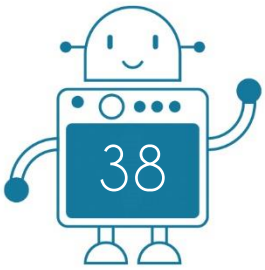


DON'T APPROACH!

STEMJAM Teaching Guide

Developing make spaces to promote creativity around STEM in schools

Acronym: STEMJAM
Project no. 2016-1-ES01-KA201-025470

www.stemjam.eu

Co-funded by the Erasmus+ Programme of the European Union

DON'T APPROACH!

ABSTRACT

We know that looking closely at the television and computer screen hurts our eyes. however, adults and children look at the screen and damage their eyes. We did this project for it. The ultrasonic sensor, which detects an object as close as 30 cm to the screen, notifies the relay that the electricity is cut off. When the object goes 30 cm away, it gives the screen the electricity by the same method. Due to 220 v of electricity is used in this study, students should definitely work on parent / teacher control.

You can use the mBot original kit, instead of using Arduino components.

DIDACTIC OBJECTIVES

- Introduction to computational thinking.
- Assimilation, creation and programming of algorithms.
- The student knows what the arduino card is and what it is used for.
- Students have knowledge about alternating current.
- Students know concepts such as setting up an electrical circuit, isolation, etc.
- Learning how to use the ultrasonic sensor.
- Learning about healthy habits when using electronic devices.
- Learning about eye damaging produced by short distances to the screen.

STEM Subject: Science☐ Technology ☒ Engineering☒ Mathematics☐

Education Level: 12-14 years☒ 14-16 years☐

PROBLEM STATEMENT

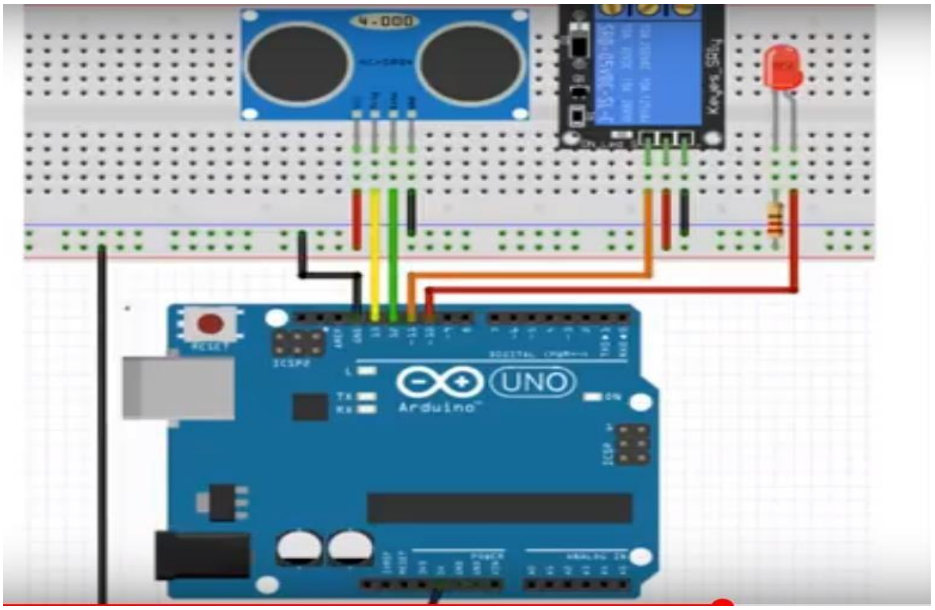
The ultrasonic sensor will detect and compare the distances between a person and the screen. The objective is to check if this person is too close to the screen, and if he/she is so, to give a warning and stop the game.

BOM (Bill of Materials Needed)

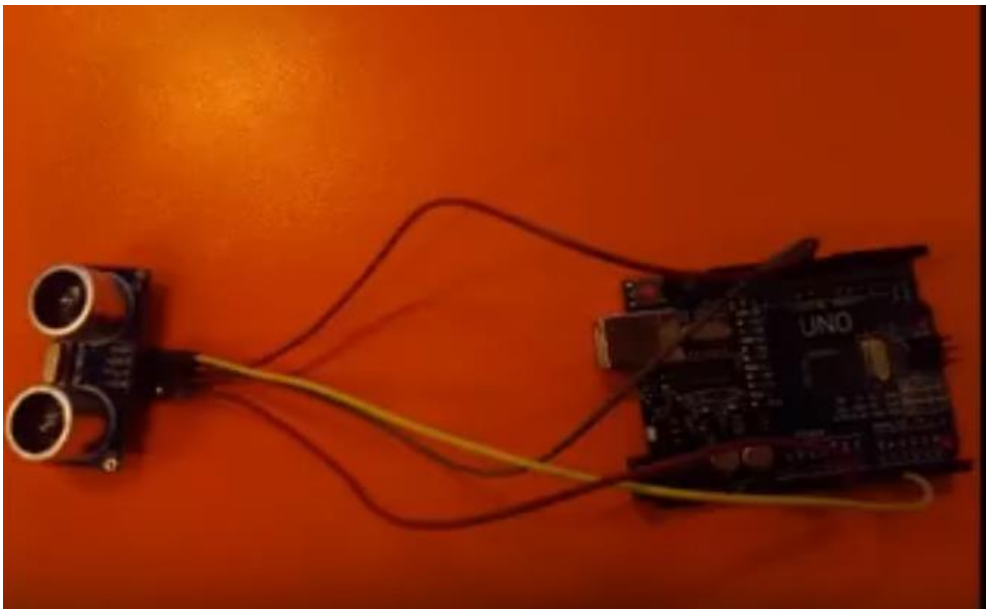
- Arduino Uno.
- Jumper cables.
- Hc-Sr04 Ultrasonic Sensor.
- Relay.
- Screen.
- mBlock or Arduino IDE.
- Usb cables, 220 v electric cables, globe, etc.

