Plotting sensors data

Difficulty 🟢

Required materials

- 1 EMDACC4 with the Temperature + Humidity sensor
- 1 Micro:bit per group
- 1 Computer per group

Prerequisites

- Basic knowledge of block languages
- Program the central EMDACC4 with the last firmware

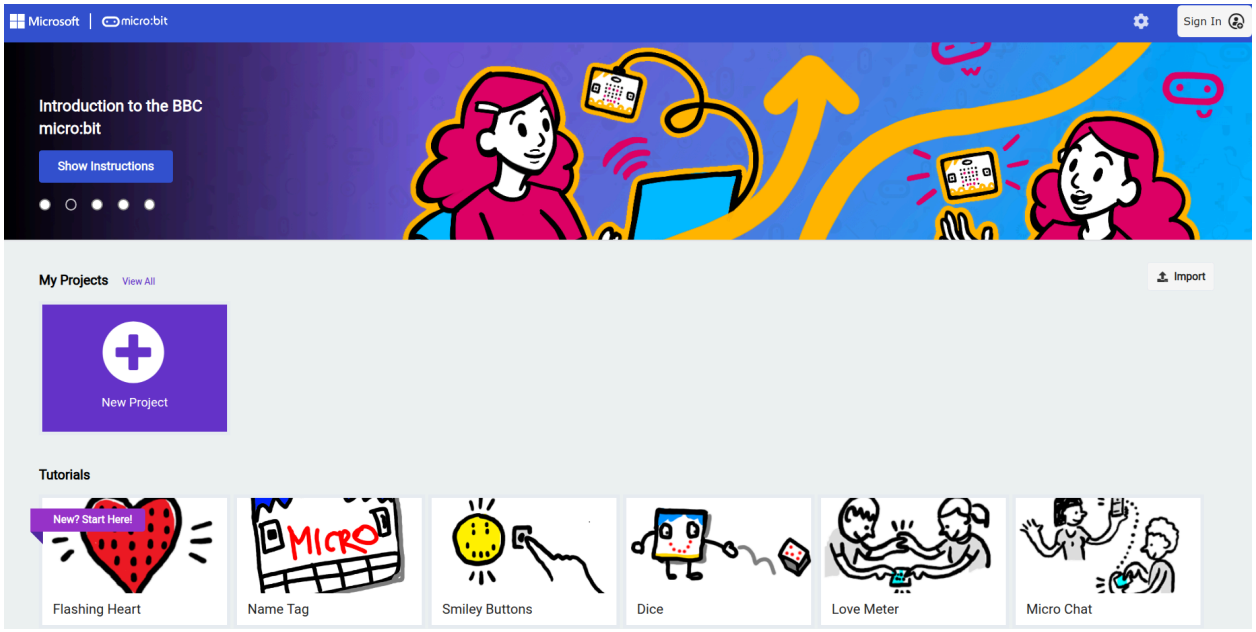
1. Deploy the central EMDACC4

After having loaded the firmware on the Micro:bit that will work as the central device, take the EMDACC4 module equipped with temperature and humidity sensors and connect the Micro:bit to it, then connect the battery to the module and close the enclosure. Turn it and check if the symbol “°C” appears, if it does the board is properly connected and is already broadcasting the data via radio waves!

