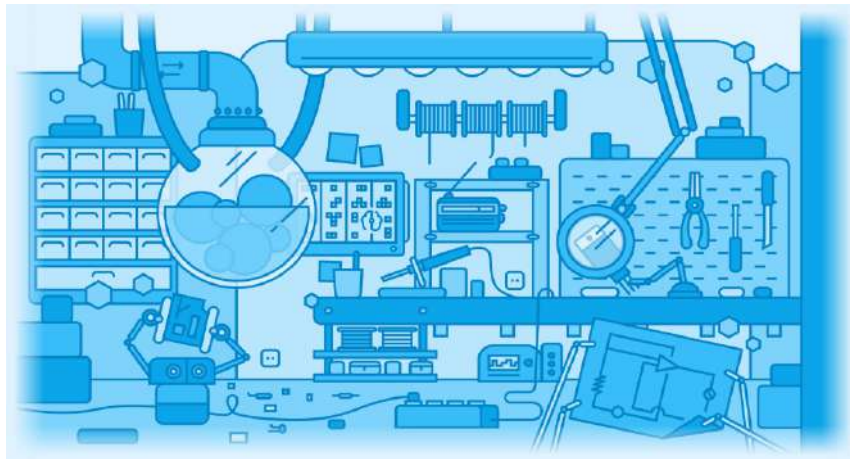# Eddy's Secret : Microcontroller

1. Online game : room contents

The microcontroller is the central element of each robot. It receives information from the sensors, calculates what the robot should do according to the program in its memory, and then sends its instructions to the actuators. It is in a way the "brain" of the robot.

It is connected to the different parts of the robot (e.g. sensors, motors, energy source) via inputs and outputs, and also contains a memory, in which the programme and the recorded data are stored, as well as a processor, which can perform the necessary calculations.

All signals that pass through the microcontroller are in binary language (0 or 1). This is because the processor is made up of thousands of transistors (mini-switches) which can be in state 1 (electricity flows) or 0 (it does not). They are combined together to form logic gates (and, or, inverter) which are the subject of the puzzle in this room. In turn, combinations of logic gates allow the processor to perform complex calculations.

Here are the different clickable elements, as well as the text displayed in the game:

This looks like the schematic of a microcontroller. The microcontroller is like the brain of the robot. It receives information from the sensors, calculates what the robot should do according to its program, and sends commands to the motors. A microcontroller is an electronic chip that includes several components: Processor, which does complex calculations. Memory, which stores information (called data). Connections, which allow communication with other parts of the robot.

Here is a transistor! It is very small behind this magnifying glass. A transistor is a small switch used in electronic circuits. A microcontroller can contain thousands of transistors, so they must be tiny!

It looks like a microcontroller! But it is too old! This is a replica of the very first microcontroller invented in America by a calculator company. Ours must be more powerful, so this is not the right one for us!

This radio surely contains a microcontroller! These days you can find them in almost any electronic device.

A rack of electronic components filled to the brim! Resistors, fuses, diodes, indeed there is almost everything here but no microcontroller.
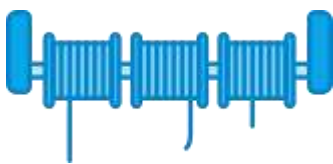
Small spools of thin cable. Useful for soldering. Soldering is used to connect electronic components together. Today they are so small that we almost always solder them with machines, not by hand!

Click on the light panel containing the room symbol to start the main puzzle.

In this puzzle, light up the correct pixels in each part of the screen by following the clues. Play the role of the microcontroller! Each pixel contains a triangle, square or round symbol, red, yellow or blue, and the clues are logical indications of these symbols. For example, select all the triangles or blue, square and red symbols, etc. The code to find is 1971.

Eddy's secret – Microcontroller
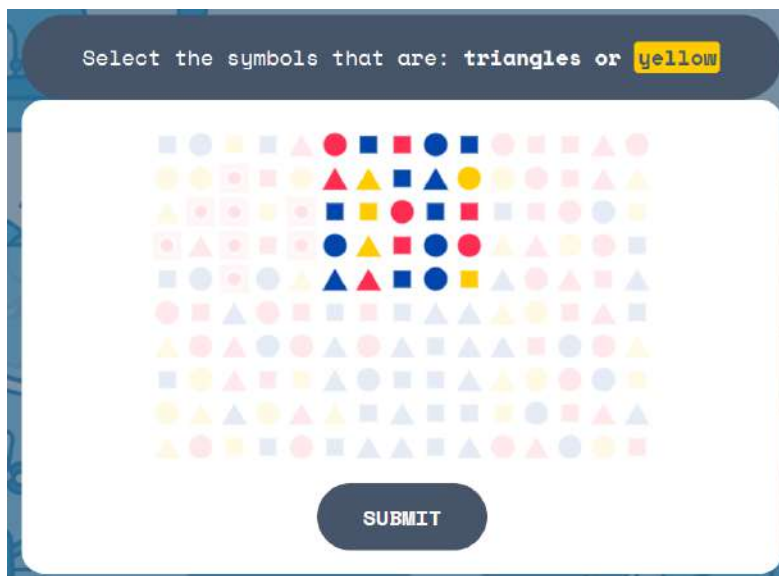
2. Additional puzzles on paper

