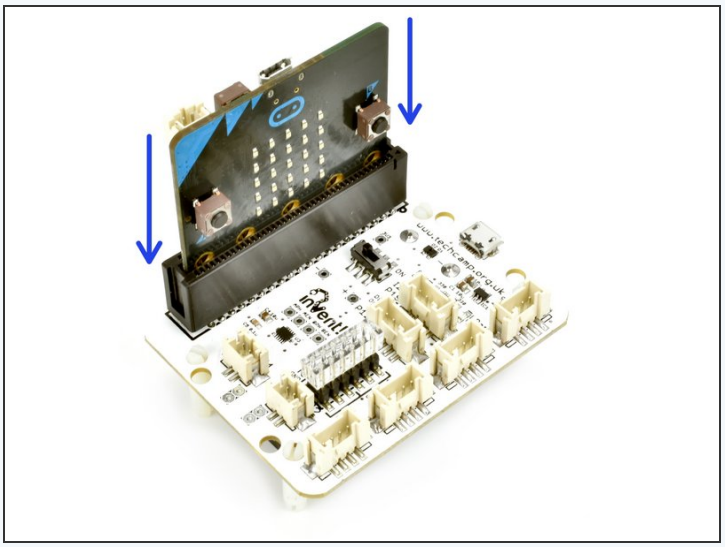
Step 1

## The Main Board




- Let's assemble our robot so we can get started.
- We need to assemble the **main board** first - this is the **brain** of the robot, and controls everything it does!
- So we can use it without the cable plugged in, turn the board over and **insert the batteries.** Make sure they are the right way around.
- Next, **plug in the micro:bit** to the long black connector - make sure it is the same way round as the picture, with the LEDs and buttons facing **forwards.**

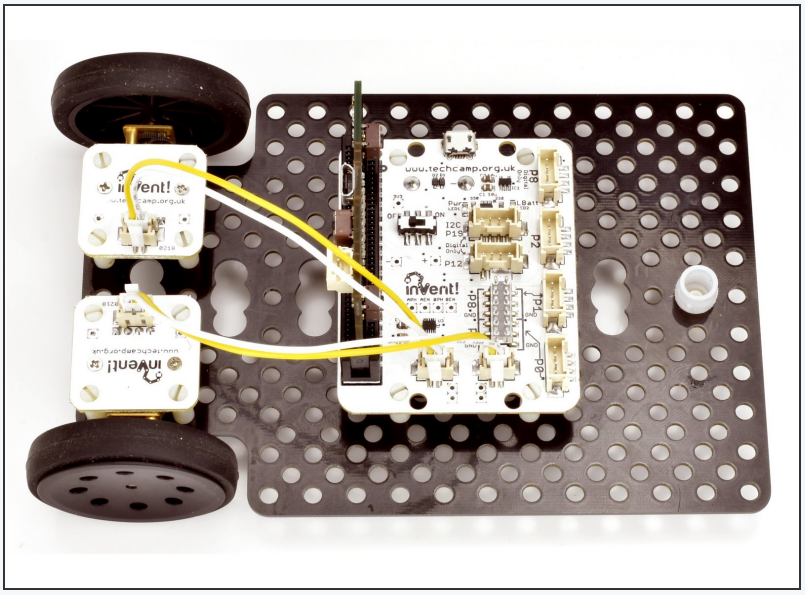


Step 2

## Assemble your robot

- Next, plug the main board and motors into the baseboard, just like the picture.
- Use the two **yellow**/**white** cables to connect the two motors to the main board.

⚠ Make sure you plug the **left** motor into the **left** socket **(M1)** and the **right** motor into **M2**!

