SIEMENS
Ingenuity for life

STUDENT ACTIVITY SHEETS

INTRODUCTION

Self-driving vehicles driven using code are on the horizon. In the future, cars and vehicles will have more in common with programmable robots and drivers will be more like passengers. Using your micro:bit programming skills, help drive our prototype robo-vehicles around Auto City, our testing environment.

CAN YOU PROGRAMME A SIEMENS ROBO BUGGY?

In the following classroom tasks you will be programming a three-wheeled micro:bit buggy to travel autonomously around the map of Auto City (on page 2). Each buggy is steered using the left and right motors, with the front wheel turning on a pivot (see the diagram below). You may have used similar robots in Design & Technology or Computing lessons at your school.

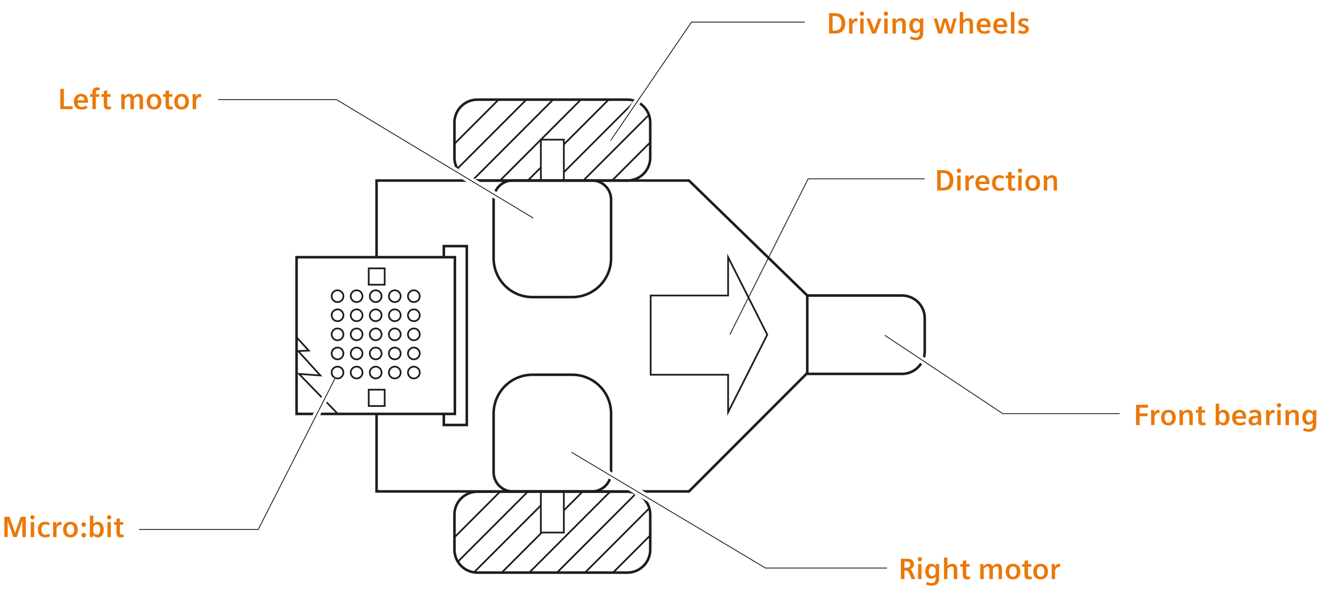

Diagram 1: Siemens Robo Buggy

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STEERING TIPS

Steering on these buggies is different to the cars you may be familiar with. These hints will help you to code your Siemens Robo Buggy (summarised in Table 1).

- To drive forward, both motors must be set to forward.
- To turn left, the right motor should be set forward and the left motor should be off or in reverse.
- To turn right, the left motor should be set forward and the right motor should be off or in reverse.
- The buggy can also be driven in reverse.

STEERING TIPS - TABLE 1

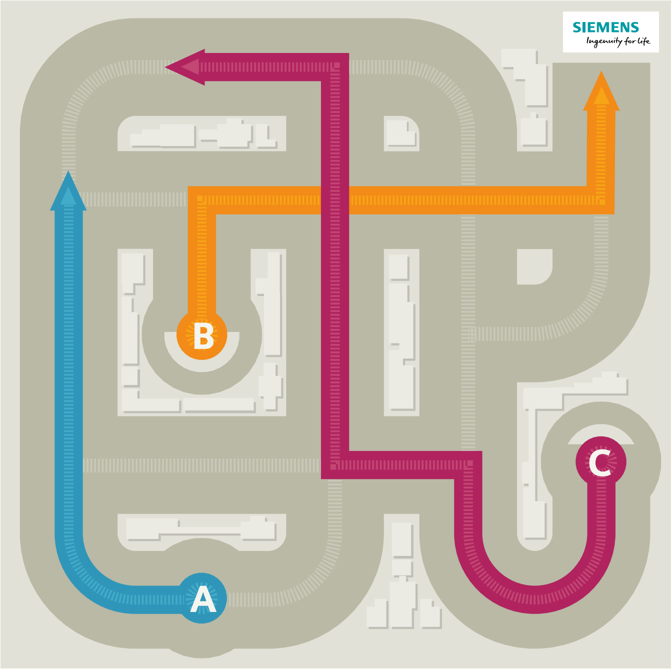
Direction of Siemens Robo Buggy travel	Left Motor	Right Motor
Forward	Forward	Forward
Left	Off or Reverse	Forward
Right	Forward	Off or Reverse
Reverse	Reverse	Reverse

