VIGILANT MBOT

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

VIGILANT MBOT

ABSTRACT

By means of a smartphone placed on mBot, we can visualize that the mBot is seeing in first person.

We have a smartphone placed on mBot and we see it on PC.

The mBot smartphone, through the camera, will visualize where it is going, and with an application on PC, we will see the mBot is visualizing in these moment.

DIDACTIC OBJECTIVES

TECHNOLOGY

- Formal explanation of Wi-Fi and 2.4G:
  - The majority of students know these technologies, but they don't know how Wi-Fi or 2.4G work, how they are made up, etc.
- Pair the smartphone with PC.
- Remote control for mBot.

ENGINEERING

- Construct a solid structure for smartphone support:
  - This structure will have to guarantee the security of the smartphone of the blows it may suffer.

STEM Subject: Science☐ Technology ☒ Engineering☒ Mathematics☐

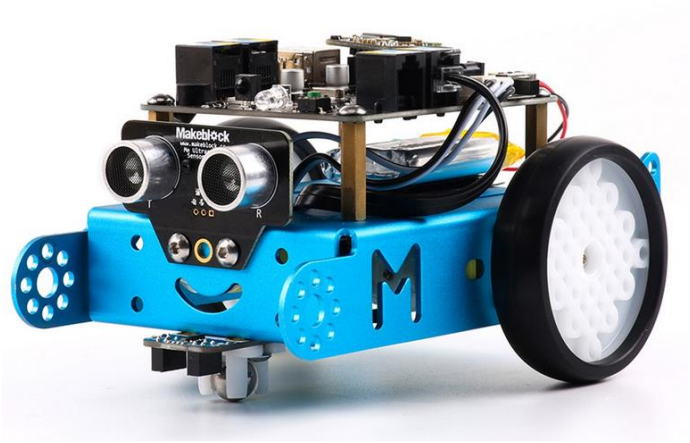
Education Level: 12-14 years☒ 14-16 years☒

PROBLEM STATEMENT

mBot's remote wifi control can cause problems between floors. This problem can be studied in advanced studies.

BOM (Bill of Materials Needed)

- mBot => Ref. 90054



- Different beams and structures or LEGO parts:

- A PC.
- Smartphone.
- Camera of Vigilancy APP.

ACTIVITY DESCRIPTION

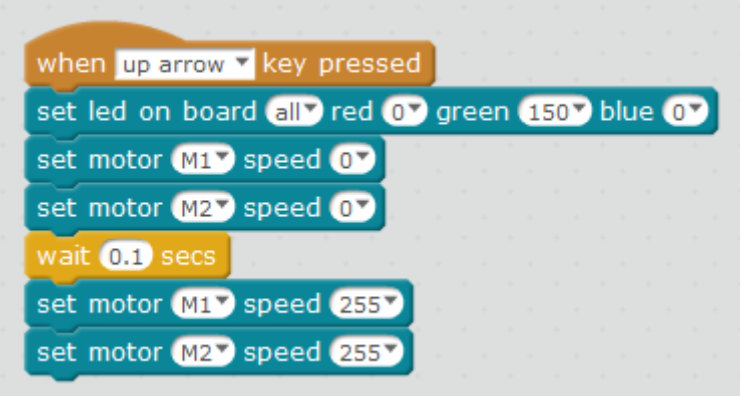
First version

This activity consists of visualize in first person that the MBOT is seeing. Through a smartphone or sports camera with Wi-Fi connection, we will visualize and listen the way that our MBOT is travelling.

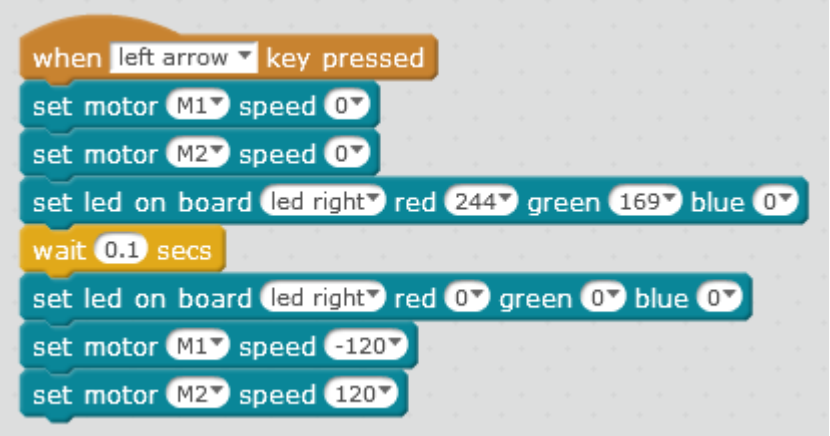
First of all, we will have to program the instructions that will allow us to control MBOT remotely.

