

# THE ASSISTANT 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](http://www.stemjam.eu)



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# THE ASSISTANT MBOT

## ABSTRACT

In this project, the aim is to serve people who have permanently or temporarily lost their ability to speak by accident, paralysis, etc.

In the second versión of the activity, we will connect two mBots through the IR sensor that are integrated in the mCore board and a message will be sent from one of the mBots to the other.

Another activity that we will carry out will be through the Wi-Fi module for mBots, which can send messages within the same Wi-Fi network.

## DIDACTIC OBJECTIVES

Students gain sensitivity to older and disable people.

Infrared remote control - mBot and LCD panel connection established.

Students will know different types of connections, such as connectivity through Infrared and Wi-Fi.

STEM Subject:    Science             Technology             Engineering             Mathematics

Education Level:            12-14 years             14-16 years

## PROBLEM STATEMENT

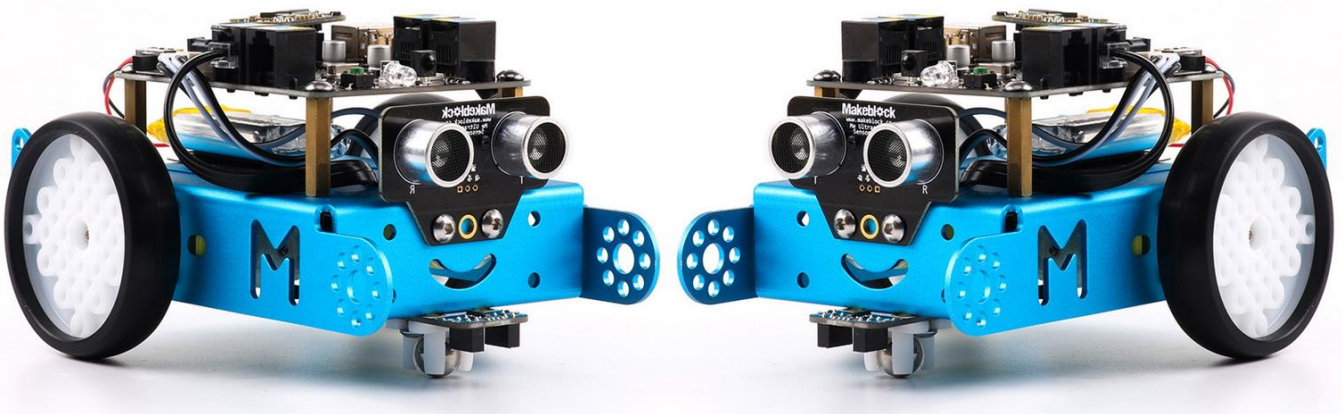
People cannot express their needs who have permanently or temporarily lost their ability to speak.

Students are always connected through the Internet on their smartphones, but they do not know how this connectivity occurs.



## BOM (Bill of Materials Needed)

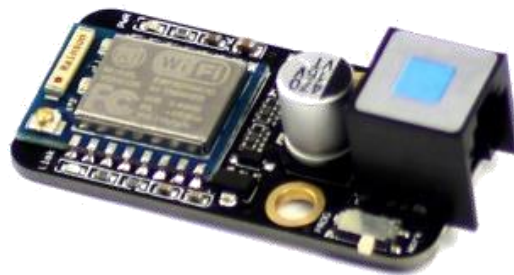
➤ (x2) mBots => Ref. 90054



❖ (x2) Me LED Matrix 8 × 16 or / and TFT LCD screen:



❖ Me WIFI Sensor:



❖ Tablet.

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	Bl	Y	B	W	Bl		
Mbot Robot 2'4G			2																
Motor 1	W*																W*		
Motor 2	W*																	W*	
Me RJ 25 adapter	Y																		
	B																		
	Bl																		
Mini Pan-Tilt kit																			
It has 2 servos.																			
We have to connect the servo to a RJ25 adapter																			
Mini Gripper																			
We have to connect the servo to a RJ25 adapter																			
Me TFT LCD Screen	B	(1)	1							B									
Me Led Matrix 8x16	B	(2)	2											B					
Me Ultrasonic sensor	Y																		
Me Temperature Sensor - Waterproof	Y																		
Me Line Follower	B																		
Me Flame sensor	Bl																		
Me PIR Motion sensor	B																		
Me Sound sensor	Bl																		
Me Touch sensor	B																		
Mini Fan Pack	B																		
Me Temperature and Humidity sensor	Y																		
Me 130 Motor Fan Pack	B																		
RJ25 cables			3																
Structures and beams																			
Laptops																			
Attrezzo (not essential)																			



