

A - Automatic Patrols

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INTRODUCTION

We need to patrol the planet to keep it safe, but don't have time to do it ourselves. Learn how to get your robot to steer itself automatically!

Step 1

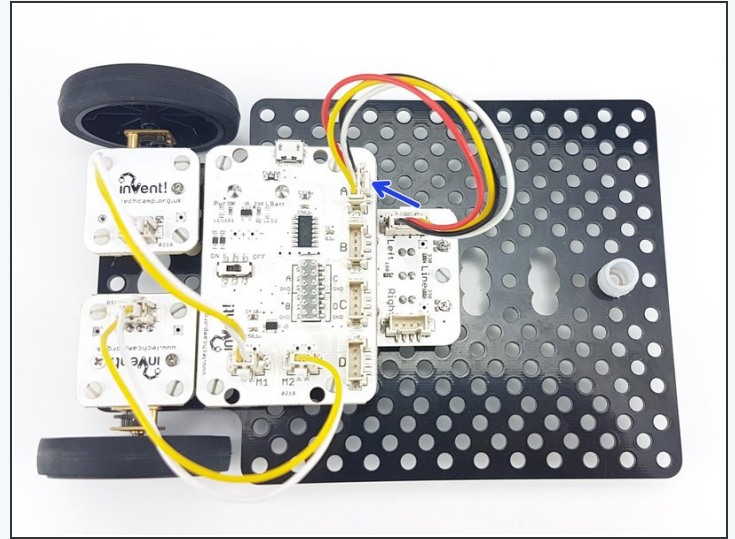
Autonomous Robots

- Autonomous robots are **very important** in advanced factories!
- Watch the video to see some of **Amazon's** autonomous transport robots moving products around the warehouse.
- **Think how many people** would be required to do the job of the robots!



Step 2

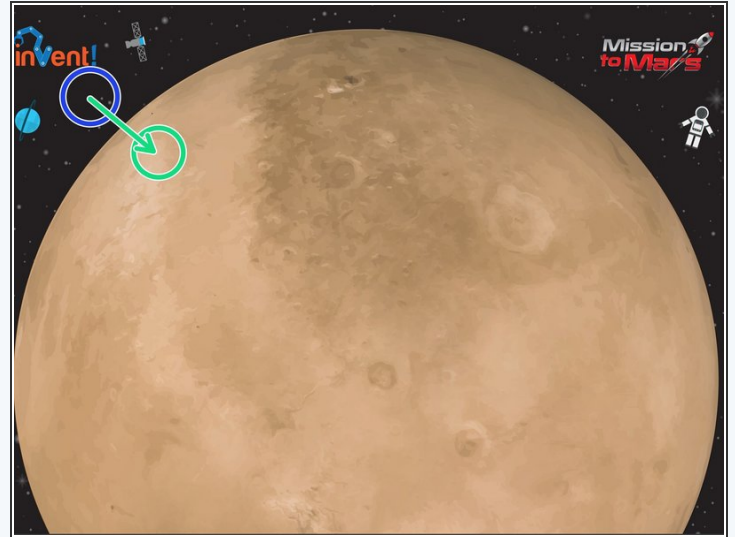
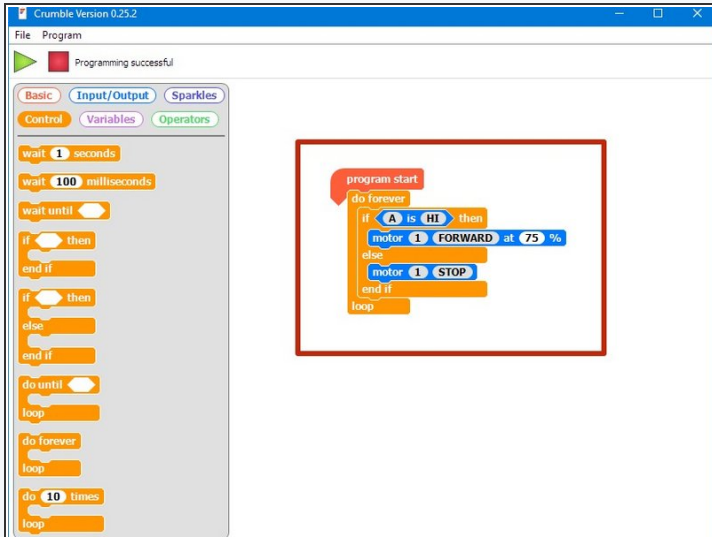
Assemble your robot!



- We're going to make our own autonomous robot to **patrol the outside of the planet.**
- **Assemble** your robot like the picture!
- You will need the **line sensor module** for this lesson. For best results, mount your line sensor underneath your junior main board as shown
- Just connect the **left sensor** to **A** for now.