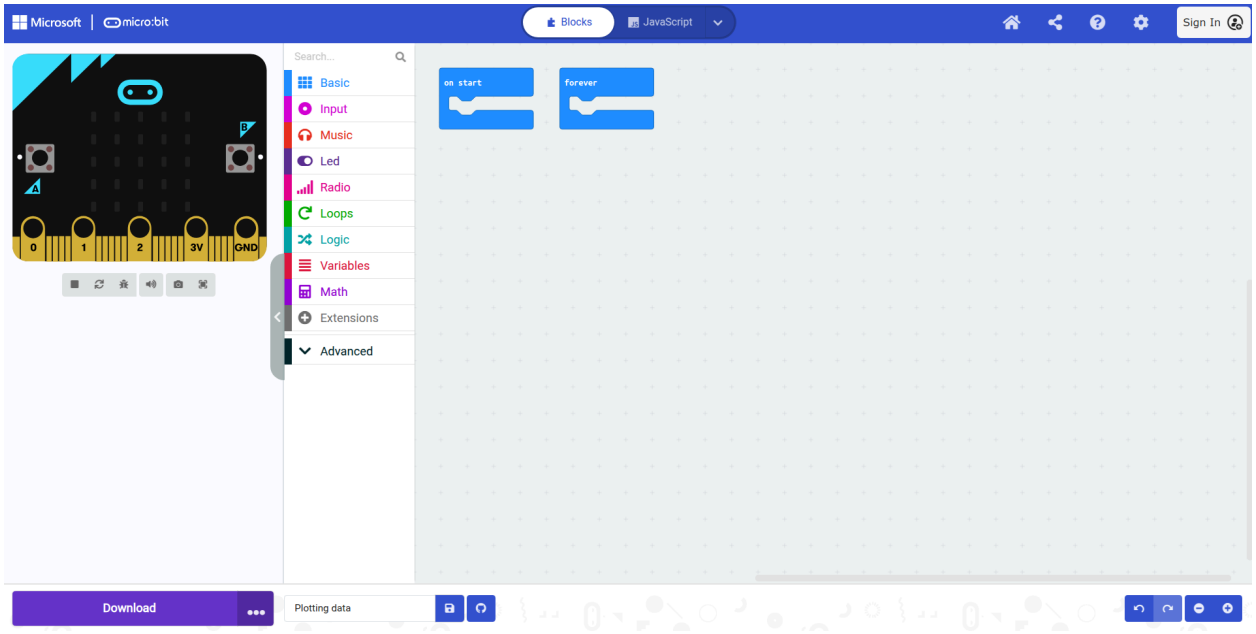
2. Connect the Micro:bit to the computer

Turn on the computer and open the web browser (Chrome is recommended).

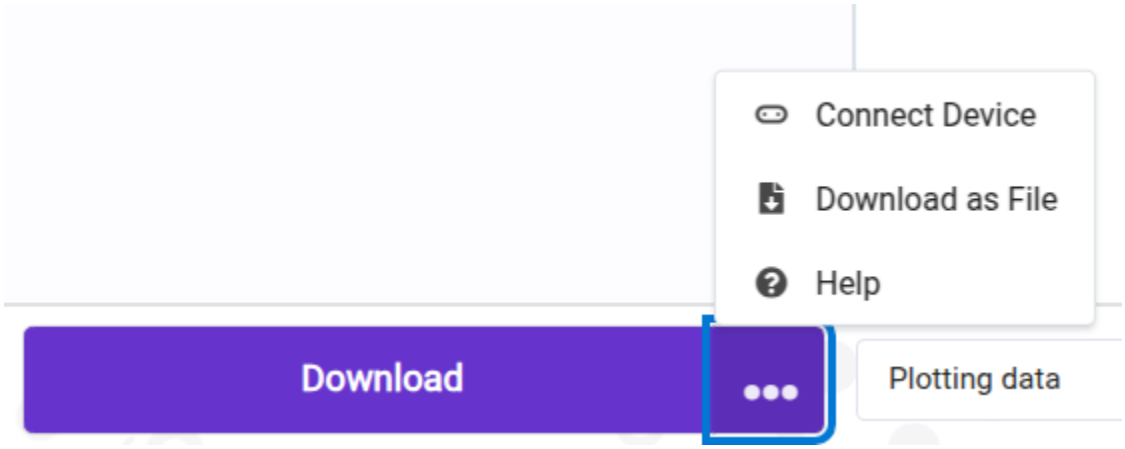
Go on the MakeCode website (https://makecode.microbit.org/), create a new project and give it a meaningful name, for instance “Plotting data”.