# ACTIVITY DESCRIPTION

## First version

### Step 1: Algorithm and Codes

The screenshot displays a Scratch-like programming environment with a script editor and a block palette. The script editor contains several 'mBot Program' blocks, each starting with a 'forever' loop. The code is as follows:

```
mBot Program
forever
  if ir remote A pressed then
    ClearScreen Port1 with color black
    ShowText Port1 at x 20 y 20 mBot Program | color white s Can you bring water?

mBot Program
forever
  if ir remote B pressed then
    ClearScreen Port1 with color black
    ShowText Port1 at x 20 y 20 mBot Program | color white s Can you bring water?
  forever
    if ir remote C pressed then
      ClearScreen Port1 with color red
      ShowText Port1 at x 20 y 20 size 64 color white s I need go toilet.
    if ir remote D pressed then
      ClearScreen Port1 with color green
      ShowText Port1 at x 20 y 20 size 24 color black s Can you turn me

mBot Program
forever
  if ir remote E pressed then
    ClearScreen Port1 with color yellow
    ShowText Port1 at x 20 y 20 size 24 color blue s Can you turn me me in the face?
  if ir remote F pressed then
    ClearScreen Port1 with color yellow
    ShowText Port1 at x 20 y 20 size 24 color blue s Can you

mBot Program
forever
  if ir remote ↑ pressed then
    ClearScreen Port1 with color yellow
    ShowText Port1 at x 20 y 20 size 24 color blue s Can you
  if ir remote ↓ pressed then
    ClearScreen Port1 with color yellow
    ShowText Port1 at x 20 y 20 size 24 color blue s May you

mBot Program
forever
  if ir remote ← pressed then
    ClearScreen Port1 with color yellow
    ShowText Port1 at x 20 y 20 size 24 color blue s Can you push the bed right?
```

The block palette on the left includes:

- Motion: move 10 steps, turn 15 degrees, turn 15 degrees, point in direction 90, point towards, go to x: 18 y: 6, go to mouse-pointer, glide 1 secs to x: 18 y: 6, change x by 10, set x to 0, change y by 10, set y to 0, if on edge, bounce, set rotation style left-right.
- Looks: x position, y position.
- Events, Control, Sensing, Operators, Robots.

Step 2: PC - LCD Panel – mBot - Tablet Connection



Step 3: Preparing the patient care environment





Step 4: The patient informs the nurses with the mBot and LCD panel

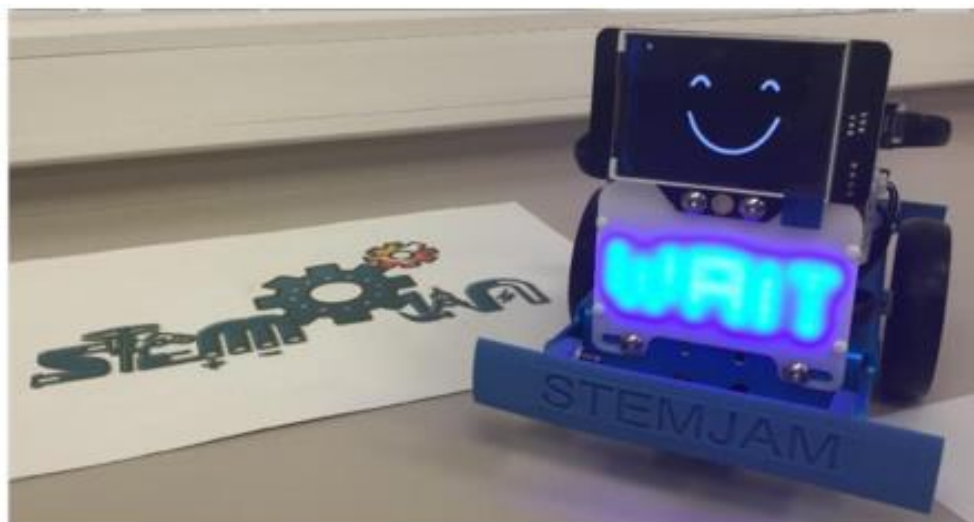
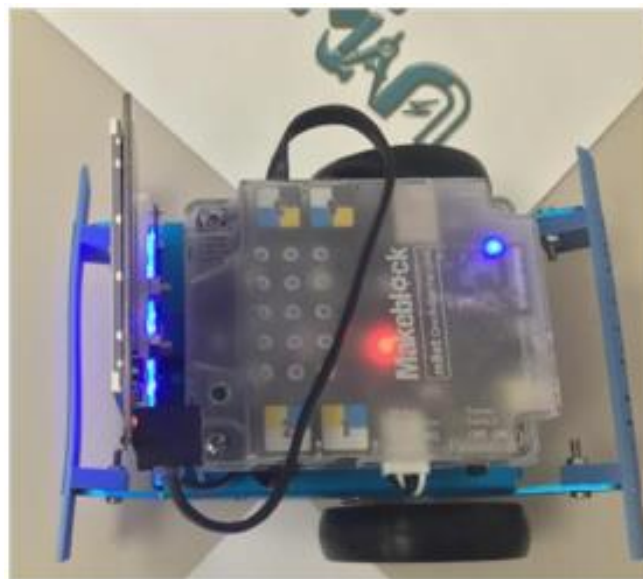
Step 5: Satisfying to patient needs



## Second version

For this activity, two parts have been developed, one that will consist in communicating to two mBots through the IR sensor and another through the Wi-Fi module.