First version

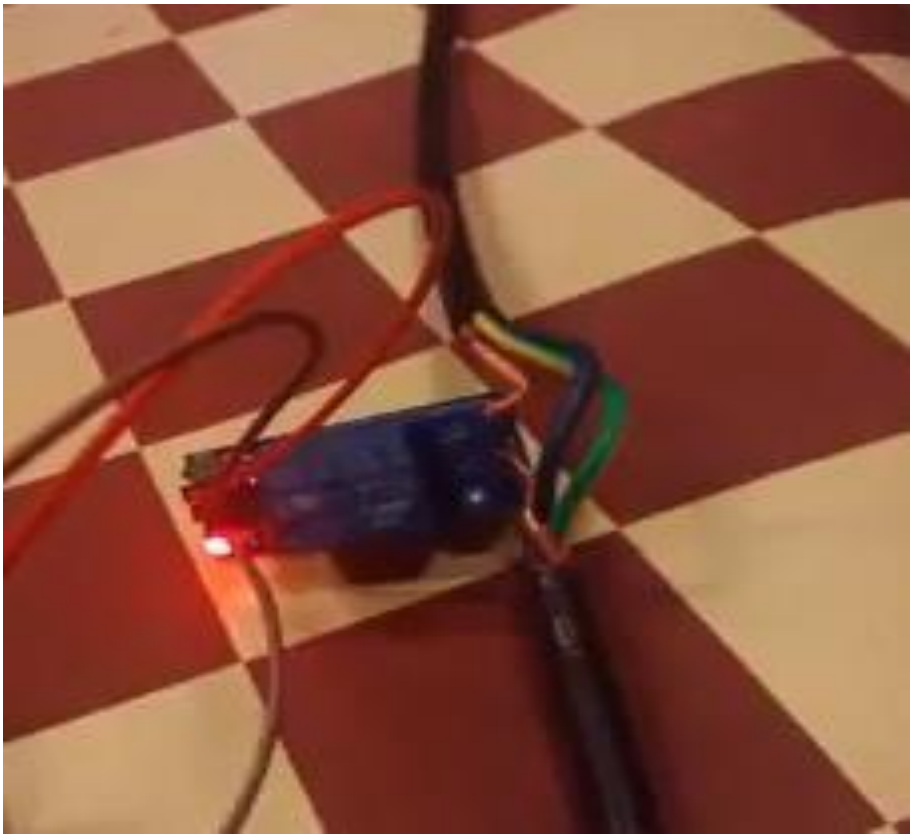
Step 1: Before connecting circuits, we organize circuit elements in a program. We preferred the fritzing program.



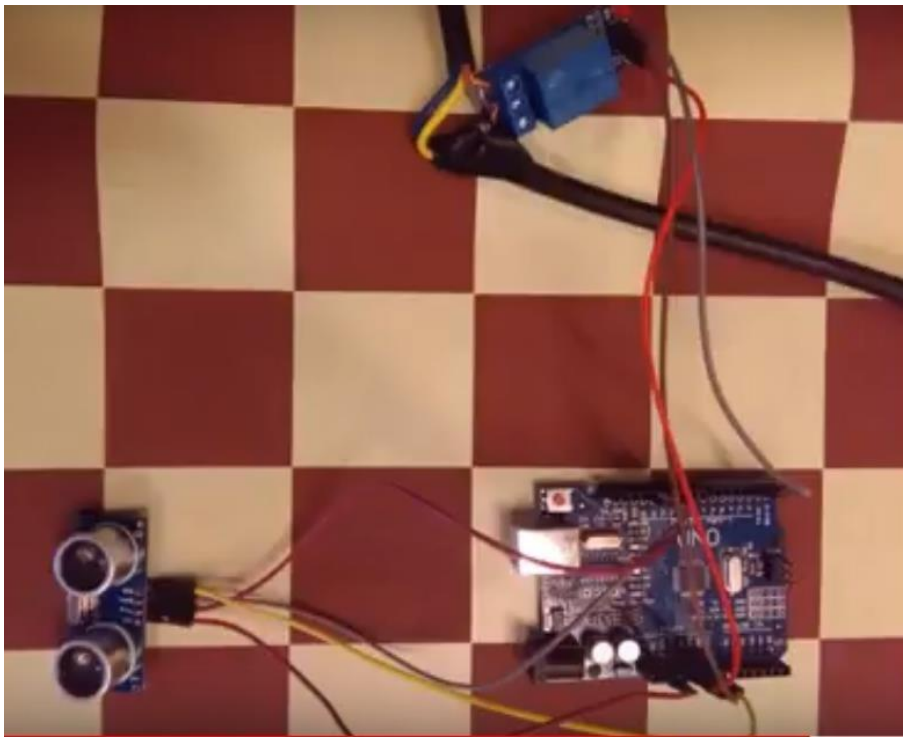
Step 2: Hc-Sr04 and our arduino uno card connections using by jumper cables.