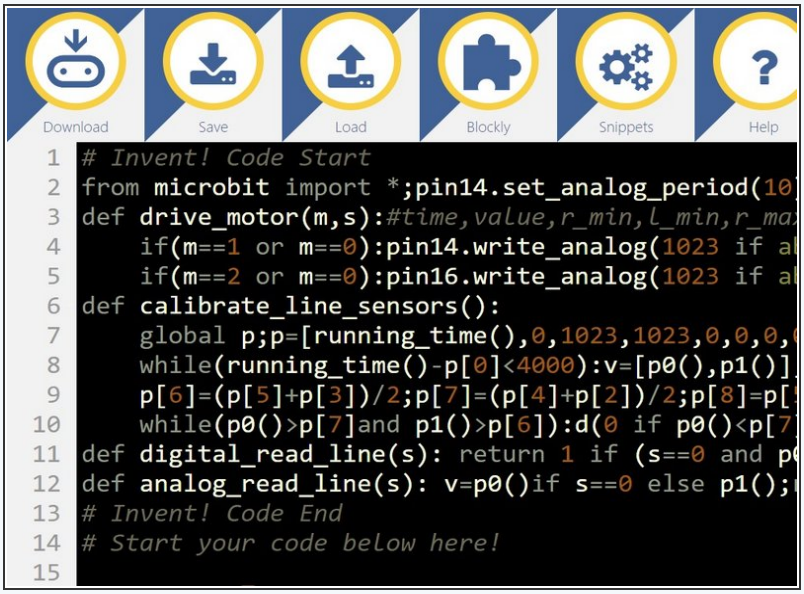


Step 3

## Open the Editor

- Open the editor which you downloaded in the **Getting Started** section - you can download it again here (https://drive.google.com/open?id=1hzofVGb9QVIYNQk_N9QCzvCXswRNr0iI) if you need to.
- **Paste the Invent! starter code** into the top of the program - again, you can get it here (https://drive.google.com/file/d/1VgLKH6Qhb47pchbd6QYZijylrgz9yUmo/view?usp=sharing) if you need to.
- **Plug in** your robot with the USB cable.
- Make sure your editor looks like the picture, and we are ready to **start programming.**

⚠ Don't forget - make sure you have this code in **every program you make**, otherwise the motors (and some other modules we get to later) won't work properly.

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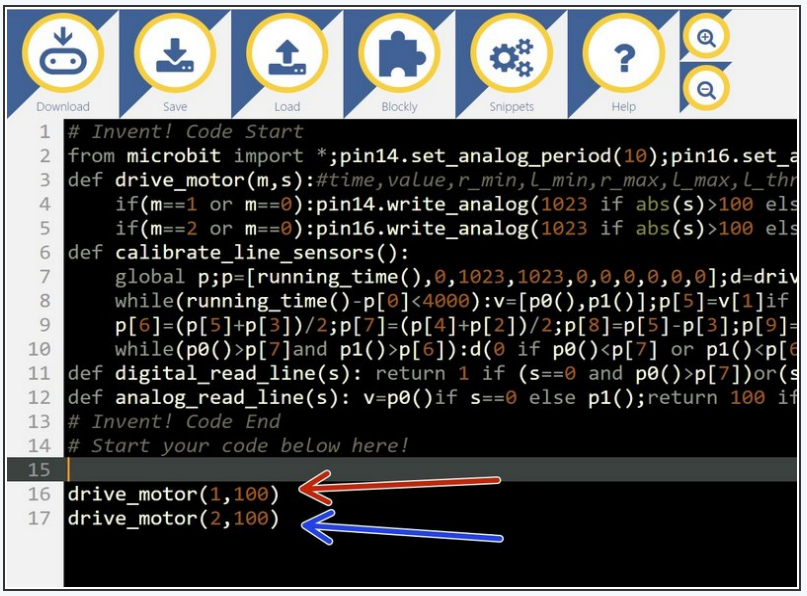
Step 4