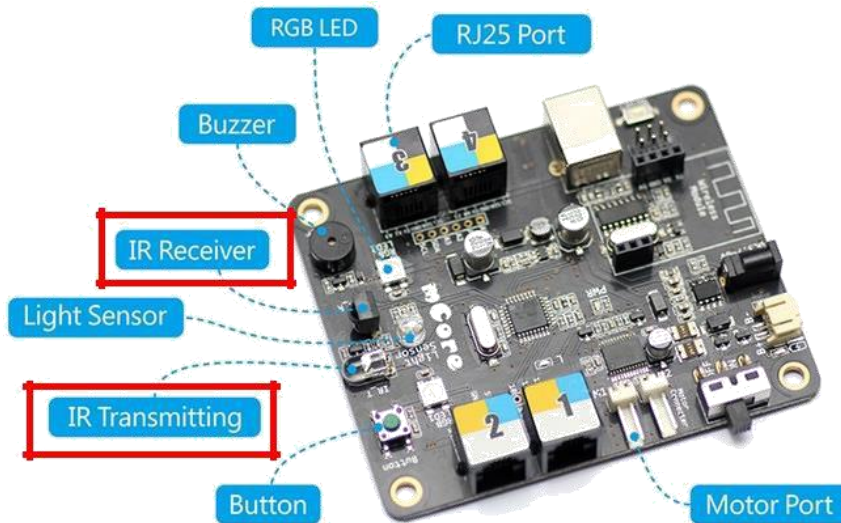
We can incorporate to mBot the LED Matrix or the TFT LCD screen to see the messages and when they are sent and receive these.





## 1. Connecting mBots through the IR sensor:

The mCore board incorporates two IR (infrared) sensors, one that sends (IR Transmitting) and one that receives (IR Receiver), as we can see in the image.



To select the message that we want to send, we have created a list with the messages assigned to the numbers from 0 to 9:

## STEMJAM MESSAGE INDEX

*When you press one of the 9 numbers of the remot control, it will be appears the next messages:*

- 1 - The SCREEN doesn't turn on
- 2 - The PRINTER doesn't not print
- 3 - The KEYBOARD doesn't work well
- 4 - The MOUSE doesn't work well
- 5 - I have a VIRUS on my computer
- 6 - MAIL does not work
- 7 - My computer WORKS very slow
- 8 - The computer SOUND isn't heard
- 9 - Other computer problems

As you can see, the messages are from the computer world, so we will use the mBot to send and receive possible computer failures.

To choose the message we will use the mBot remote control:



Next, we will show the code to see how the messages are sent:

```
mBot Program
forever
  if ir remote R0 pressed then
    m0
  else
    if ir remote R1 pressed then
      m1
    else
      if ir remote R2 pressed then
        m2
      else
        if ir remote R3 pressed then
          m3
        else
          if ir remote R4 pressed then
            m4
          else
            if ir remote R5 pressed then
              m5
            else
              if ir remote R6 pressed then
                m6
              else
                if ir remote R7 pressed then
                  m7
                else
                  if ir remote R8 pressed then
                    m8
                  else
                    if ir remote R9 pressed then
                      m9
                    else
                      show drawing Port3 x: 0 y: 0 draw: WRIT

define m0
  send mBot's message m0
  play tone on note A7 beat 20
  show drawing Port3 x: 0 y: 0 draw: FEND
  wait 1 secs
  show drawing Port3 x: 0 y: 0 draw: FFI
  wait 1 secs

define m1
  send mBot's message m1
  play tone on note A7 beat 20
  show drawing Port3 x: 0 y: 0 draw: FEND
  wait 1 secs
  show drawing Port3 x: 0 y: 0 draw: FFI
  wait 1 secs

define m2
  send mBot's message m2
  play tone on note A7 beat 20
  show drawing Port3 x: 0 y: 0 draw: FEND
  wait 1 secs
  show drawing Port3 x: 0 y: 0 draw: FFI
  wait 1 secs

define m3
  send mBot's message m3
  play tone on note A7 beat 20
  show drawing Port3 x: 0 y: 0 draw: FEND
  wait 1 secs
  show drawing Port3 x: 0 y: 0 draw: FFI
  wait 1 secs

define m4
  send mBot's message m4
  play tone on note A7 beat 20
  show drawing Port3 x: 0 y: 0 draw: FEND
  wait 1 secs
  show drawing Port3 x: 0 y: 0 draw: FFI
  wait 1 secs

define m5
  send mBot's message m5
  play tone on note A7 beat 20
  show drawing Port3 x: 0 y: 0 draw: FEND
  wait 1 secs
  show drawing Port3 x: 0 y: 0 draw: FFI
  wait 1 secs

define m6
  send mBot's message m6
  play tone on note A7 beat 20
  show drawing Port3 x: 0 y: 0 draw: FEND
  wait 1 secs
  show drawing Port3 x: 0 y: 0 draw: FFI
  wait 1 secs

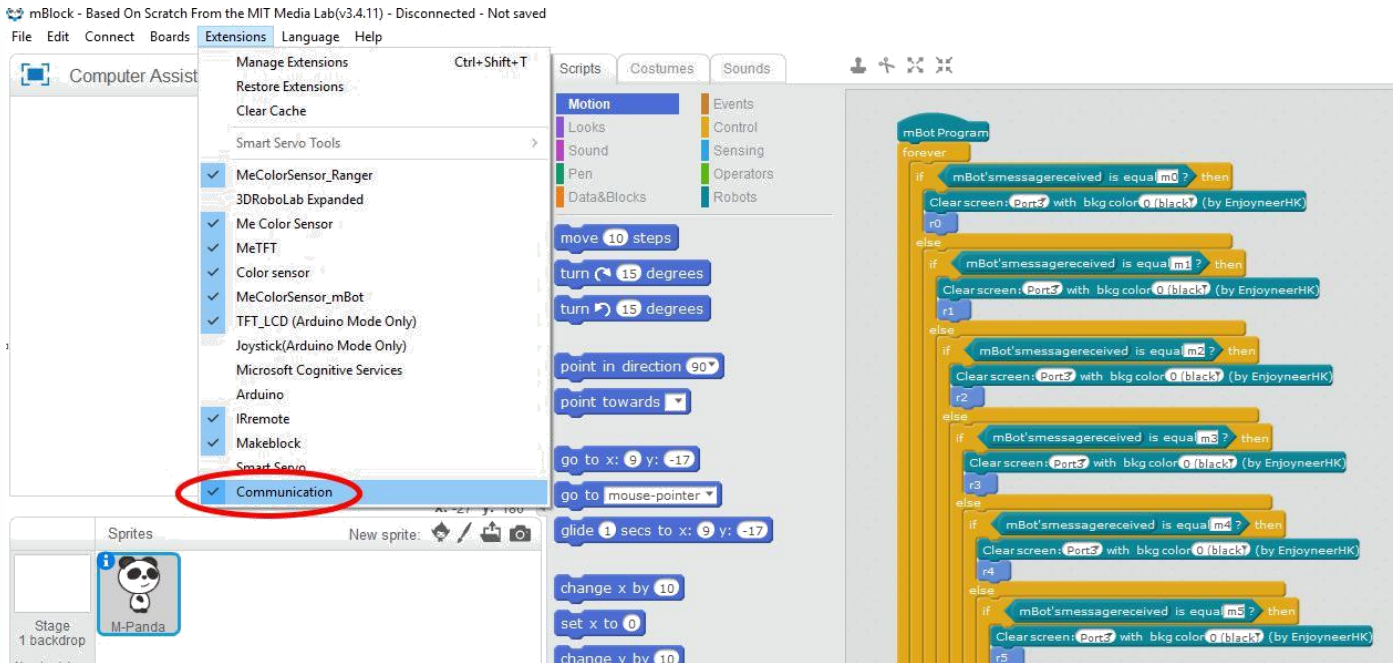
define m7
  send mBot's message m7
  play tone on note A7 beat 20
  show drawing Port3 x: 0 y: 0 draw: FEND
  wait 1 secs
  show drawing Port3 x: 0 y: 0 draw: FFI
  wait 1 secs

define m8
  send mBot's message m8
  play tone on note A7 beat 20
  show drawing Port3 x: 0 y: 0 draw: FEND
  wait 1 secs
  show drawing Port3 x: 0 y: 0 draw: FFI
  wait 1 secs

define m9
  send mBot's message m9
  play tone on note A7 beat 20
  show drawing Port3 x: 0 y: 0 draw: FEND
  wait 1 secs
  show drawing Port3 x: 0 y: 0 draw: FFI
  wait 1 secs
```

As you can see, the main code will always be ready to send the signal, and when you press a number on the remote control, the corresponding function will be activated, which will be responsible for send the message.

To receive the message, we need to activate in the mBlock software, in Extensions, the Communication section:



Now, we can receive the messages.

The number of the received message will be displayed in the LED Matrix and the message text will be displayed on the TFT LCD Screen.

A sound will also be emitted and the mBot lights will change, so that the notification would be more perceptible as possible.

The receiver mBot will always be listening, and the moment it receive a message, the function of the message in question will be activated.



```
mBot Program
forever
  if mBot'smessagereceived is equal m0 ? then
    Clear screen: Port3 with bkg color 0 (black) (by EnjoyneerHK)
    r0
  else
    if mBot'smessagereceived is equal m1 ? then
      Clear screen: Port3 with bkg color 0 (black) (by EnjoyneerHK)
      r1
    else
      if mBot'smessagereceived is equal m2 ? then
        Clear screen: Port3 with bkg color 0 (black) (by EnjoyneerHK)
        r2
      else
        if mBot'smessagereceived is equal m3 ? then
          Clear screen: Port3 with bkg color 0 (black) (by EnjoyneerHK)
          r3
        else
          if mBot'smessagereceived is equal m4 ? then
            Clear screen: Port3 with bkg color 0 (black) (by EnjoyneerHK)
            r4
          else
            if mBot'smessagereceived is equal m5 ? then
              Clear screen: Port3 with bkg color 0 (black) (by EnjoyneerHK)
              r5
            else
              if mBot'smessagereceived is equal m6 ? then
                Clear screen: Port3 with bkg color 0 (black) (by EnjoyneerHK)
                r6
              else
                if mBot'smessagereceived is equal m7 ? then
                  Clear screen: Port3 with bkg color 0 (black) (by EnjoyneerHK)
                  r7
                else
                  if mBot'smessagereceived is equal m8 ? then
                    Clear screen: Port3 with bkg color 0 (black) (by EnjoyneerHK)
                    r8
                  else
                    show drawing Port4 x: 0 y: 0 draw: 3115
```