Step 3: Cut the electric cable with the help of a knife from a suitable place, and connect it to any cable except the twin color cable.



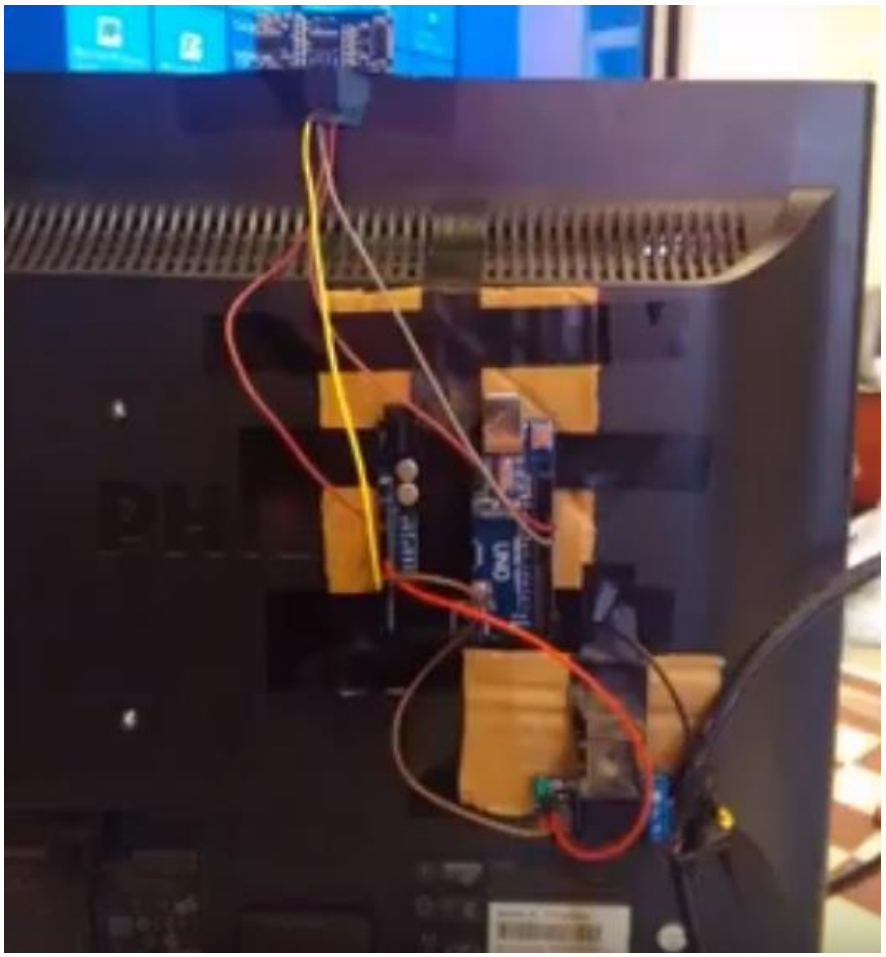
Step 4: Let's connect the relay to the arduino card and Lets make a circuit like that.



Note: Sections like that 5v and gnd on Ardunio, not changed,we can change the digital batteries. We must use codes too.

Step 5: mBlock codes

Step 6: Let's connect the circuit to your display. But direct contact with the screen can create a short circuit, let's be careful about insulation.