## Driving Forwards

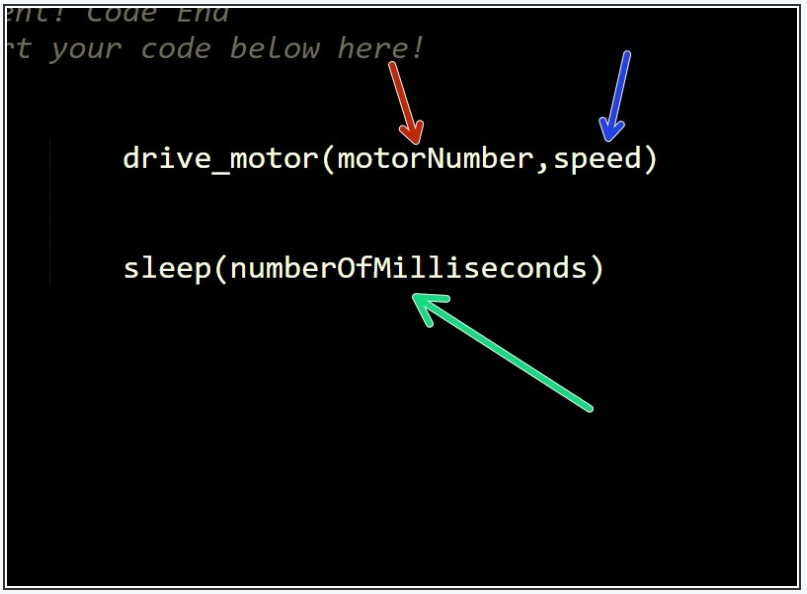
- Now we're all setup, let's make a simple program so the robot drives **forwards.**
- After the **Invent! code** , add the following two lines into your program:
  - drive_motor(1,100)
  - drive_motor(2,100)
- **Can you guess** what the robot will do? **Upload** the code and find out!




Step 5

## How does it work?

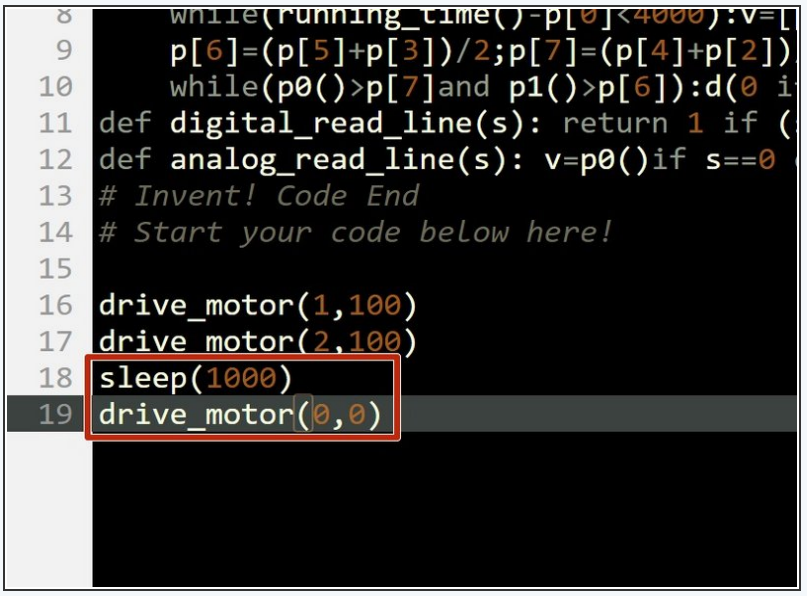
- If you guessed drive forwards - you are correct! Let's have a detailed look at the **drive_motor** line and how it works:
- drive_motor is a **function** (this just means that it does something), which takes 2 **inputs**:
  - The motor to drive - this can be **1** (left motor, M1), **2** (right motor, M2) or **0** (both motors)
  - What speed to drive it at - this can be any number from **-100** (full speed backwards) to **100** (full speed forwards)
- We're also going to be using another function - **sleep**. This function just **waits** for however long you want it to.
- The sleep function takes just **1 input**: how many **milliseconds** to sleep for. In programming, time is usually measured in milliseconds. **There are 1000 milliseconds in 1 second.**