Activity 1: Binary table   Difficulty: ⭐⭐⭐

These numbers in computer language (0 and 1) code a black and white picture, line by line. The 0 corresponds to a black cell, and the 1 to a white cell. It is up to you to find the image by colouring the correct pixels in the grid in black and white. You will then see the secret code number appear.

Objectives :   Apply the principle of coding an image by pixel with 0s and 1s
Recognise robots and computers use binary language

Activity 2: The carpet   Difficulty: ⭐☆☆

Play the role of the microcontroller for your robot and decide where it moves according to the colour of the carpet it is on, and following the instructions of the program. Start on the yellow mat at the bottom left and follow the instructions in the program until you reach a blue mat. The pattern of the blue mat you arrive on gives you the secret code.

Objectives: Recognise the role of the microcontroller in a robot
Practise how to follow a list of conditional instructions

Activity 3: The secret message   Difficulty: ⭐⭐☆

Computers and robots use 0's and 1's to communicate: this is the binary language. In order to encode a lot of information, sequences of 0s and 1s are used. For example, each letter of the alphabet is coded with a sequence of several 0's or 1's. This is called the ASCII code. Can you understand the language of robots and decode the following message using the alphabet available?

Objectives: Apply the principle of coding in binary language
Implement a letter-by-letter replacement code

3. Answer to the additional puzzles

Eddy's secret – Microcontroller

Binary table

These numbers in computer language (0 and 1) code a black and white picture, line by line. The 0 corresponds to a black cell, and the 1 to a white cell.

It is up to you to find the image by colouring the correct pixels in the grid in black and white. You will then see the secret code number appear.

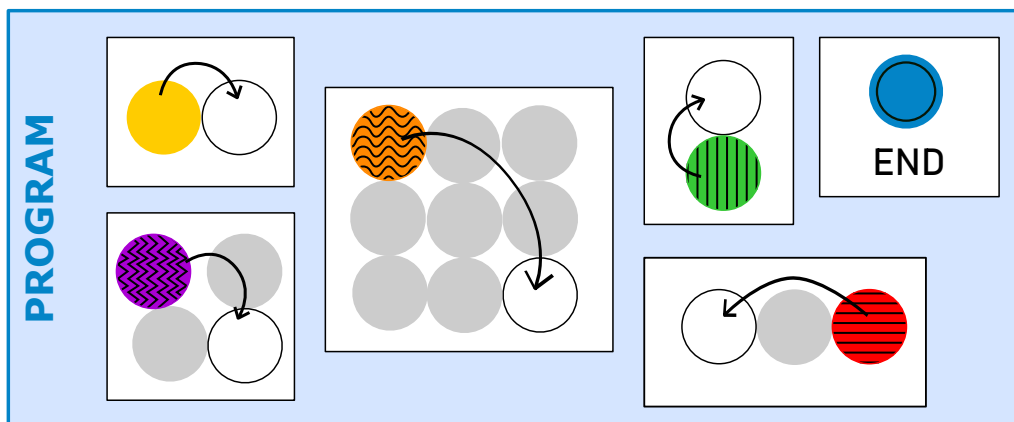| 1100111	0010100	0010100	0100110

0010001	0010001	1100110

						1100111
						0010100
						0010100
						0100110
						0010001
						0010001
						1100110

Secret code: 35

The carpets

Play the role of the microcontroller for your robot and decide where it moves according to the colour of the carpet it is on, and following the instructions of the program.
Start on the yellow mat at the bottom left and follow the instructions in the program until you reach a blue mat. The pattern of the blue mat you arrive on gives you the secret code.

PROGRAM

Secret code: <u>S</u> <u>U</u> <u>N</u>

The secret message

Computers and robots use 0's and 1's to communicate: this is the binary language. In order to encode a lot of information, sequences of 0s and 1s are used. For example, each letter of the alphabet is coded with a sequence of several 0's or 1's. This is called the ASCII code.
Can you understand the language of robots and decode the following message using the alphabet available?