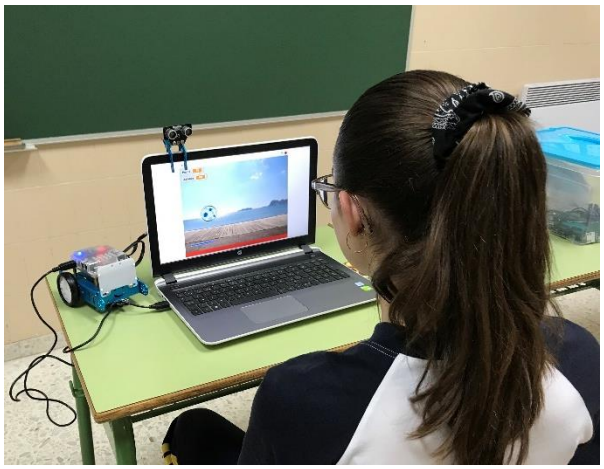
Second version

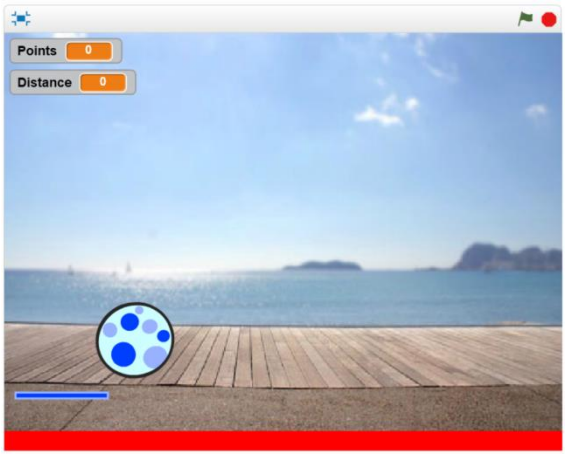
The aim of the activity is to detect and compare the distance between a person and a screen by programming the ultrasonic sensor. There will occur two different responses to a short approach: themBot will perform light and sound effects while the screen will show a message and end the running game.

1. ACTIVITY SEQUENCE:

The activity will be developed as follows:

Step 1: a student has created a videogame using scratch and now is playing with it.





Step 2: little by little, this student approaches to the screen. If he/she arrives to a distance between 40 and 25 cm to the screen, the mBot will warn about this short distance by performing "First Warning" routine.

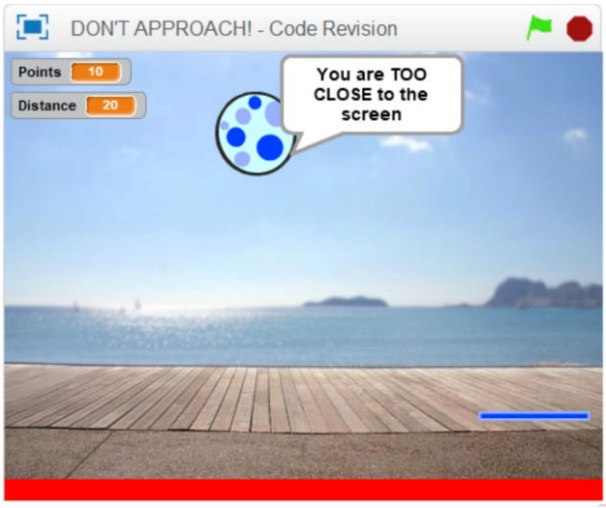
This *First Warning* will contain:

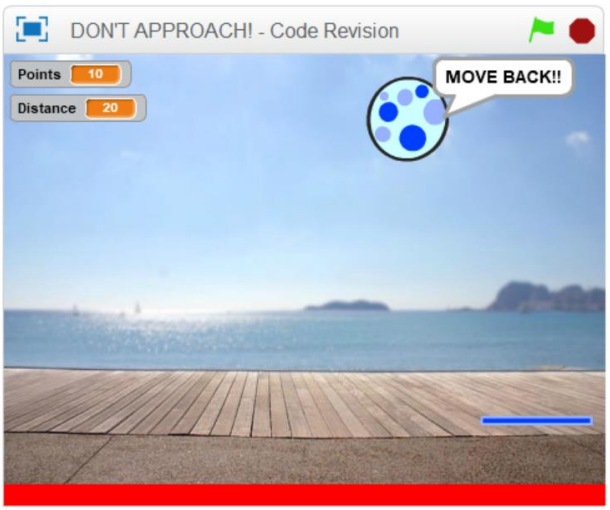
- Sound effects.
- Light effects.
- A warning face showed in the LED matrix.
- The following warning message appearing on the laptop screen: "You are getting closer to the screen...move back!"

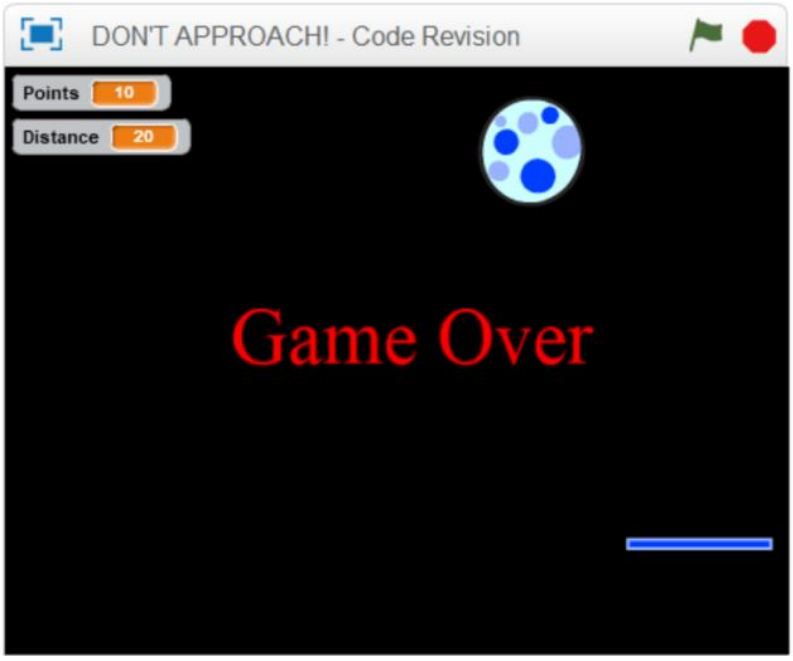
Step 3: If the student ignores the first warning and approaching to the screen (to a distance smaller than 25 cm), the mBot will warn about it by performing "Final Warning" routine and stopping the game.