Step 6

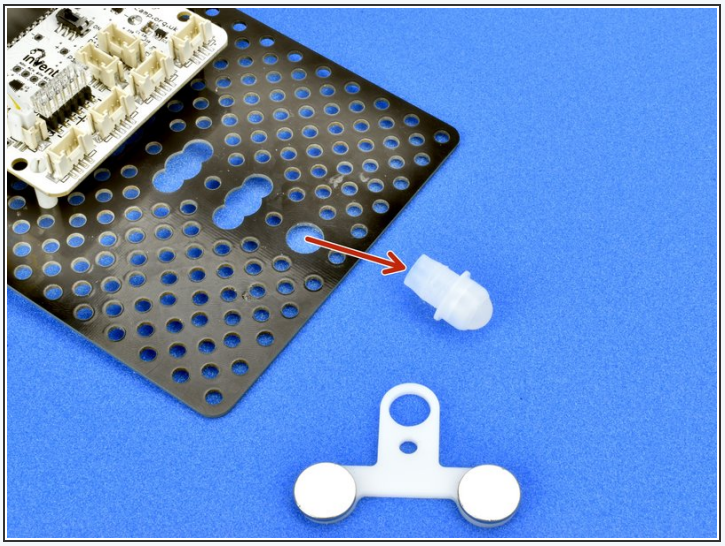
## Stopping

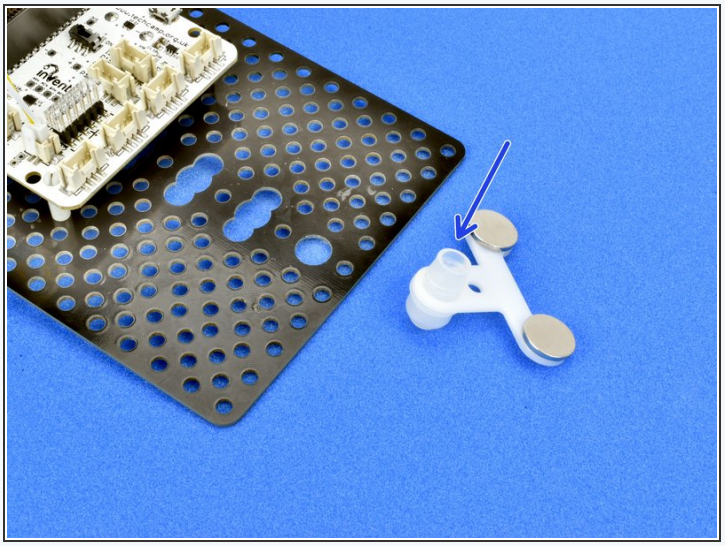
- Let's change the code so the robot doesn't drive **forever.**
- Change your program so it looks like the picture - now we are using both the **drive_motor** and the **sleep** functions.
- Can you **guess** what they might do?
  - **sleep(1000)** just makes the robot wait for 1 second (don't forget - there are **1000** milliseconds in 1 second
  - The final **drive_motor** line should make the motors
- **Upload and test** the program - your robot should drive forwards and then stop!

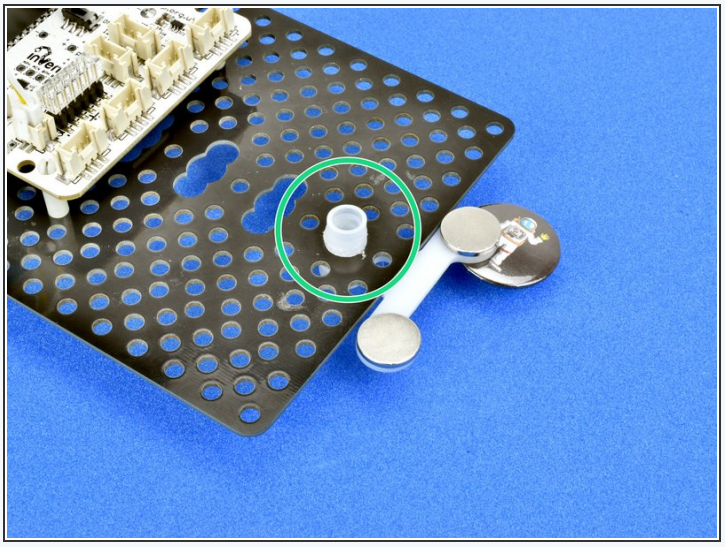


Step 7

## Magnets







- To save the astronaut, we need to attach the **magnet module** to the robot so we can pickup the magnetic astronaut.
- Remove the white **trackball** from the front of the robot - if you have a brand new kit it might be quite hard to get out, so ask your teacher for help if it is too difficult.
- Slot the **magnet module** over the top of the trackball, with the magnets facing **upwards** like in the picture.
- Finally **put the trackball back into the robot** like the picture. You should now be able to pickup an astronaut!