1000001 1010010 1000101 / 1010010 1001111

A   R   E   /   R   O

1000010 1001111 1010100 1010011 /

B   O   T   S   /

1000001 1000010 1001100 1000101 / 1010100

A   B   L   E   /   T

1001111 / 1001101 1000001 1001011 1000101

O   /   M   A   K   E

1001010 1001111 1001011 1000101 1010011 ?

J   O   K   E   S   ?

Binary table

These numbers in computer language (0 and 1) code a black and white picture, line by line. The 0 corresponds to a black cell, and the 1 to a white cell.

It is up to you to find the image by colouring the correct pixels in the grid in black and white. You will then see the secret code number appear.

1100111	0010100	0010100	0100110

0010001	0010001	1100110

Secret code:

The carpets

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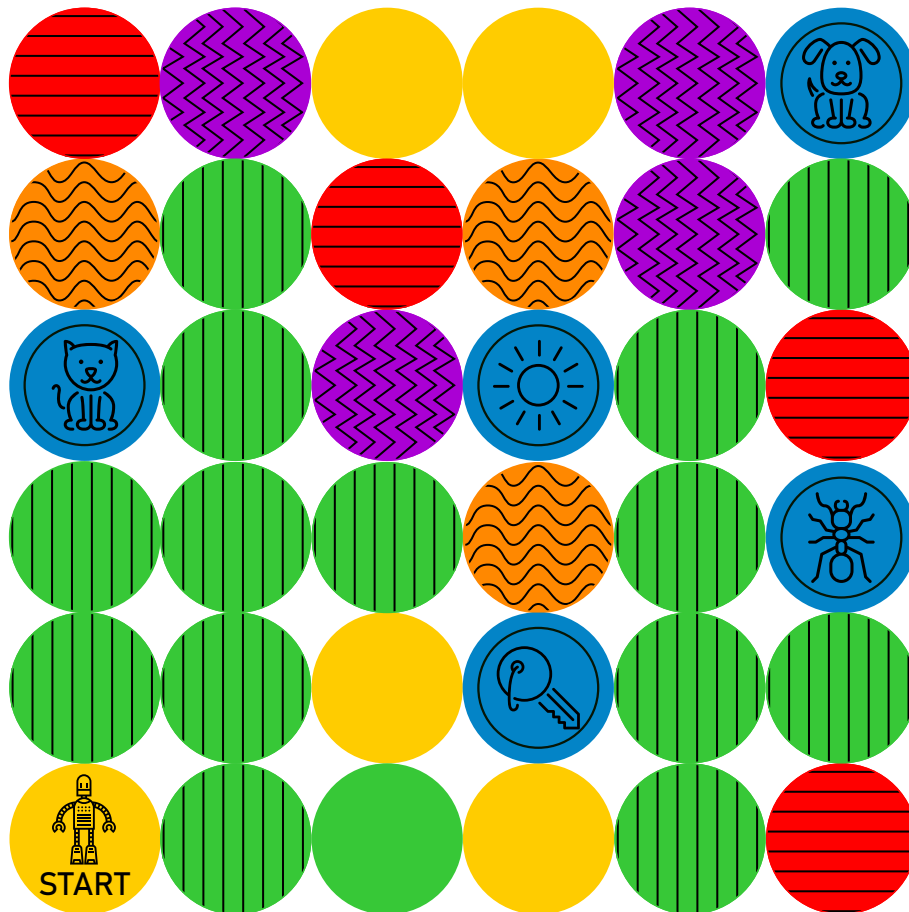
Secret code: _ _ _

The secret message

Computers and robots use 0's and 1's to communicate: this is the binary language. In order to encode a lot of information, sequences of 0s and 1s are used. For example, each letter of the alphabet is coded with a sequence of several 0's or 1's. This is called the ASCII code.
Can you understand the language of robots and decode the following message using the alphabet available?

1000001 1010010 1000101 / 1010010 1001111
 ____   ____   ____   /   ____   ____

1000010 1001111 1010100 1010011 /
 ____   ____   ____   ____   /

1000001 1000010 1001100 1000101 / 1010100
 ____   ____   ____   ____   /   ____

1001111 / 1001101 1000001 1001011 1000101
 ____   /   ____   ____   ____   ____

1001010 1001111 1001011 1000101 1010011 ?
 ____   ____   ____   ____   ____   ?

A 1000001	B 1000010	C 1000011	D 1000100	E 1000101
F 1000110	G 1000111	H 1001000	I 1001001	J 1001010
K 1001011	L 1001100	M 1001101	N 1001110	O 1001111
P 1010000	Q 1010001	R 1010010	S 1010011	T 1010100
U 1010101	V 1010110	W 1010111	X 1011000	Y 1011001
Z 1011010				

ASCII code