The DIY automobile project (Level 1)

Worksheet for students

Team:………………………………

Aim: Creation of a DIY automobile that moves forwards, backwards, left and/or right

Can you describe what an automobile is? Search for information online and write your answers below.

Can you think of some scenarios and implementations where an automobile might be necessary? Discuss with your team and document your thoughts below.

Review several scenarios and choose one to demonstrate. Sketch your automobile and list the main components that consist an automobile, as well as the crafting material that you may need.

Area for sketches

List of components:

List of materials:

Time for crafting! Start working on the construction and the design of the automobile using the available electronic components and crafting materials. Think of different designs/patterns for the chassis, as well as of different arrays of the electronic components on it, that can serve the purpose of this activity (i.e. a robust structure that is able to move). You can draw inspiration by the diagrams presented below (*Figure 1*). Think also of alternative solutions as far as power supply is concerned (i.e. batteries, solar banks etc.) Bear in mind that your model will be revised
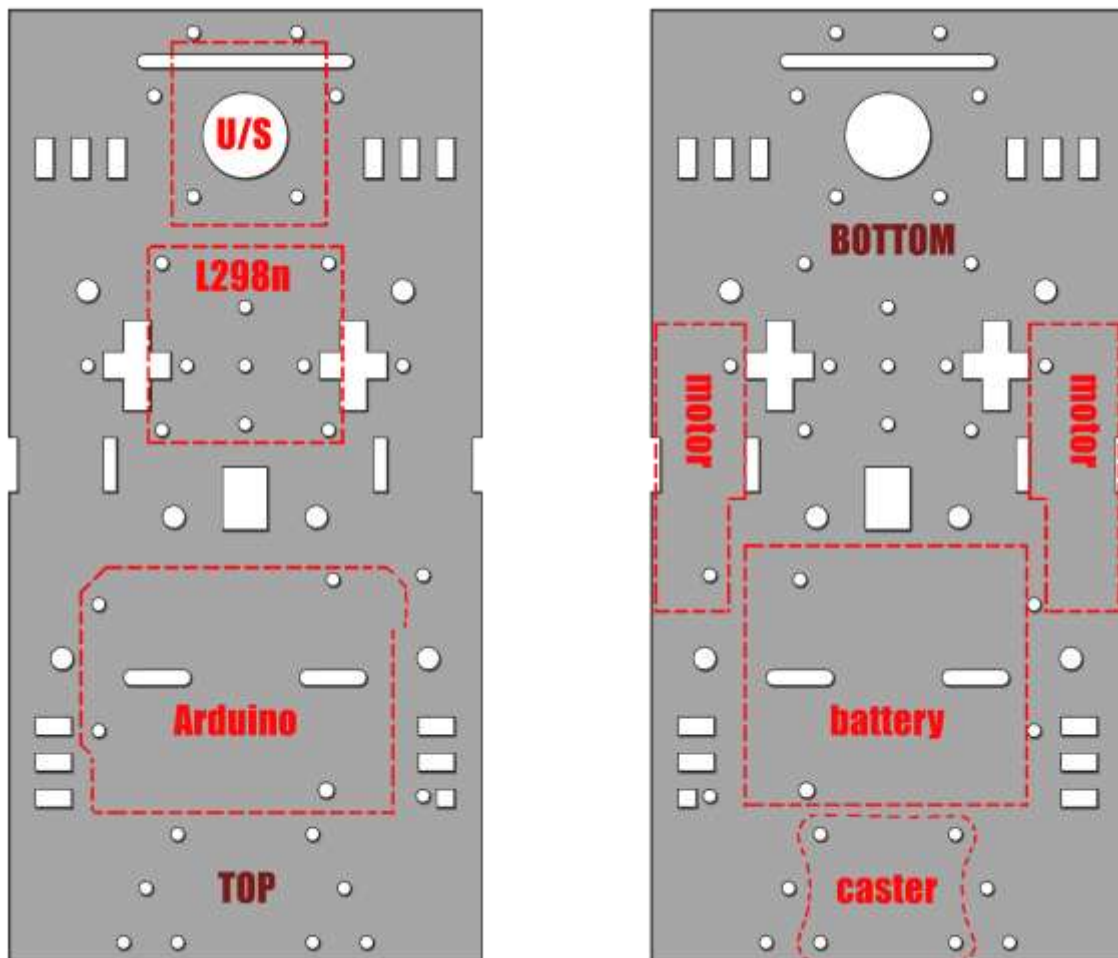

Figure 1: Indicative pattern for the chassis with marked places for each electronical component

Time for circuit making!

The image below depicts an already connected driver for DC motors to Arduino Sensor Shield, as well as one of the DC motors to the driver.