This Final Warning will contain:

- Sound and light effects performed in a higher tone and speed.
- An angry face showed in the LED matrix.
- The following warning messages appearing on the laptop screen: "You are TOO CLOSE to the screen" MOVE BACK!!".
- A change of scenario for the game.

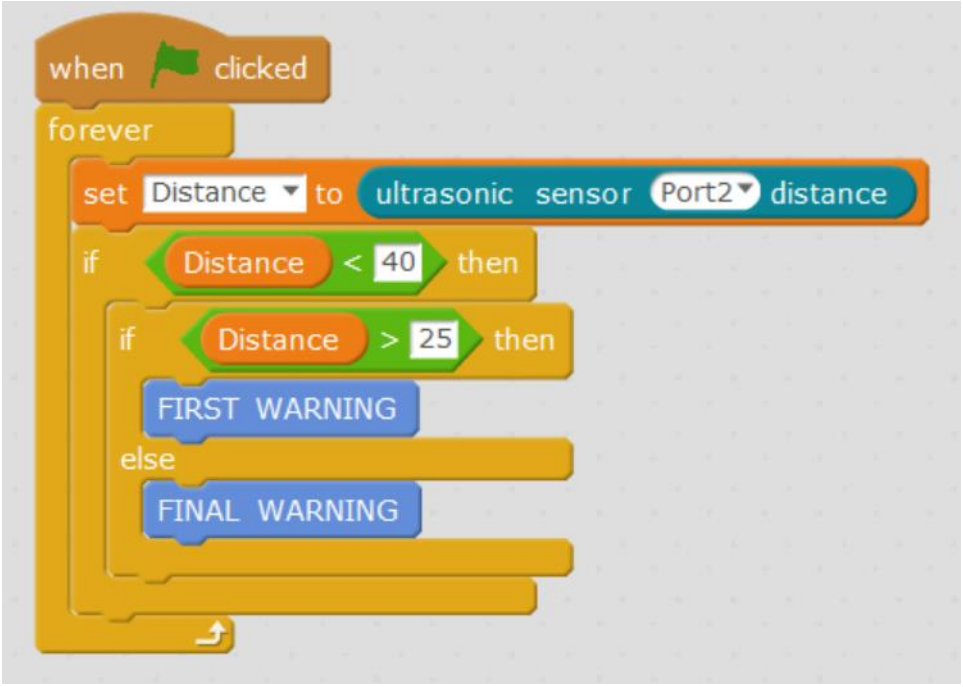




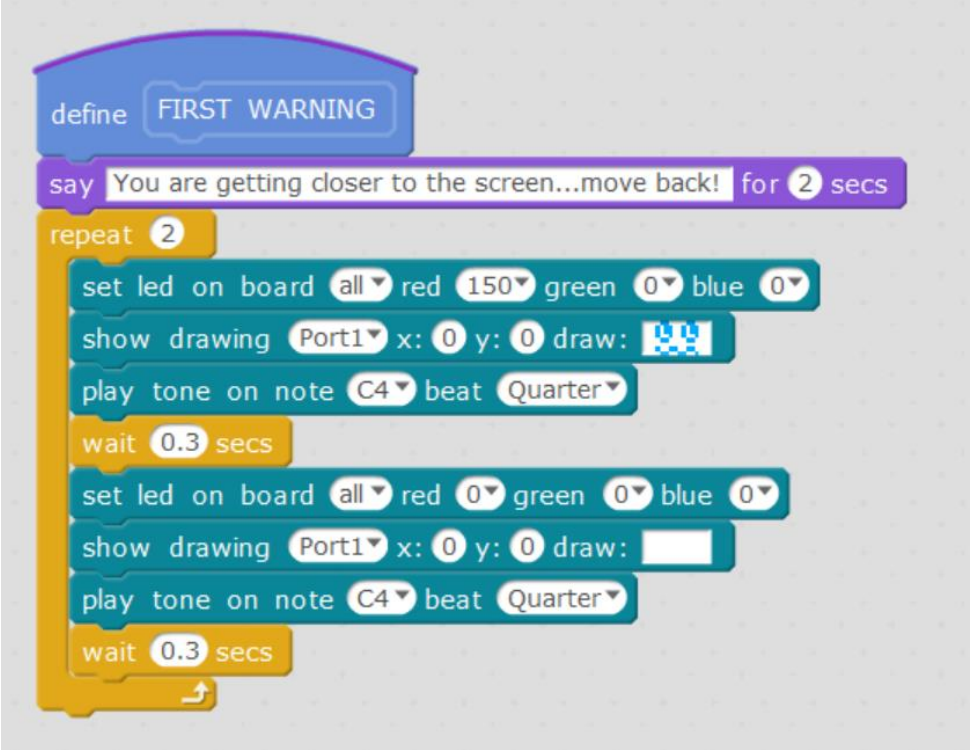


If the distance is longer than 40 cm, the game will continue and the mBot will remain steady.