The visual programming editor will be opened, take your time to explore it.



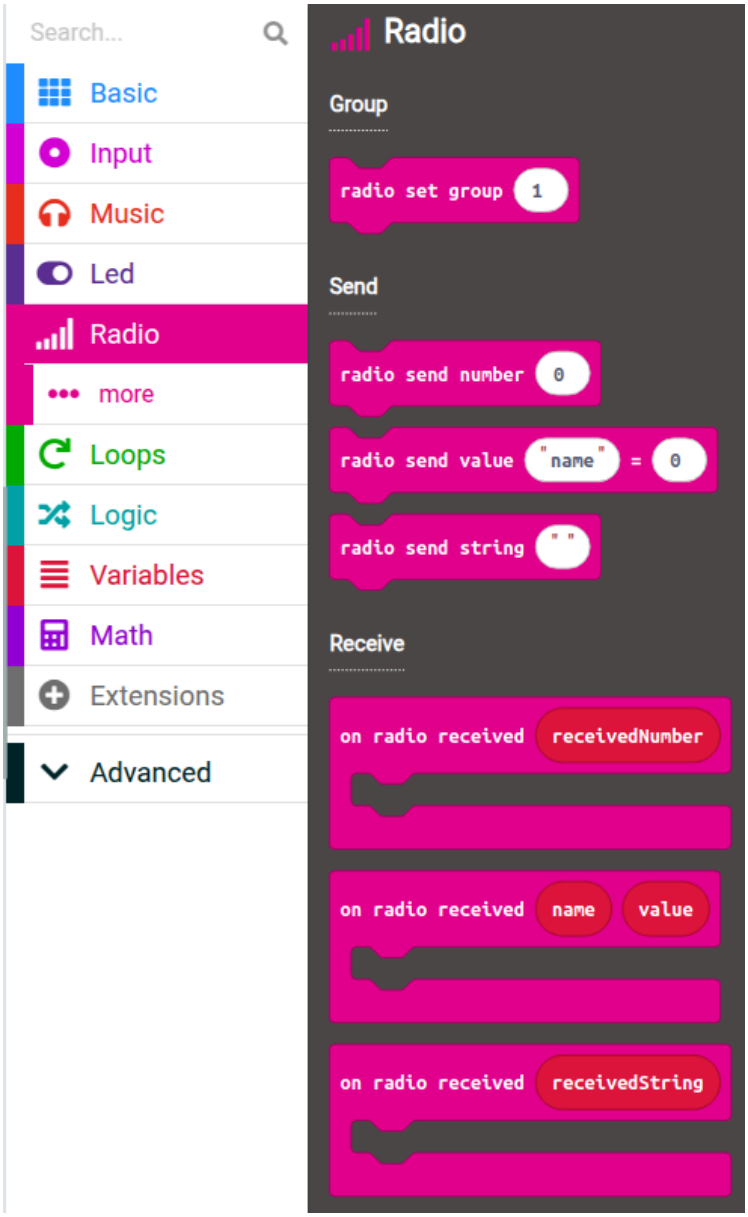
In order to receive data and visualize them, we need first to connect the Micro:bit to the computer and to pair it. Click on the three dots next to the “Download” button and select “Connect Device”.



Then follow the reported instructions: connect via USB the Micro:bit assigned to you, click on “Next” and then on “Pair”. Select the device reported in the list and you are ready to go: now the computer and the Micro:bit, can talk to each other to exchange data.

3. Program the Micro:bit

The program we are going to develop is very simple: we just need a block that will be executed every time we receive a radio packet. We can find this block under the “Radio” collection, in particular we need the block “on radio received <name> <value>”. Such a block is very important since the central EMDACC4 will send packets composed of two parts: a “name” used to understand from which device and which sensor the data are from and a “value” that is the actual value measured by the sensor itself.