Step 3

Test the line sensor

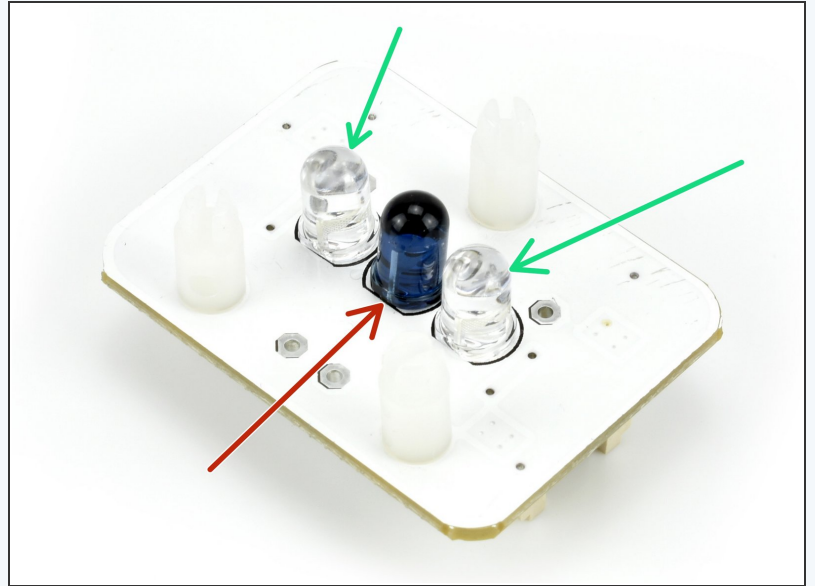


- How does the line sensor work? Let's write a **test program** to find out.
- **Build** the test program in the picture. Can you **guess** what it will do?
- **Program** your robot and place it on the activity mat, **outside the planet** - the motor should be **off**.
- Then, try moving it **onto** the planet - the **motor should start turning!**

Step 4

How does it work?

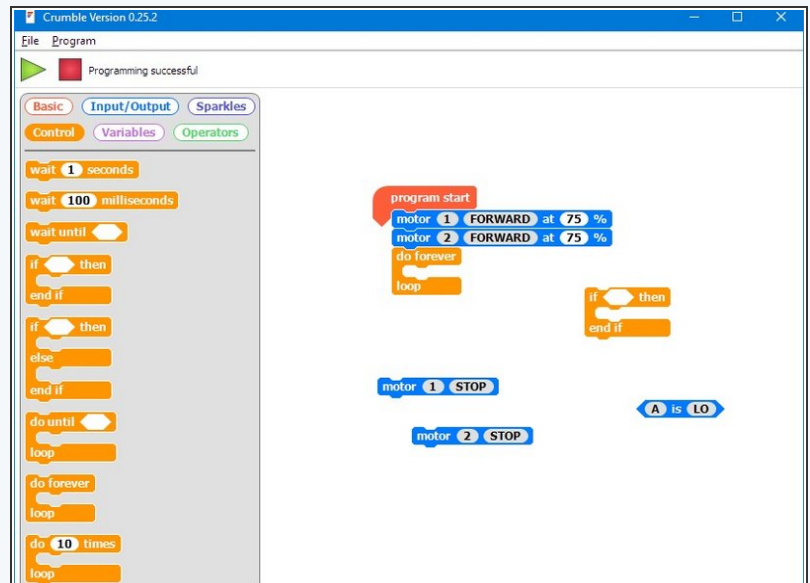
- Turn the robot over and look at the **bottom** of the line sensor. You should see **3 LEDs**.
- The centre LED is an **infrared emitter** - just like on your TV remote control! It shines infrared light downwards **all the time**.
- The two outer LEDs are **infrared receivers** - they can **sense infrared light**.
- When the robot is on a **black surface**, infrared light is **not reflected** and so the receivers give a **LO** signal.
- On a **white surface**, the light is **reflected** and so the receivers give a **HI** signal.
- Using the signal from the sensors (HI or LO), we can **detect what colour surface to robot is on!**



Step 5

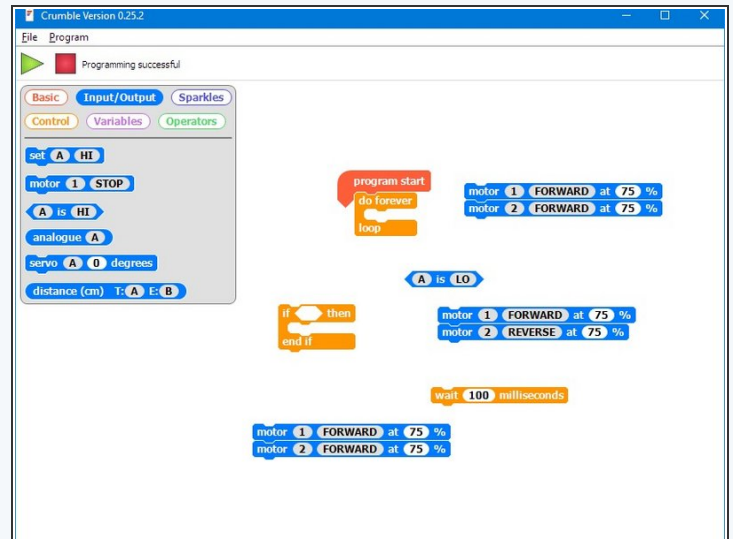
Don't drive off the planet!

- Let's use the line sensor to stop the robot from **driving off** the planet.
- Don't forget - the sensor is **HI** on **white** backgrounds, and **LO** on **black** backgrounds.
- Put the code blocks in the picture into a program that makes the robot:
 - Drive **forward**
 - **Stop** IF it drives off the planet (when the background is **black**)



Patrolling the Planet

Challenge!



- Now we have everything we need to drive around the edge of the planet **automatically**!
- To do this, your program needs to:
 - Drive **forwards**
 - **Check** the sensor
 - If the sensor is **LO**, we are about to drive off the planet! **Turn slightly** towards the **middle of the planet** and then go **forwards** again.
- Your robot should drive around the edge of the planet, without getting lost. There is a **hint** of the blocks you need in the picture if you need help!
- Try and make your robot drive around the planet as **smoothly** as you can.

Step 7

Orbiting the Planet

- Currently, the robot tries to **stay** on the white and **avoid** the black.
- Can you change the code so the robot **orbits** the planet by staying on the black, and turning **away** from the white?
- Hint: instead of normally going forwards, you will need to **normally be turning towards the centre of the planet**.