How will you connect the second DC motor to the driver? Try to draw/finalize the circuit and test it to your physical model.
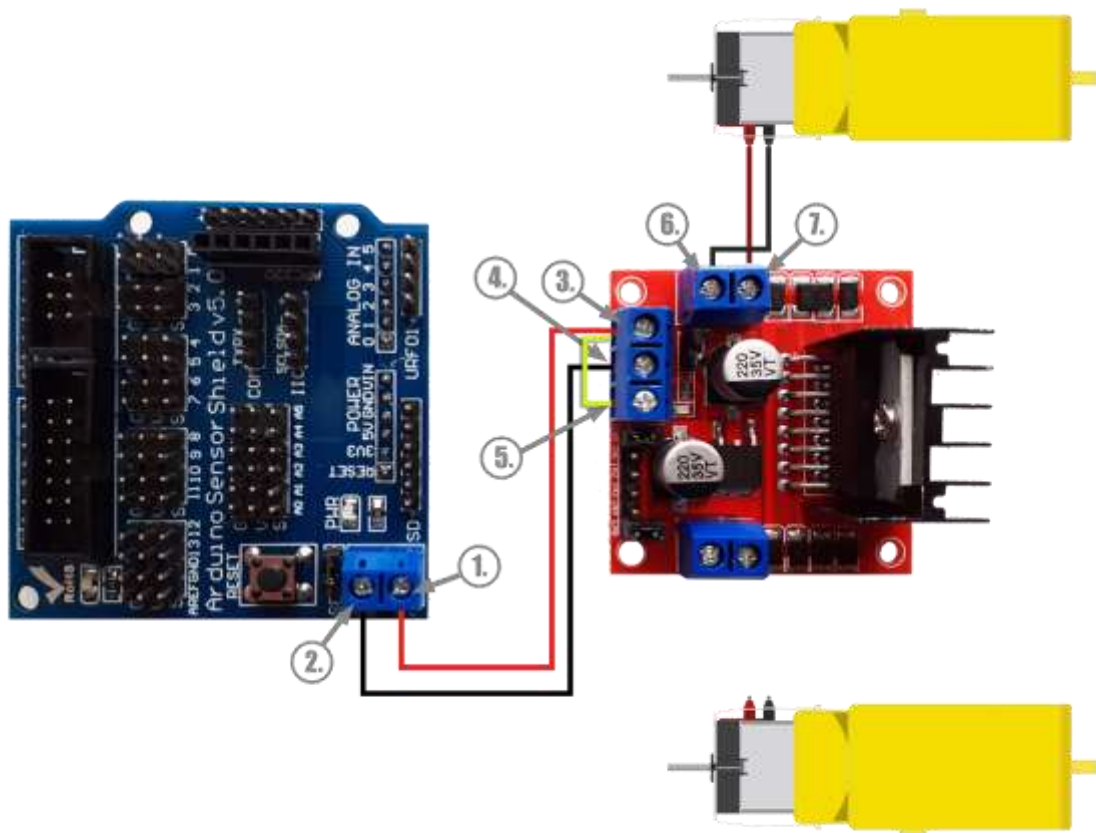
Do you think that reversing port's connectivity is of significant importance? Why or why not? *Please write your answer below:*

The image below depicts a half-baked solution for connecting the En and IN ports of the driver to the Arduino Sensor Shield.

Try to draw/finalize the circuit by connecting the colored pins to the rest of driver's port and test it to your physical model.
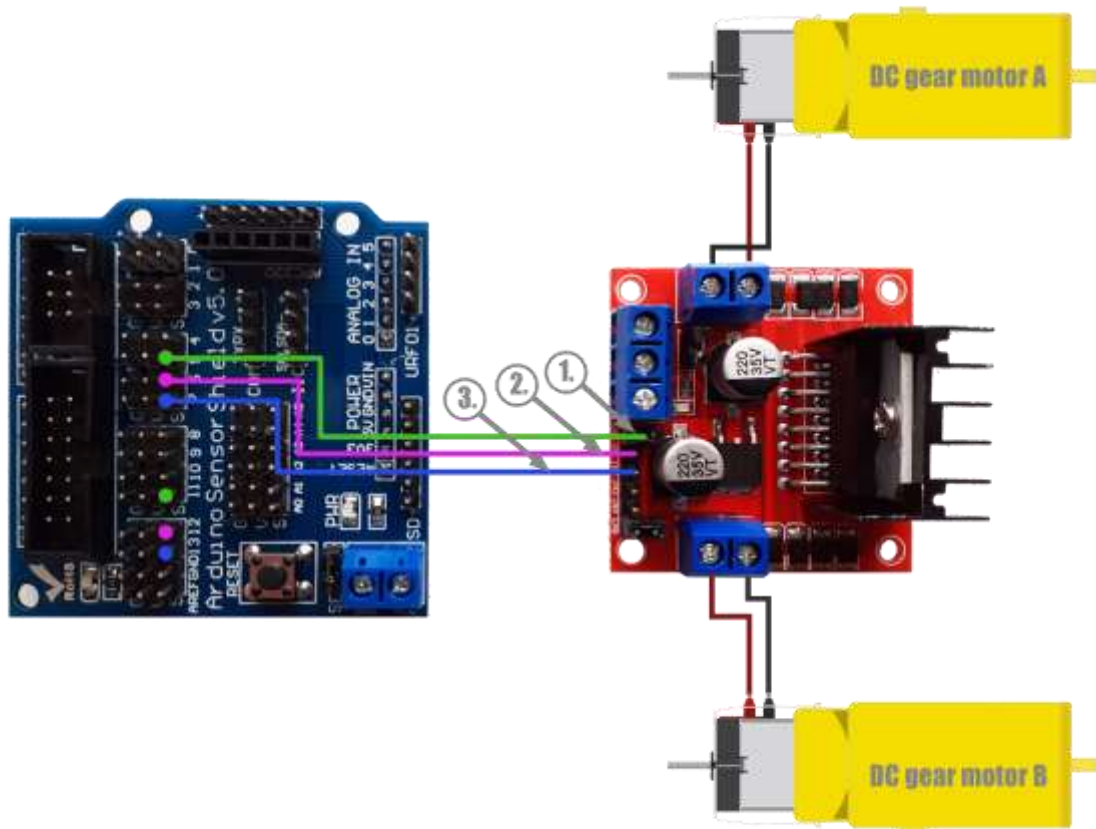
Do you think that using PWM pins is of significant importance? Why or why not? *Please write your answer below:*