## Step 8

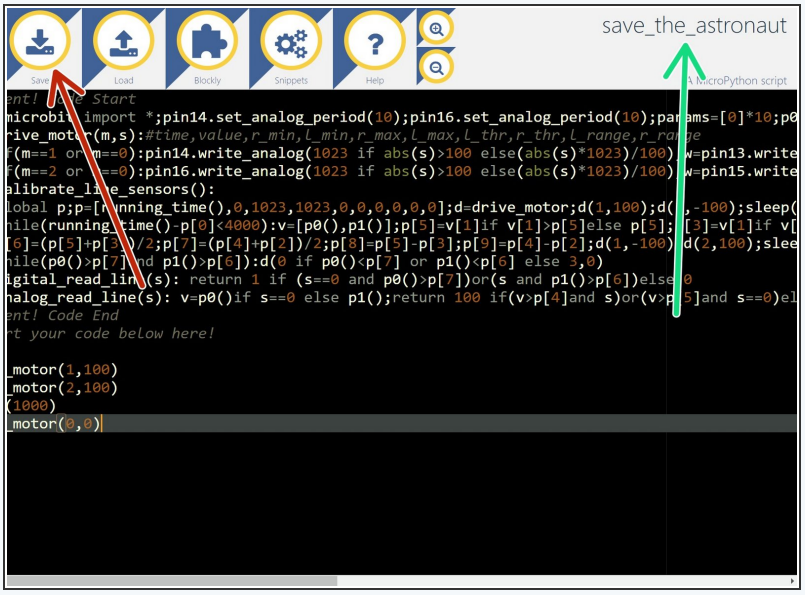
# Rescue the Astronaut!


- Now you can make your robot drive and stop, and have some magnets, you need to save the stranded astronaut.
- Write a program to make your robot **drive forwards** across the planet and **pick up the astronaut**. You will need to **change the sleep time** so it drives forwards the right amount!

## Step 9

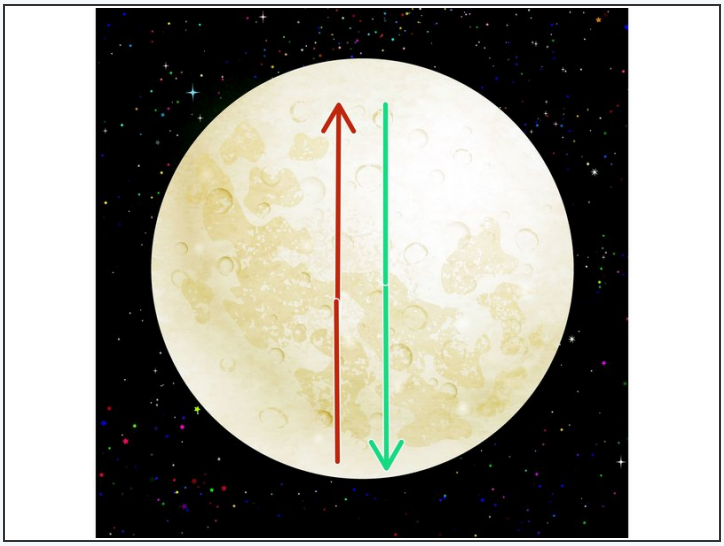
# Save Your Work

- After each challenge, make sure to **save your work** - you might need it later!
- Try to give your programs **descriptive names** so you know what they do.



Step 10

## Bring them Back

- For this **extension challenge**, add some more lines of code to make your robot:
  - Drive forwards
  - Pickup the astronaut
  - Reverse back again

See if you can work out how to change the numbers in the **drive_motor** lines to make the robot reverse - make some changes and **try it out!**