Some of the messages that the mBot receives are shown:

```
define r2
Clear screen: Port3 with bkg color 0 (black) (by EnjoyneerHK)
wait 1 secs
play tone on note A7 beat 20
show drawing Port4 x: 0 y: 0 draw: [EEP]
Show text: Port3 font size 24 top left corner at x 60 y 180 text/value Message 2 Receiv color 15 (white) (by EnjoyneerHK)
wait 2 secs
show drawing Port4 x: 0 y: 0 draw: [ ]
Draw a line: Port3 from x1 0 y1 110 to x2 320 y2 110 color 15 (white) (by EnjoyneerHK)
wait 0.5 secs
show drawing Port4 x: 0 y: 0 draw: [M2]
Show text: Port3 font size 16 top left corner at x 60 y 80 text/value The printer does not pri color 15 (white) (by EnjoyneerHK)
wait 5 secs
Clear screen: Port3 with bkg color 0 (black) (by EnjoyneerHK)
Show text: Port3 font size 32 top left corner at x 40 y 140 text/value Waiting Messag color 15 (white) (by EnjoyneerHK)
wait 0.1 secs

define r3
Clear screen: Port3 with bkg color 0 (black) (by EnjoyneerHK)
wait 1 secs
play tone on note A7 beat 20
show drawing Port4 x: 0 y: 0 draw: [EEP]
Show text: Port3 font size 24 top left corner at x 60 y 180 text/value Message 3 Receiv color 15 (white) (by EnjoyneerHK)
wait 2 secs
show drawing Port4 x: 0 y: 0 draw: [ ]
Draw a line: Port3 from x1 0 y1 110 to x2 320 y2 110 color 15 (white) (by EnjoyneerHK)
wait 0.5 secs
show drawing Port4 x: 0 y: 0 draw: [M3]
Show text: Port3 font size 16 top left corner at x 40 y 80 text/value The keyboard does not work we color 15 (white) (by EnjoyneerHK)
wait 5 secs
Clear screen: Port3 with bkg color 0 (black) (by EnjoyneerHK)
Show text: Port3 font size 32 top left corner at x 40 y 140 text/value Waiting Messag color 15 (white) (by EnjoyneerHK)
wait 0.1 secs
```

In the file of the activity that you can download, you will see the complete code.

Below are some screenshots of the activity.

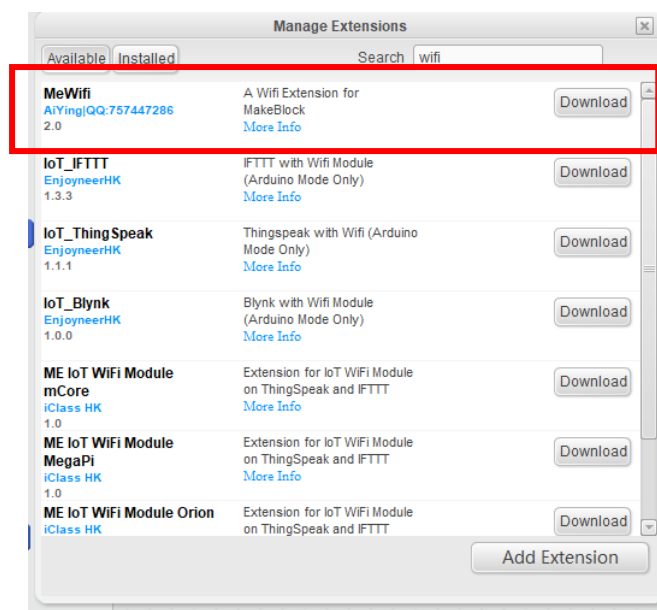




## 2. Connecting mBots through Me WiFi Sensor:

The code of the program would be the same as the previous one, but now we use the Wi-Fi module of Makeblock, which allows us to connect several robots within the same Wi-Fi network.

We also need to install the library in our mBlock Software in order to use this sensor:



The code to receive the messages would be very similar to the previous one, but now we use the sentence of the Wifi module:

```
mBot Program
forever
  if mBot's message received wifi is equal m0 ? then
    Clear screen: Port3 with bkg color 0 (black) (by EnjoyneerHK)
    r0
  else
    if mBot's message received wifi is equal m1 ? then
      Clear screen: Port3 with bkg color 0 (black) (by EnjoyneerHK)
      r1
    else
      if mBot's message received wifi is equal m2 ? then
        Clear screen: Port3 with bkg color 0 (black) (by EnjoyneerHK)
        r2
      else
        if mBot's message received wifi is equal m3 ? then
          Clear screen: Port3 with bkg color 0 (black) (by EnjoyneerHK)
          r3
        else
          if mBot's message received wifi is equal m4 ? then
```