First, we paired the MBLOCK software with MBOT. For do this, we use the 2.4G Wireless[1] Serial Port. Then we proceed to perform the programming:

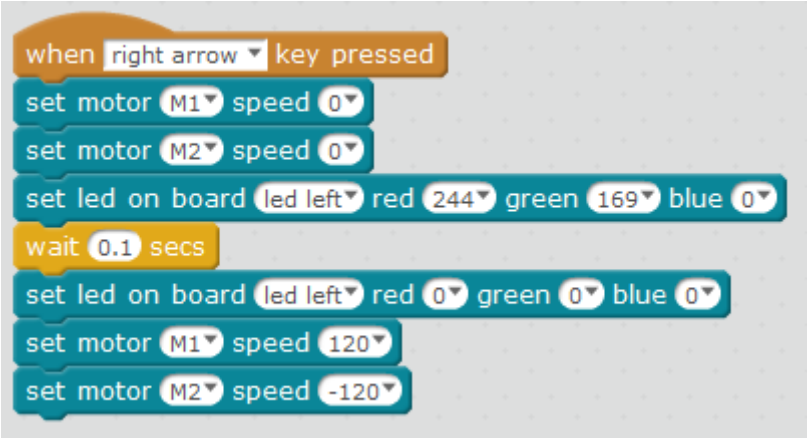
1. Programming Up Arrow Key:



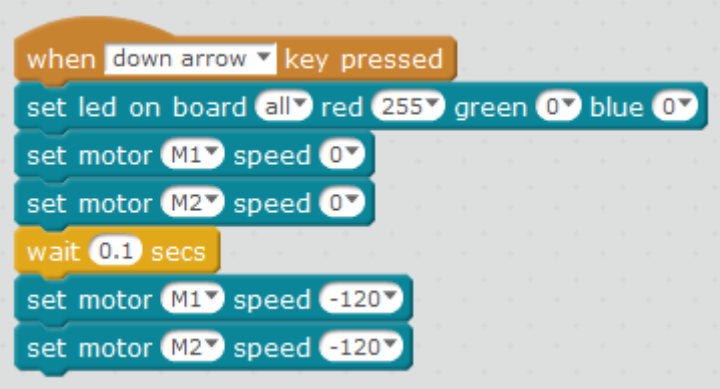
2. Programming Left Arrow Key:



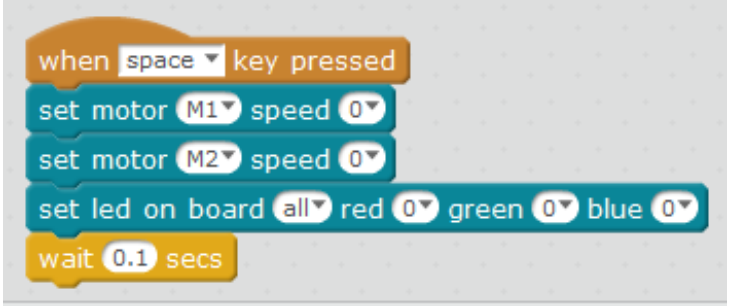
3. Programming Right Arrow Key:



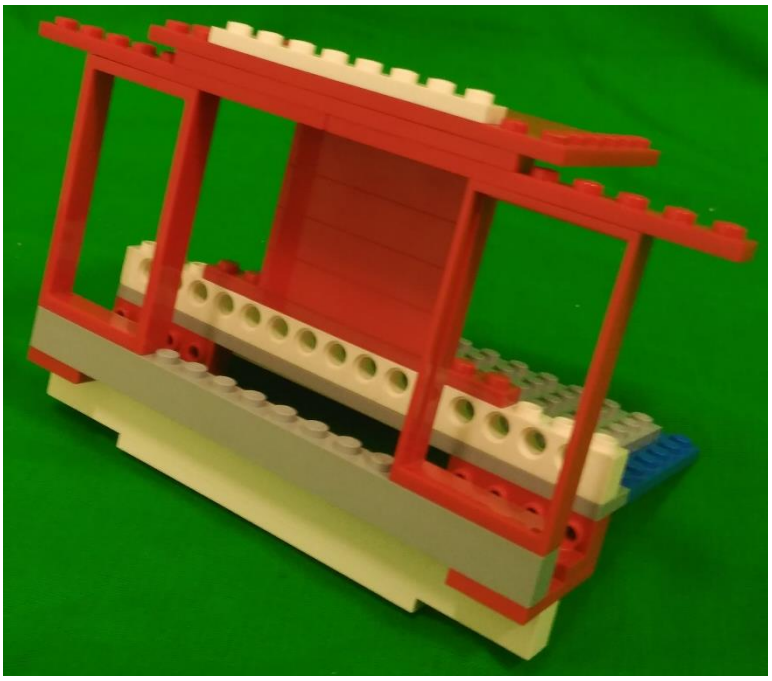
4. Programming Down Arrow Key:

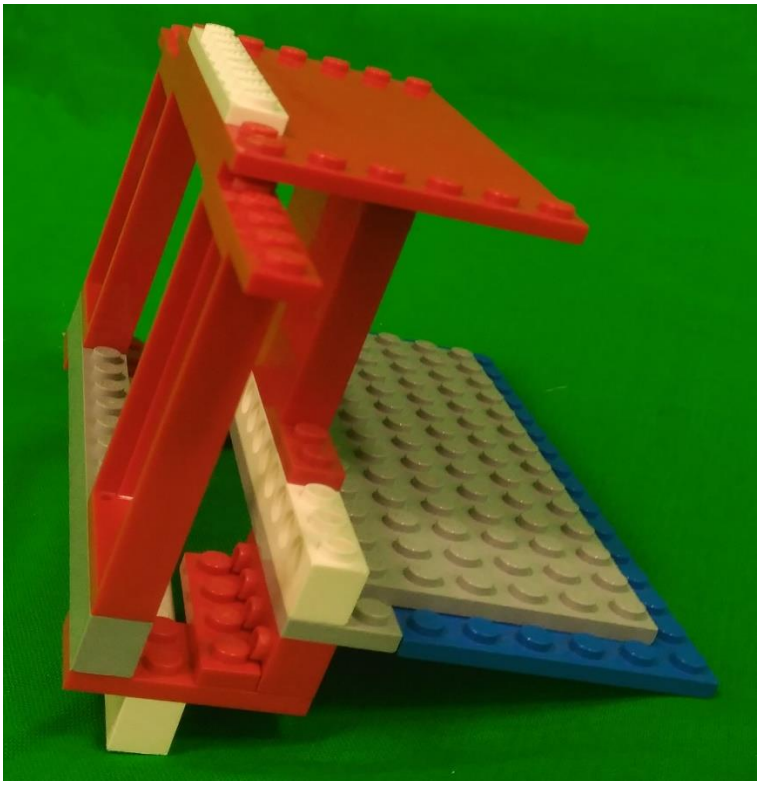


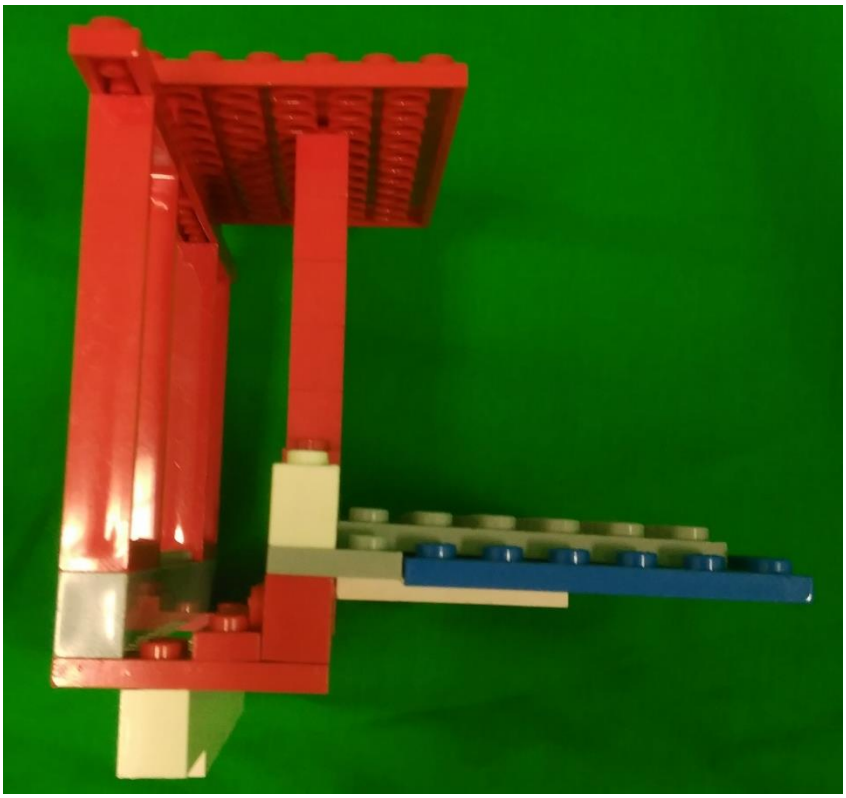
5. Programming Space Key:

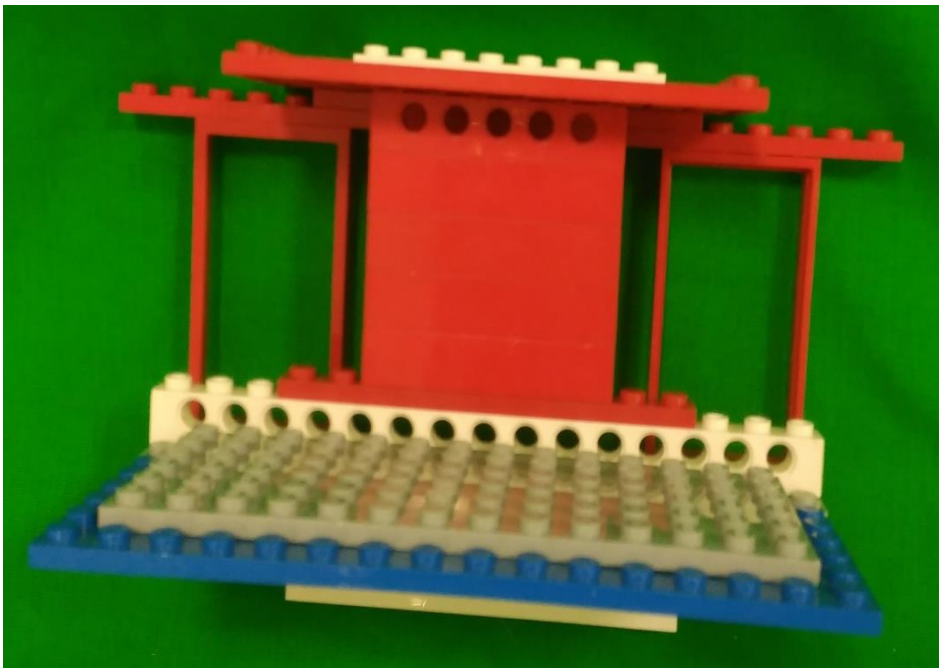


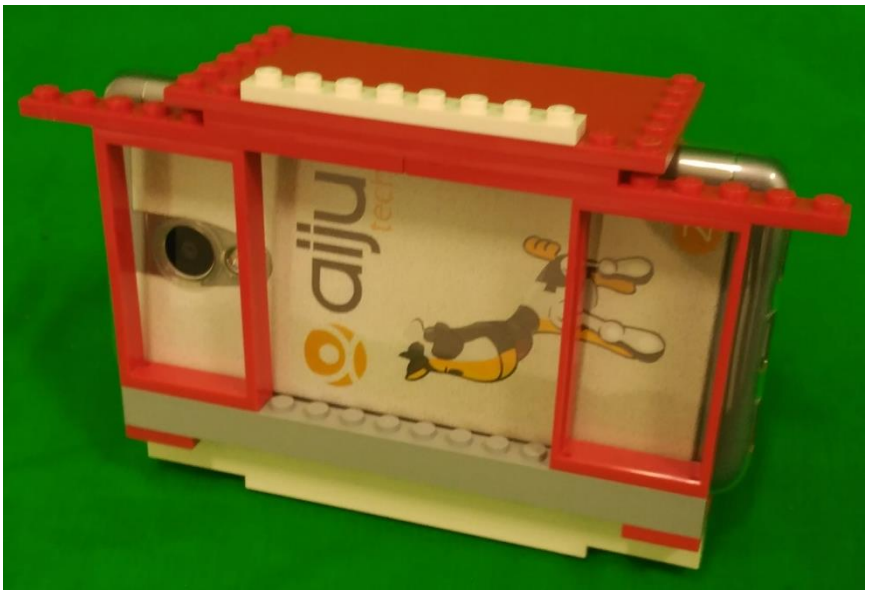
Once we have programmed the MBOT, we proceed to design and construct the Smartphone support structure. We use LEGO parts for do this:

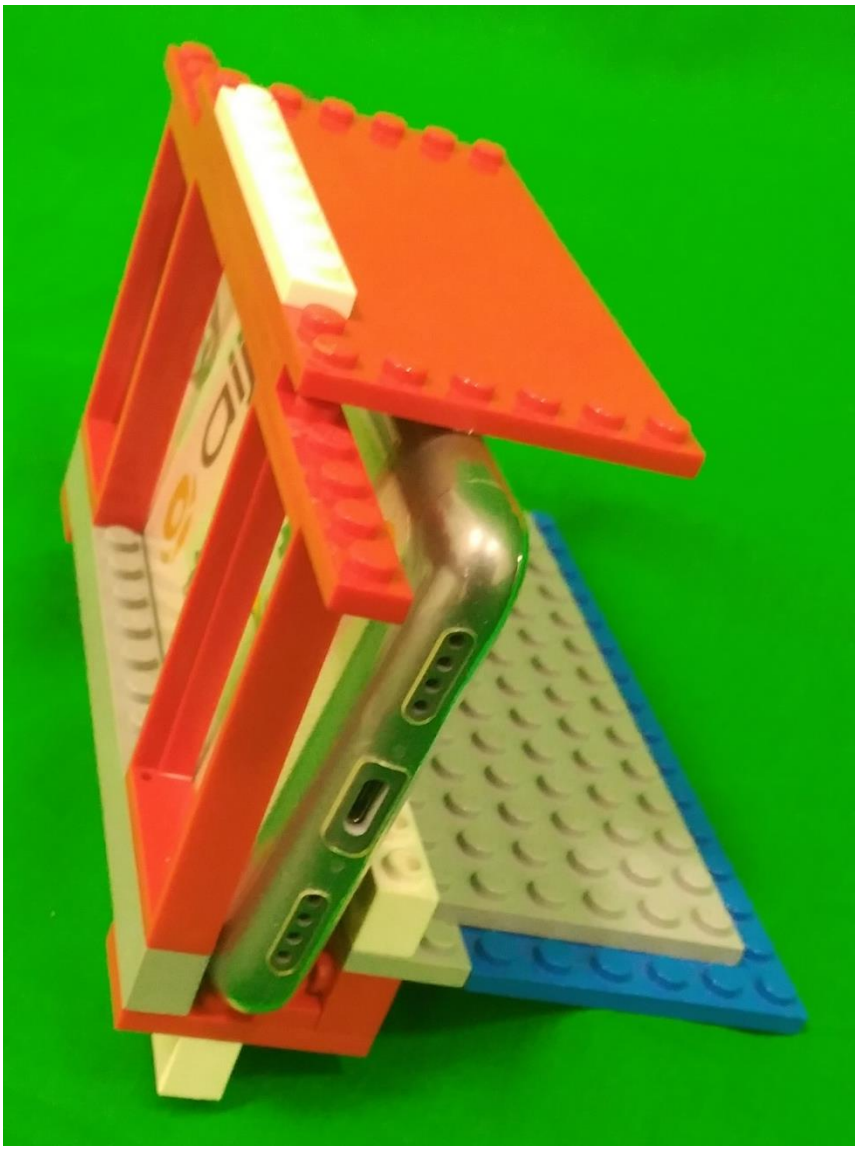




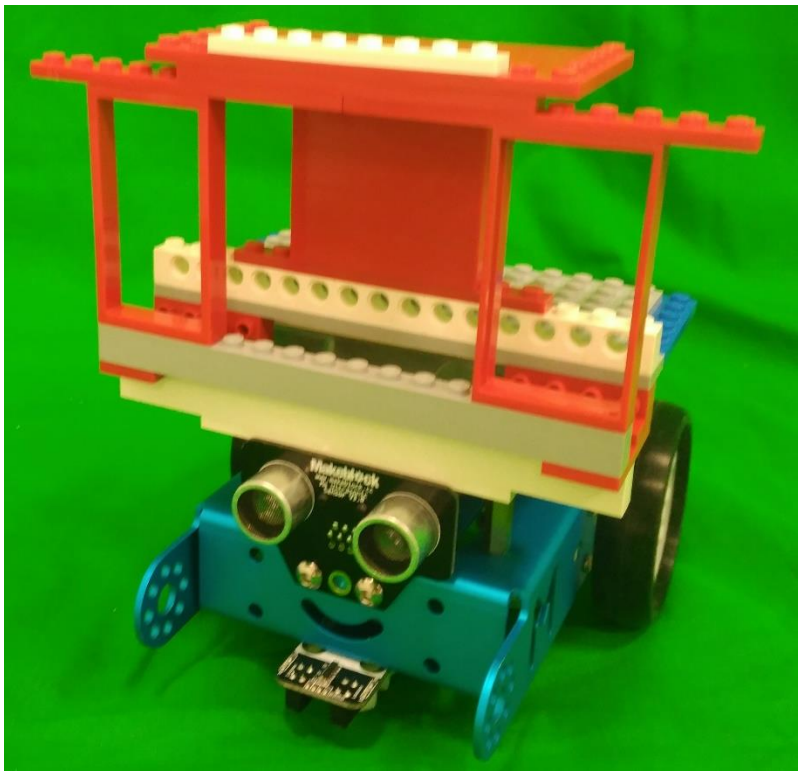


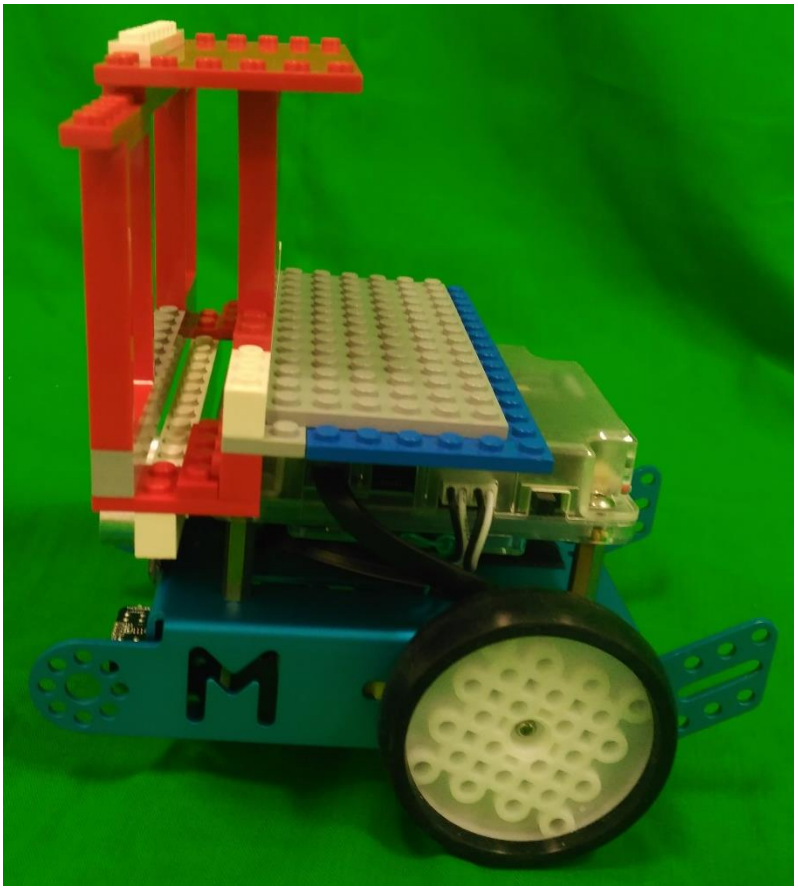