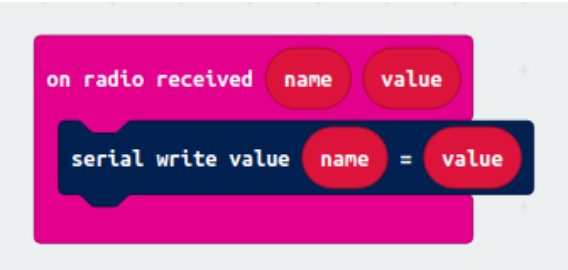
The block we picked before will execute the code for every radio packet we receive. Every time we receive something, we would like to send it to the computer so it can be displayed. For such an aim we need to establish a communication between the computer and the Micro:bit, we use a serial port for such aim.

In order to send data via the serial port we need to use the instructions found under the menu “Advanced” > “Serial”. We need the instruction “serial write value <x> = <number>”, this instruction allow us to send the data to the computer in a formatted way so every value we receive is sent with its label.



For instance, if the temperature sensor is measuring a temperature of 23°, we would like to send via serial a label and along with the value, so “serial write value “temperature” = 23.0”.

Coming back to our case, we need to send via serial the information we receive from the radio packets. So it is time to assemble the two blocks seen above.

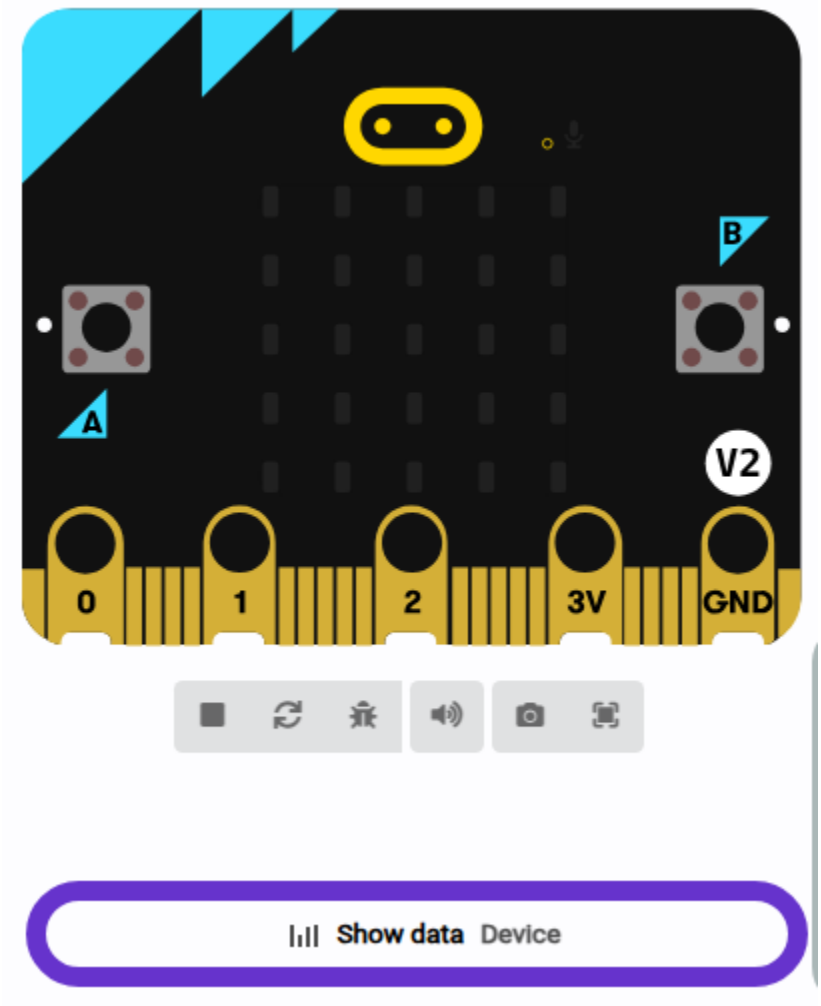


Since we want to send to the computer via serial port the data received from the radio packet, we need to drag the variables “name” and “value” given by the radio block onto the serial write instruction’s parameters.