USING YOUR OWN BUGGIES

You are welcome to use your own buggies throughout this activity, however due to the differences in motors, wheel sizes and power, you will have to adjust the motor speed of '310' that we have used in the codes supplied. Ask your teacher for the correct speed for your robot buggy, or use trial and error on route A to find this out for yourself!

AUTO CITY - A TESTING ROAD MAP

This is our testing environment for Siemen's Robo Buggies. Each street is the width of one buggy. Use this map to help you write code for the following activities, following routes A, B and C. A full sized printable version is available from Siemens Education (www.siemens.co.uk/education) for use with your own buggies. You may need to adjust the motor speeds for your own buggies, and similar codes could be created in programming environments like Crumble.



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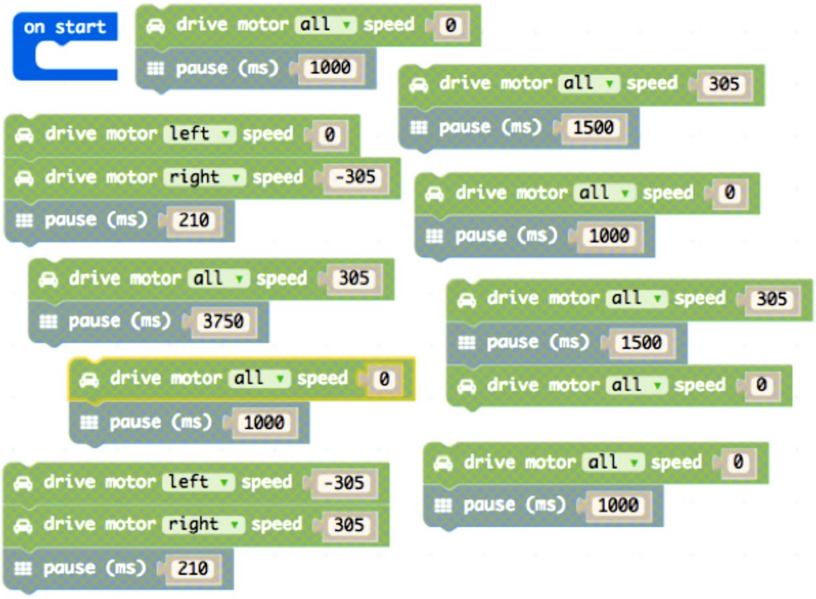
SIEMENS DRIVERLESS CAR CHALLENGE: ROUTE B

Creating new systems is an iterative design process: this means that the overall product is created over many stages of testing, evaluation and development. Advanced driver assistance systems (ADAS) already exist, and can be seen as the first stage towards driverless technology. These include GPS, anti-lock breaking systems and other information and sensing systems including radar.

STUDENT ACTIVITY 1: ROUTE B

Using the micro:bit block editor (https://makecode.microbit.org/), copy and complete the code below to navigate a Siemens Robo Buggy along Route B, as laid out on the Auto City map (on page 2).

If you have your own buggy, test the code on your print out of the Auto City map. You will have to adjust the speed of the motors for your own buggy.



```
on start

drive motor all speed 0
pause (ms) 1000

drive motor all speed 305
pause (ms) 1500

drive motor left speed 0
drive motor right speed -305
pause (ms) 210

drive motor all speed 0
pause (ms) 1000

drive motor all speed 305
pause (ms) 3750

drive motor all speed 305
pause (ms) 1500
drive motor all speed 0

drive motor all speed 0
pause (ms) 1000

drive motor all speed 0
pause (ms) 1000

drive motor left speed -305
drive motor right speed 305
pause (ms) 210
```

ACTIVITY 2: QUESTIONS

Answer the following in full sentences

a) What is ADAS technology?

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b) Look at the examples of ADAS technology below. Fill in the table to explain what each one is and how it makes driving safer. Use your research skills to find the following definitions.

ADAS System	How it makes driving safer
GPS Navigation	
Parking Sensor	
Rain Sensor	
Automatic braking	