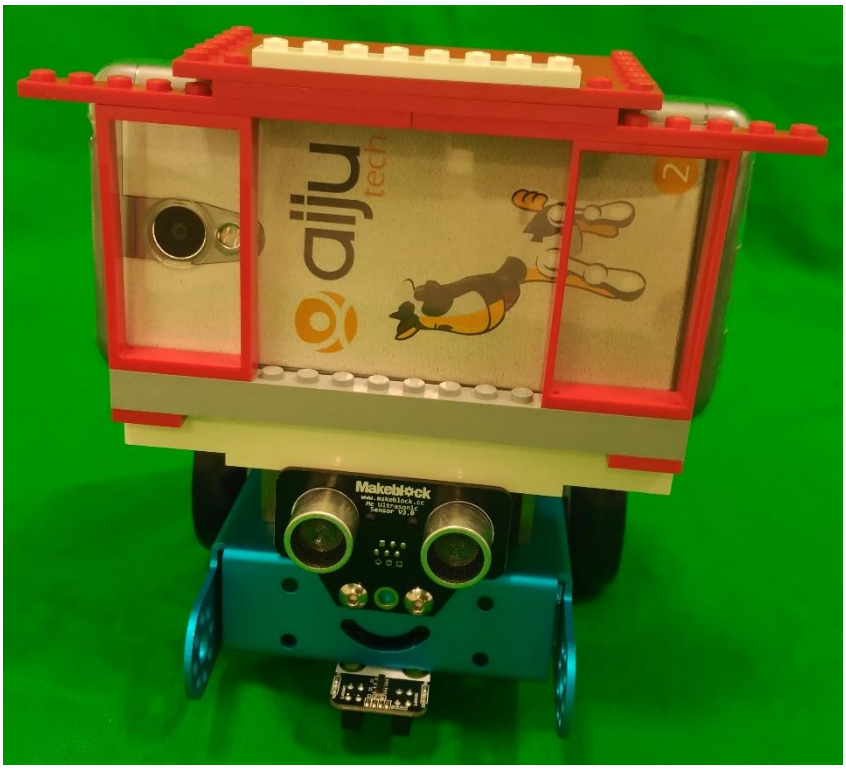




Then, we will incorporate the smartphone support structure to MBOT:



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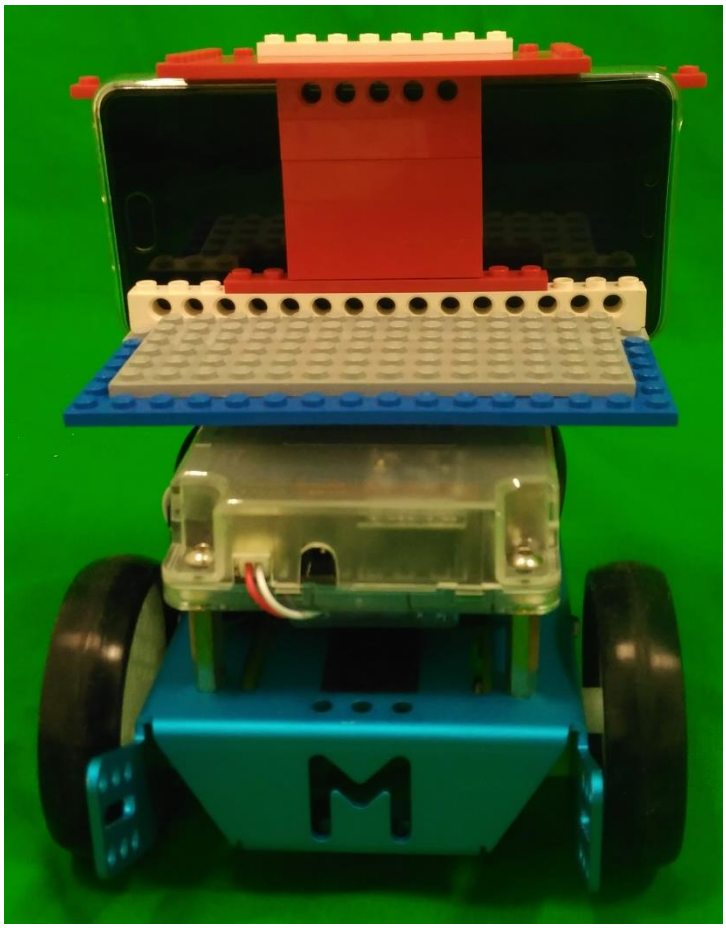


We already have the support mounted on the MBOT and now, we start to pair the smartphone with PC.

We use a Vigilancy Camera APP, that pair them with WiFi [2].

1. Download “Cámara de vigilancia wifi” at Play Store (Android) or App Store (iOS) in our smartphone.
   - Play Store Link => https://goo.gl/SX0o62
   - App Store Link => https://goo.gl/DSqlI8

2. When the app was installed, we will need to be connected our smartphone to a WiFi network and we need a Gmail account, as it will provide the necessary security for use the app safely.

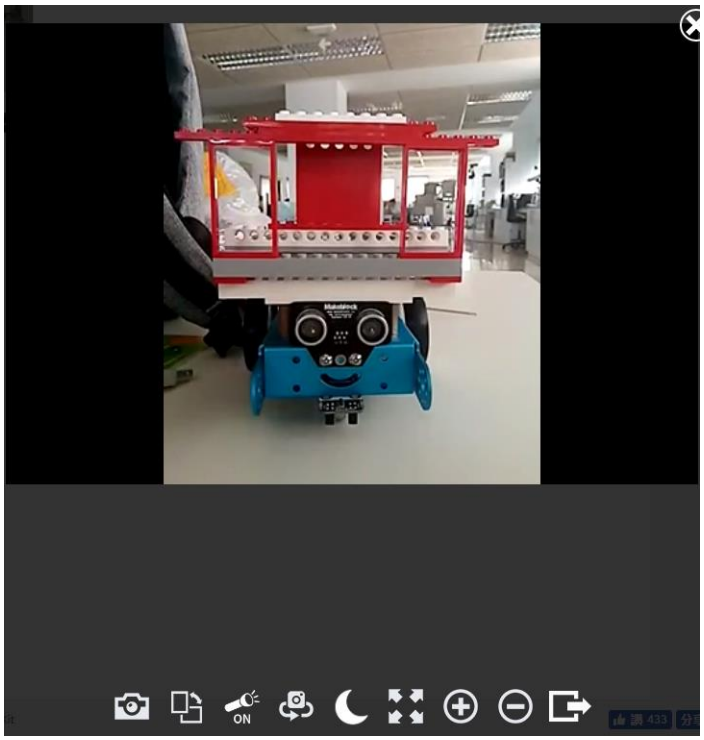
3. If we have successfully followed the previous step, on smartphone we will have the following result:

4. As you can see in the image, we are logged in our Gmail account and the camera is already visible.

5. Now, open the browser in our PC and click in next link: https://alfred.camera/webapp/

6. When the new window opens, we will have to enter in the same Gmail account that we put in our smartphone.

7. Once we have entered with the Gmail account, we will be able to see in our browser that the MBOT smartphone camera is visualizing.



We can already enjoy with our VIGILANT MBOT created, since we can see and hear everything that has around our MBOT.