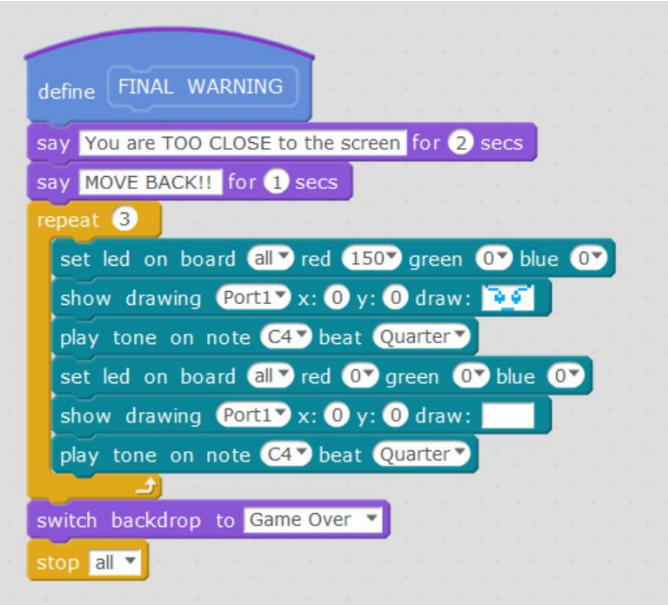
2. MAIN CODE OF THE ACTIVITY:



3. FIRST WARNING CODE:

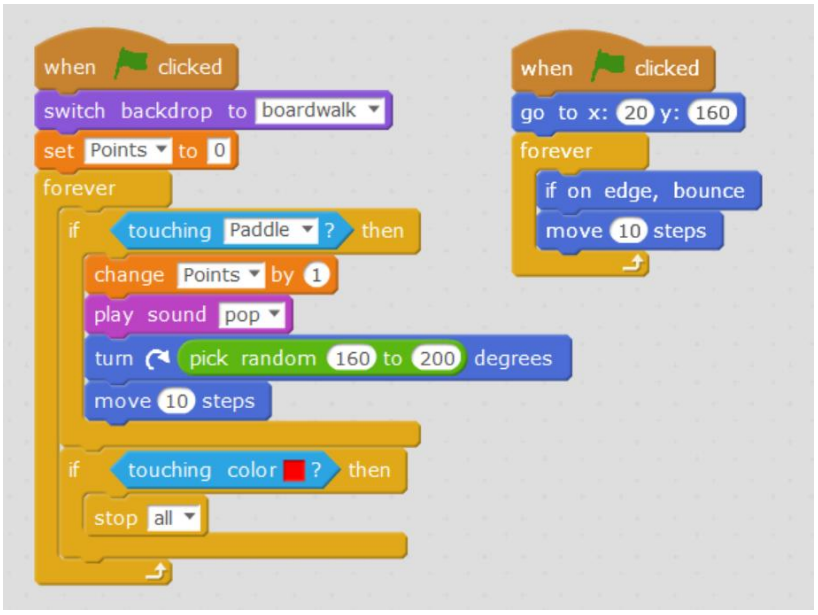


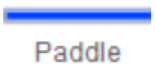
4. FINAL WARNING CODE:



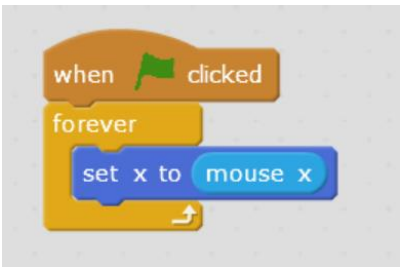
5. SCRATCH GAME CODE:

Beachball

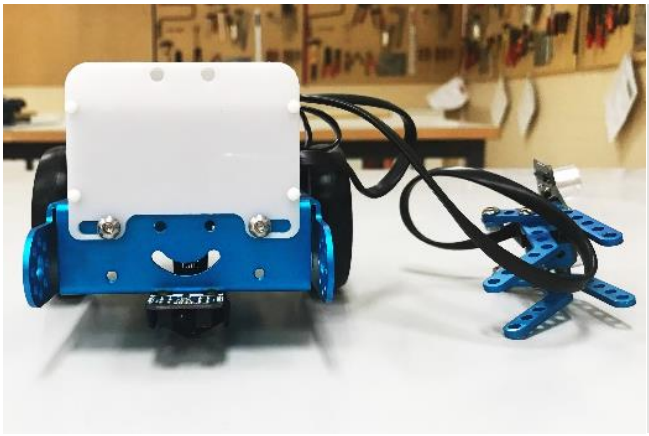


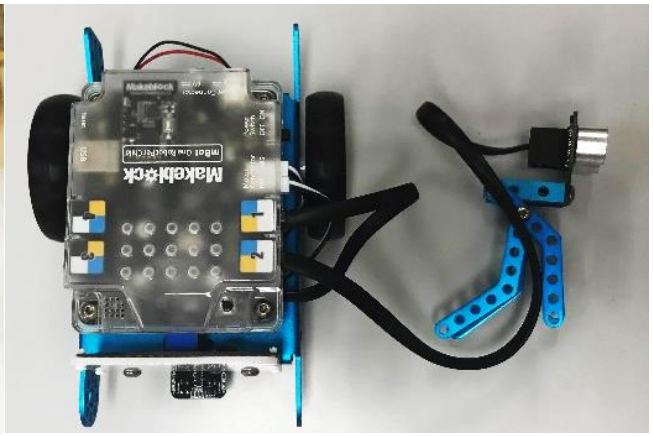


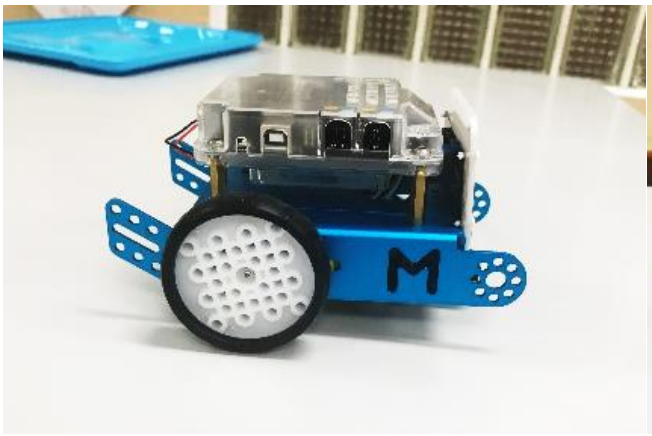
Paddle

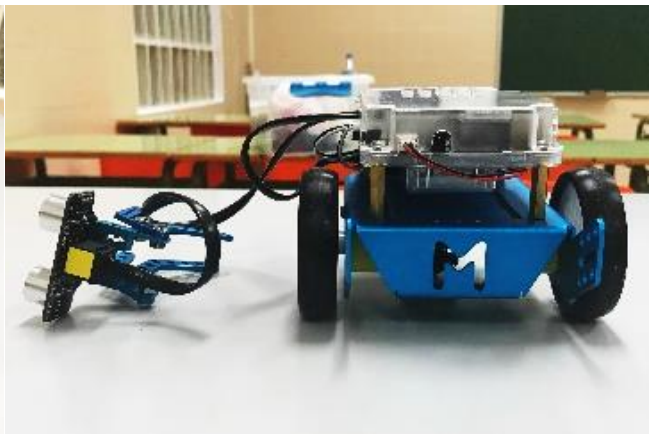


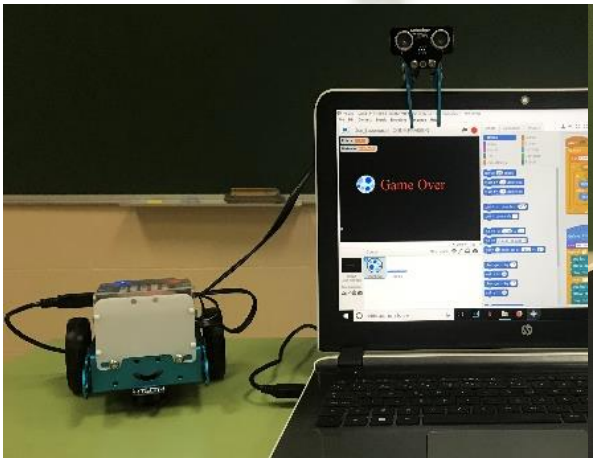
Once, the programming is finished, we start BUILDING UP THE STRUCTURE where all the mechanical elements will be set, just as the electronic elements.