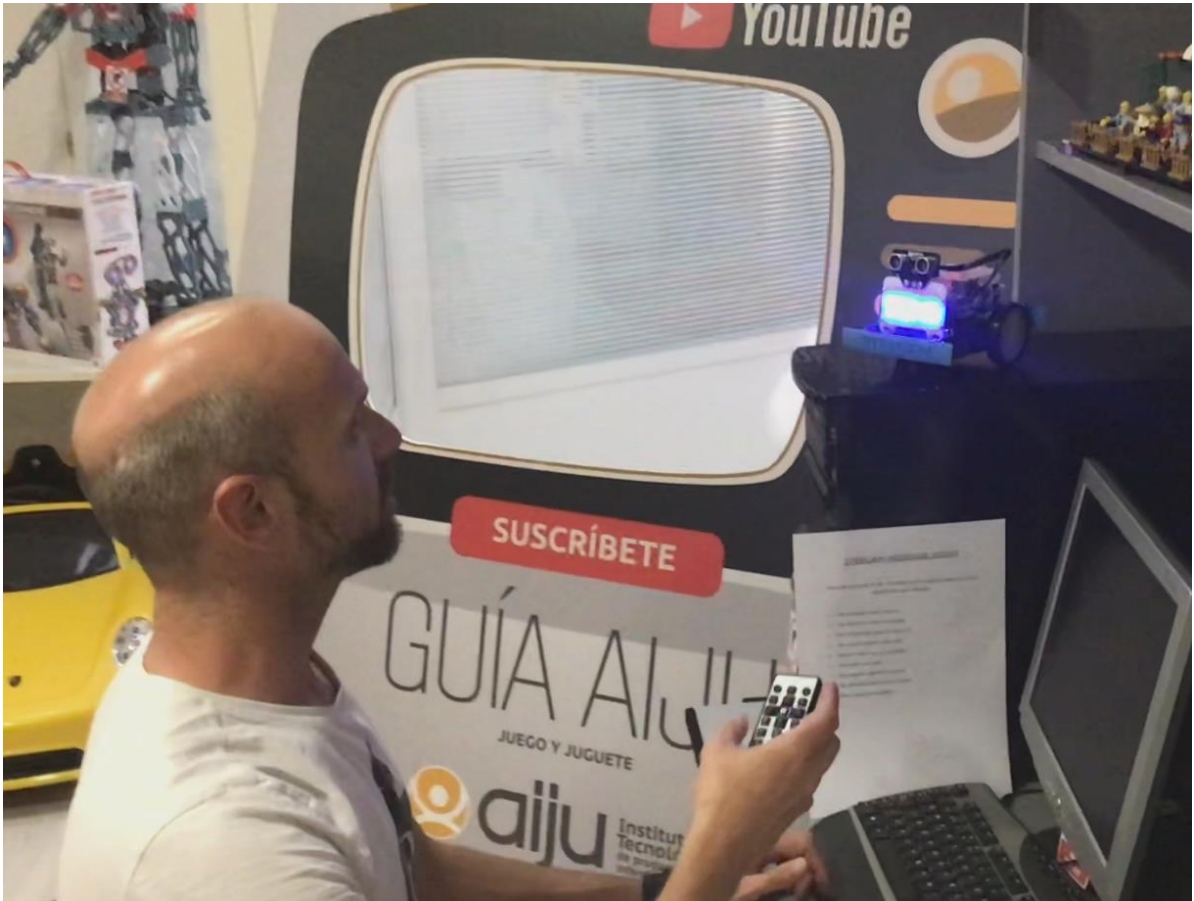
When the message is received, the corresponding function will be activated:

```
define r0
  Clear screen: Port3 with bkg color 0 (black) (by EnjoyneerHK)
  wait 1 secs
  play tone on note A7 beat 20
  show drawing Port4 x: 0 y: 0 draw: RECT
  Show text: Port3 font size 24 top left corner at x 60 y 180 text/value Message 0 Received color 15 (white) (by EnjoyneerHK)
  wait 2 secs
  show drawing Port4 x: 0 y: 0 draw: 
  Draw a line: Port3 from x1 0 y1 110 to x2 320 y2 110 color 15 (white) (by EnjoyneerHK)
  wait 0.5 secs
  show drawing Port4 x: 0 y: 0 draw: M0
  Show text: Port3 font size 16 top left corner at x 40 y 80 text/value Hello, I am the Assistant mBot color 15 (white) (by EnjoyneerHK)
  wait 5 secs
  Clear screen: Port3 with bkg color 0 (black) (by EnjoyneerHK)
  Show text: Port3 font size 32 top left corner at x 40 y 140 text/value Waiting Message color 15 (white) (by EnjoyneerHK)
  wait 0.1 secs
```