Now, we explain the different technologies that our activity uses:

[1] 2.4G Serial Wireless:

This 2.4G Wireless Serial is designed for MBOTs to be used in classroom or workshop when many people use wireless communication simultaneously. It uses the same the techology as wireless mouse. With the feature of no pairing needed and no drivers needed, there is no signal interference when many modules work simultaneously. With two parts included: a dongle to plug on your computer; a module to plug on the mCore, you can easily establish a wireless connection between the software mBLOCK and MBOT.

Its features are: allow auto pairing, the same technology as wireless mouse; USB Dongle support 32&64 bit Windows&Mac OS; driver installed automatically; no signal interference when many MBOTS work simultaneously.

And its specifications are: default baud rate: 115200; communication distance: about 10 meters; power supply: 5V DC; dimension: 30mm*20mm*14mm.

[2] WiFi:

Is a technology for wireless local area networking with devices based on the IEEE 802.11 standards. It uses radio waves in the same way as mobile or cell phones, televisions and radios themselves. In fact, communication over a wireless network is very much like the two radio communication channels.

The wireless adapter of a computer translates the data as a radio signal and transmits it using an antenna.

A wireless router receives the signal and decodes it. The router sends the information to the Internet using a physical, wired, Ethernet connection.

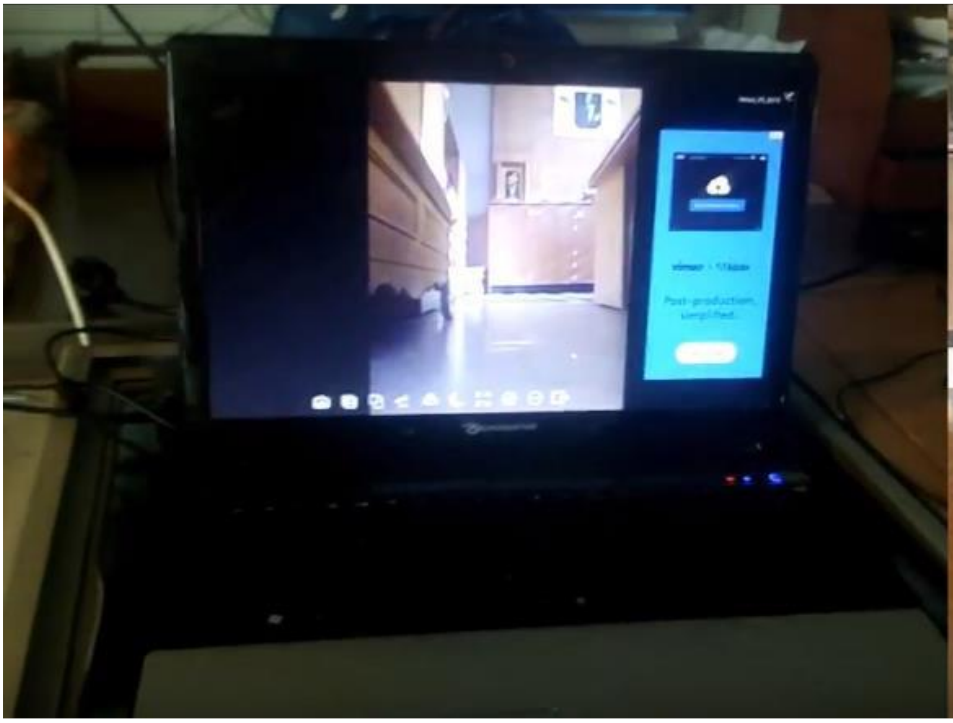
Resume:

1. Develop the software that will control MBOT.
2. Develop MBOT support using LEGO parts or other materials.
3. Incorporate the smartphone support structure to MBOT.
4. Download and install the “Vigilancy Camera App” in our smartphone.
5. Pair the smartphone with PC using Wi-Fi.
6. Pair MBOT with PC with Bluetooth Module or 2.4G Wireless.
7. The smartphone will be inserted into the MBOT support.
8. Enjoy!!

Second version

mBot of school canteen gets orders from teachers with smartphone and transfers it to the computer and the phone, both in audio and video mode. So both canteen and teachers can submit their orders through MBot without getting tired.

A slogan can be used here. "You do not need extra staff if you have mBot". Our main goal in the event is to reduce the load on the person with MBot.



Third version

Smartphone Cardboard**:**

1. It will have to pair 2 smartphones using Bluetooth or Wi-Fi.
2. One smartphone will be inserted into the cardboard and the other will be subject to MBOT.
3. Develop MBOT support using LEGO parts or other materials.
4. Cardboard Develop, whose material is paperboard for reduce costs and facilitate their acquisition.

STUDENT'S EVALUATION

- Students know that mBot can be remotely controlled by keyboard.
- The image recorded with the phone application can be viewed again.
- I understand that the application can also be used in different areas (especially security).
- Knowing that using technology can save people's energy.

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