Time for programming!

Open mBlock and connect your Arduino.

A script in mBlock software (and in most of the block-based programming environments) is assembled by dragging blocks from a palette of commands, and dropping them into the scripting area.

The following scripts (see below) are semi-structured. Find the blocks and place them in the correct order into the scripting area, in order to create three new procedures that will enable the left wheel of your automobile to move forwards, backwards, and/or stop any movement.

Note: You can create a new procedure through **my block** palette, by clicking on "Make a Block" tab.

define Left_Motor_Forward	∞ set PWM 5 output as 200	∞ set PWM 5 output as 200
define Left_Motor_Backward	∞ set digital pin 6 output as high ▾	∞ set digital pin 6 output as low ▾
define Left_Motor_OFF	∞ set digital pin 7 output as low ▾	∞ set digital pin 7 output as high ▾
∞ set digital pin 6 output as low ▾	∞ set digital pin 7 output as low ▾	∞ set PWM 5 output as 200

Try to create similar procedures for the right wheel of your automobile. Which pins will you use? Which should be set as high and which as low? *Please write your answer below:*

Defining both Motors' functionality

Let's move to the main goal of the present level.

The following script is semi-structured. Find the blocks and place them in the correct order into the scripting area, in order to repeatedly make the automobile move forward for a second, move backwards for another second and then stop. Do you need to create any new procedure?

How could you combine the created procedures to make your automobile turn left or right? *Please write your answer below:*

Tips zone

Programming blocks

when Arduino Uno starts up

This is an Arduino extension Event block that executes the subsequent script when Arduino board starts up.

set PWM 5 output as 0

This block sets the output of the selected PWM pin to the specified value.

PWM signals can be used to control the speed of DC motors. Pins 3, 5, 6, 9, 10, and 11 of Arduino Uno can be used as PWM output. The range of values varies from 0 to 255, where 0 indicates the duty cycle of 0%, and 255 the duty cycle of 100%

set digital pin 9 output as high ▾

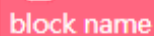Sets the output of the selected digital pin to low (false) or high (true) level.

Make a Block

Click on **Make a Block** command to create a procedure that contains a number of consecutive commands (i.e. Move Forward).

define block name

Drag the needed function blocks and assemble them under the hat block "**define()**" to set a new procedure (i.e. all the needed functions to make your Automobile move forward).

block name

Use the created procedure (i.e Move Forward) into the main code, under the Event hat block. When the procedure runs, mBlock will run the blocks below the corresponding Define block.

Try to freely experiment with the values included in the aforementioned scripts. Use a table like the one presented below to record your observations

EnA (pin 5)	IN1 (pin 6)	IN2 (pin 7)	Motor A status
200	High	Low	Motor A is turning forwards
200	Low	Low	Motor A is stopped
….	….	….	….

Electrical components

The following table is an index containing the main electrical components that need to be implemented for accomplishing the present activity.

	DC Motor
	L298n driver
	Arduino Sensor Shield

ROBOSCIENTISTS PROJECT

Motivating secondary school students towards STEM careers through robotic artefact making

Erasmus+ KA2 2018-1PL01-KA201-051129

Creators

Chrysanthi Papasarantou (EDUMOTIVA), Konstantinos Salpasaranis (EDUMOTIVA), Rene Alimisi (EDUMOTIVA)

Declaration

This report has been prepared in the context of the ROBOSCIENTISTS project. Where other published and unpublished source materials have been used, these have been acknowledged.

Copyright

Funding Disclaimer