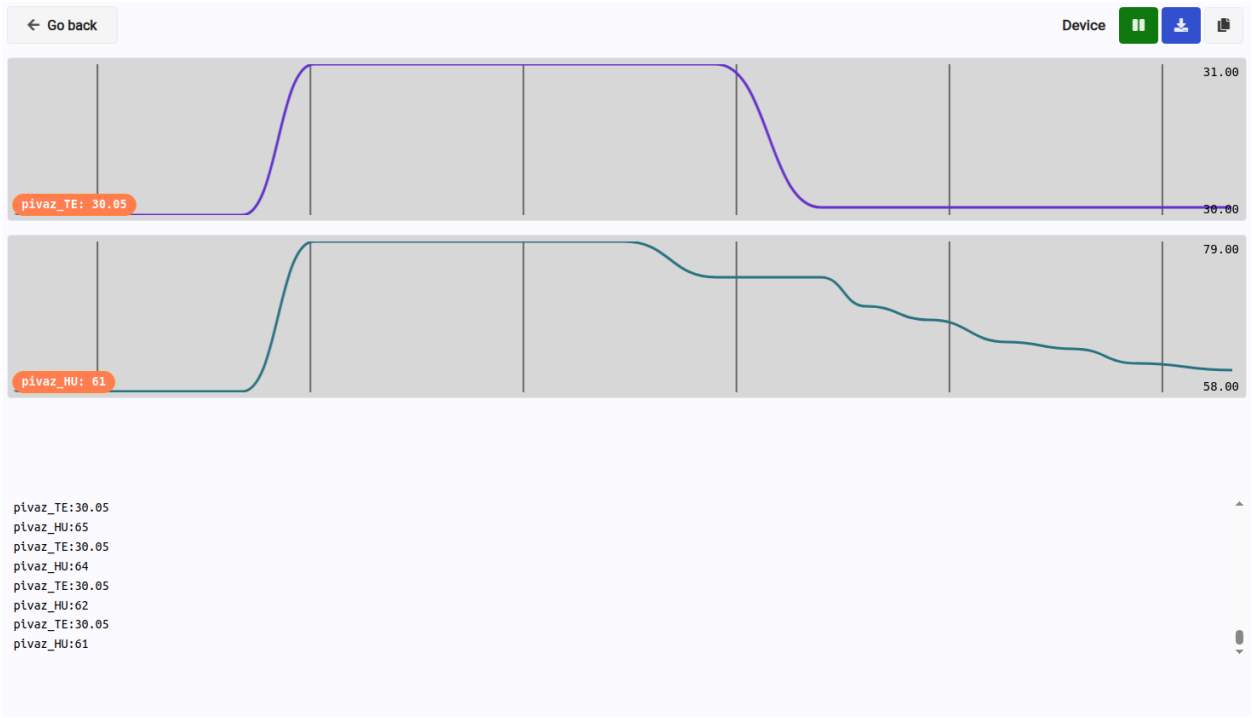
Once we are done assembling the code, it is time to program the device: just push the “Download” button and wait for the procedure to be completed.

4. Visualize the data measured

After loading the code the Micro:bit will reboot and will start running the program we wrote and a new button should appear right below the virtual Micro:bit shown on the web page.



Clicking on “Show data Device”, a new interface should start showing the list of the data sent from the Micro:bit to the computer and the plot of the same data.



On the X axis you will see the time flowing, on the Y axis the value of the variable.

The naming of the variables is composed of two parts: the first (“pivaz”, in our example) indicates the name of the central device (there could be multiple at the same time) while the latter is the name of the variable (“TE” stands for temperature and “HU” for humidity).

Ideas

1. Try to alter the status of the EMDACC4, does the plotted data change as expected?
2. Try to use the EMDACC4 with a different module and plot the produced data.