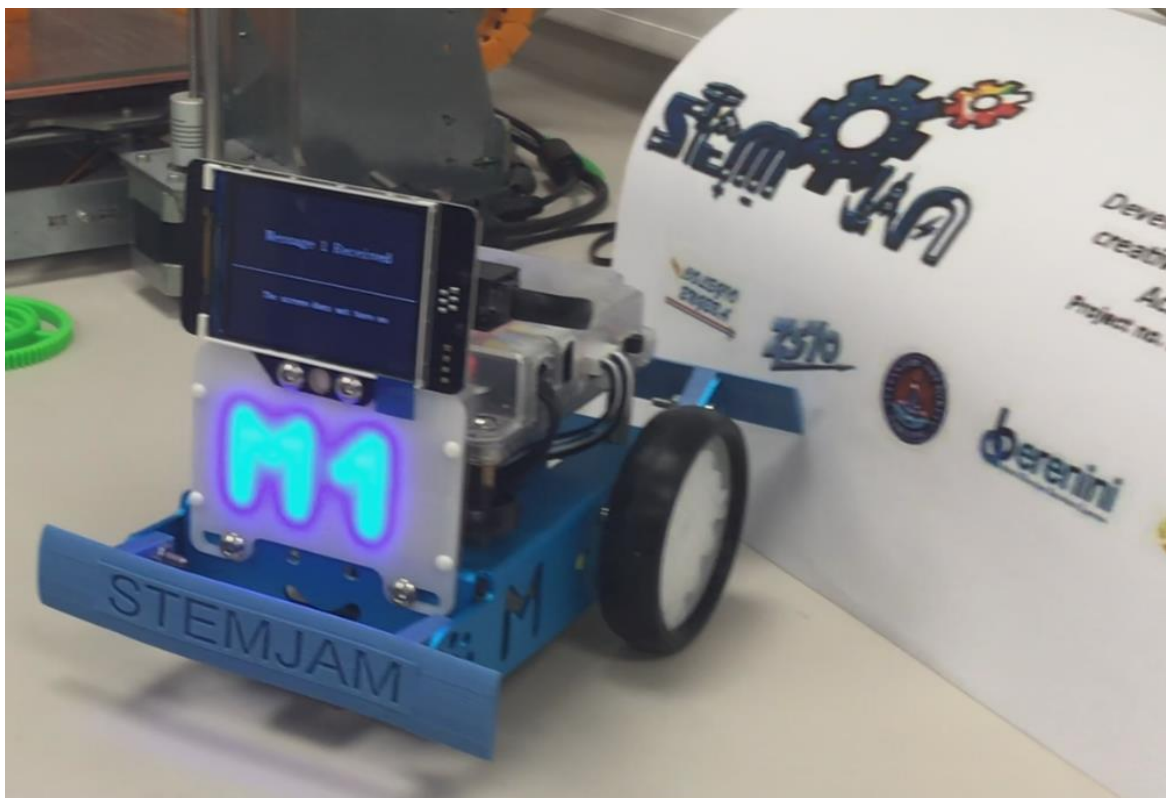
The message will be displayed on the TFT LCD Screen and the message code in the Led Matrix.



Below are pictures of the activity:



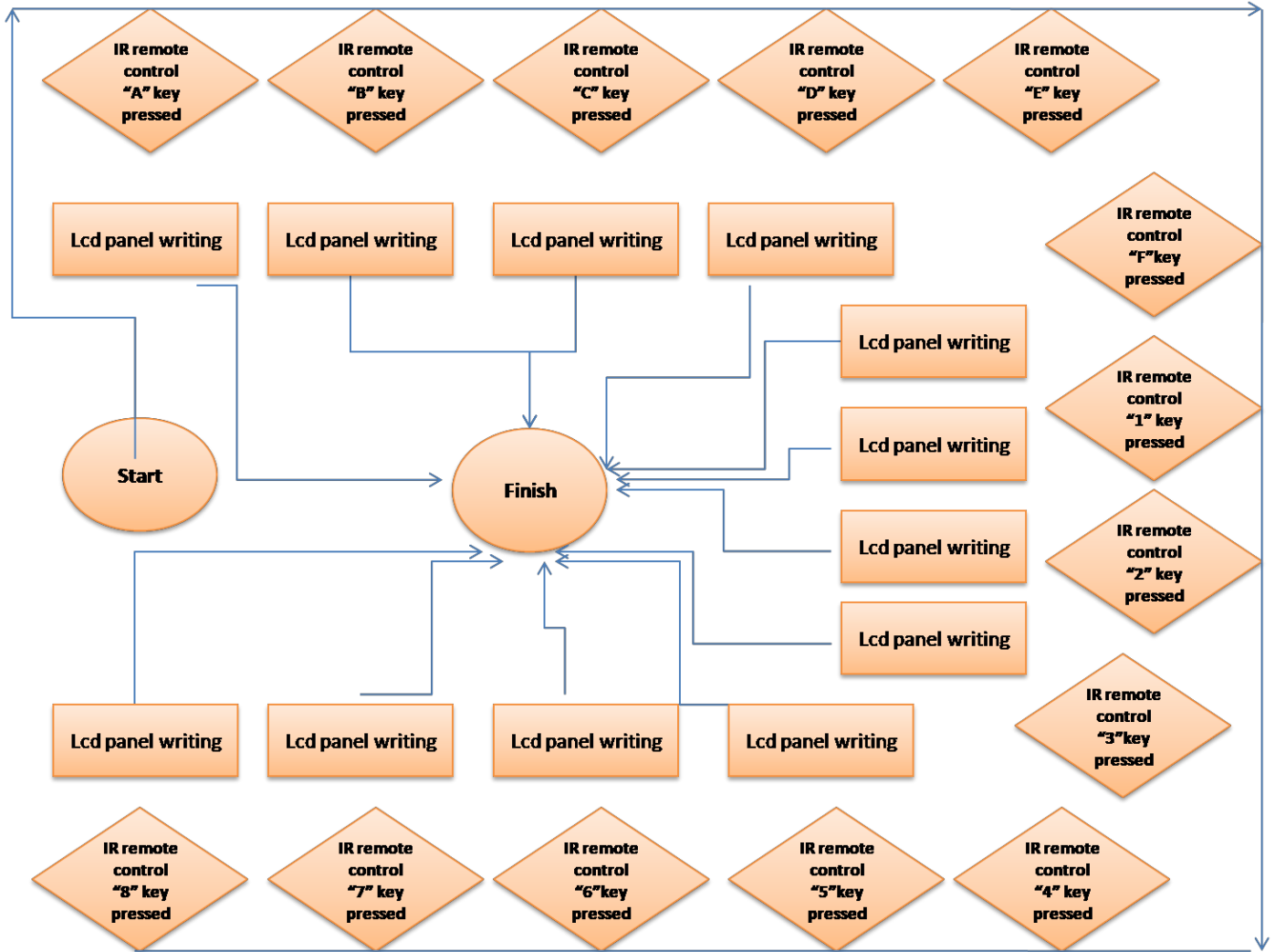
*mBot send the signal*



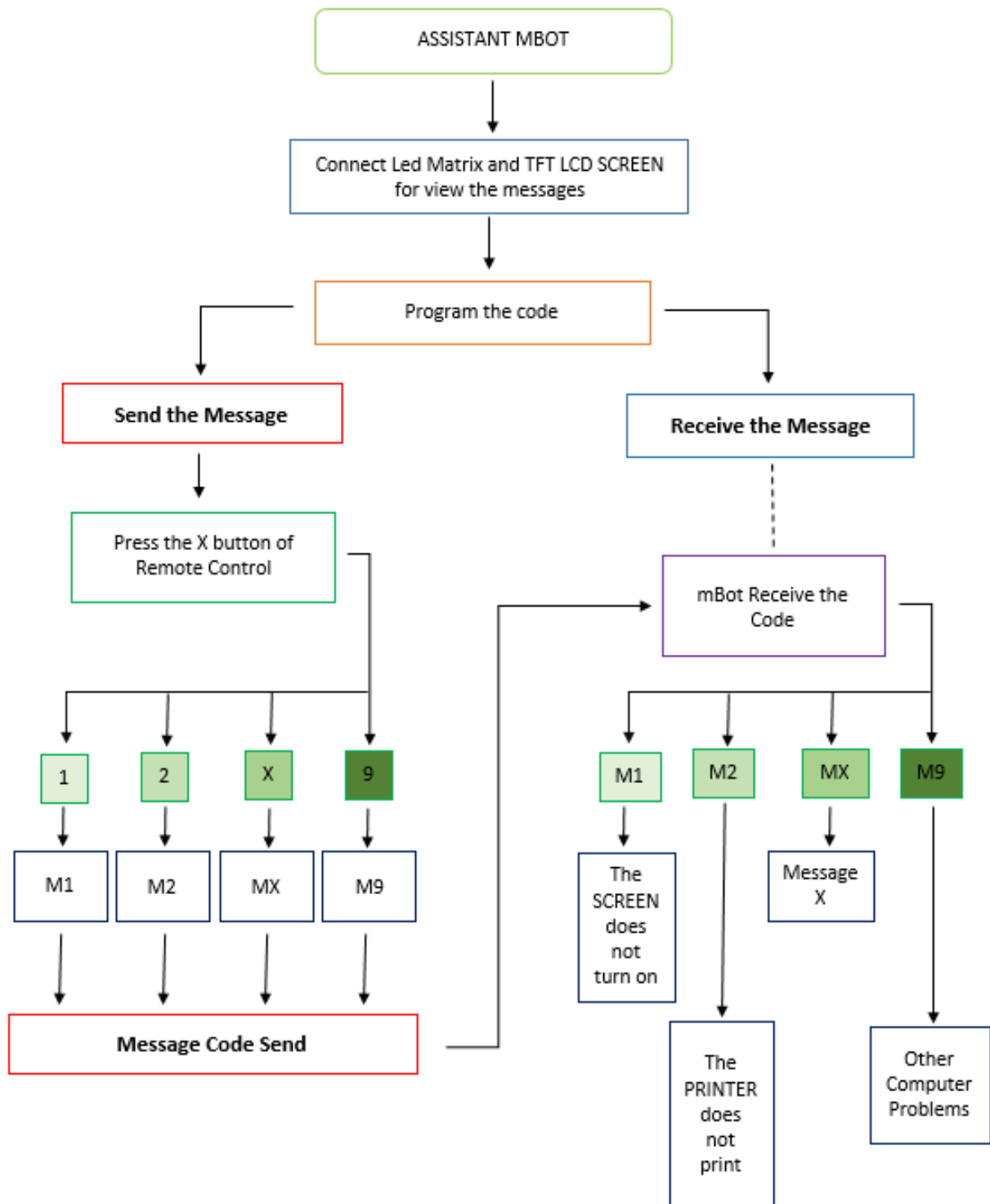
*mBot receive the signal*

# FLOW CHART

## First version



## Second version



## BIBLIOGRAPHY

<http://cloud.makeblock.es/>

<http://www.mblock.cc/example/infrared-communication/>