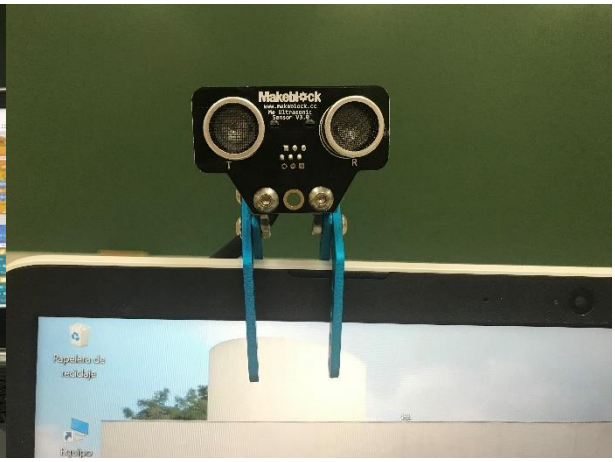




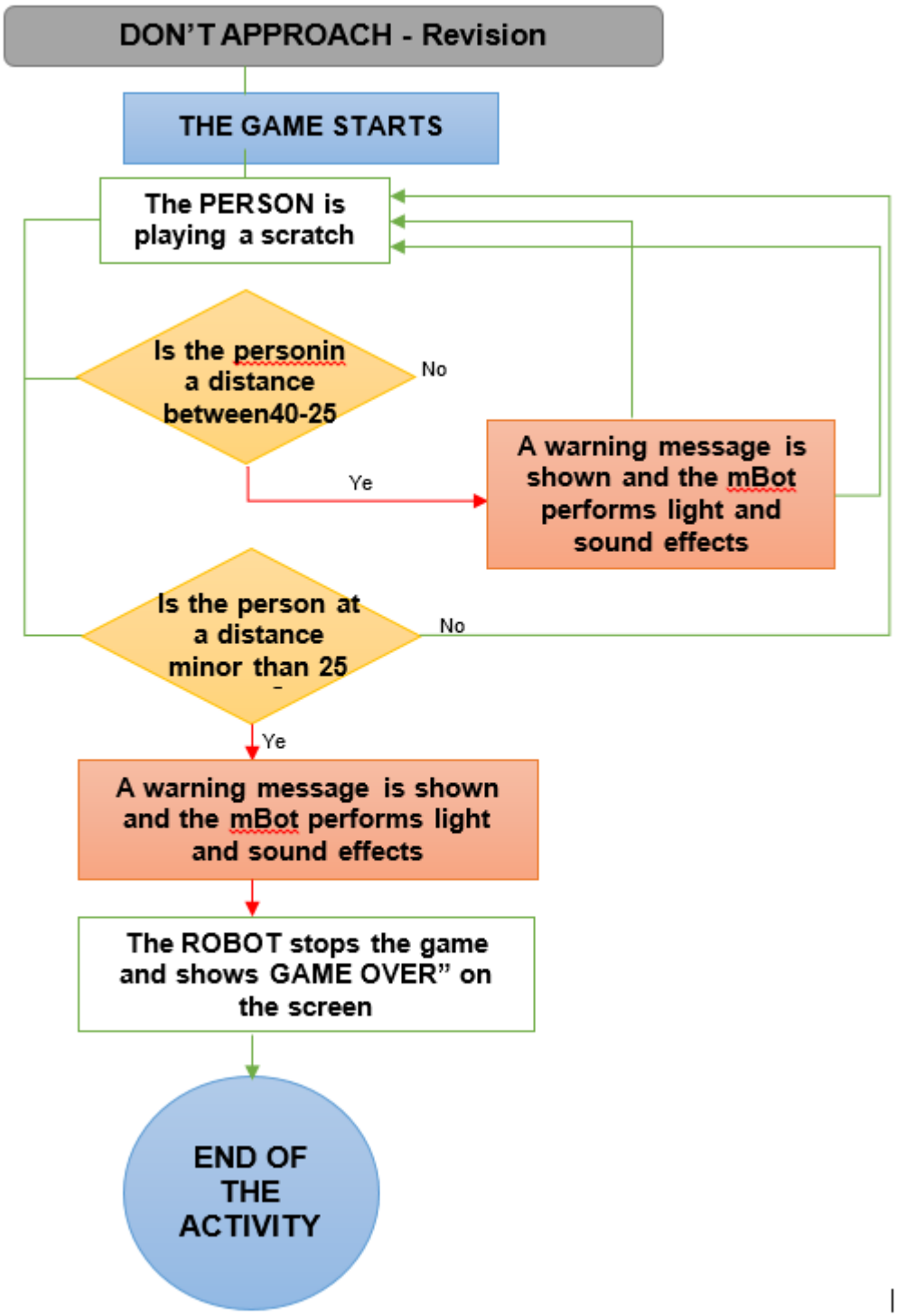








FLOW CHART



STUDENTS' EVALUATION

The student's evaluation will be developed on the RUBRIC created specifically for the activity.

RESOURCES FOR USE MBOT

ELEMENT	ID	CABLE	AMOUNT	PORT 1			PORT 2			PORT 3				PORT 4				P.MOT1	P.MOT2
				Y	B	W	Y	B	W	Y	B	W	BI	Y	B	W	BI	W*	W*
Mbot Robot 2´4G			1																
Motor 1	W*																	W*	
Motor 2	W*																		W*
Ultrasonic sensor	Y	1	1				Y												
Matriz de LEDs	B	1	1		B														
RJ25 cables			4																
Structures																			
Support P1			2																
Plate 45°			4																
Laptops			1																
Atrezzo (not essential)			X																