ERASMUS+ ARTIE
ARTIFICIAL INTELLIGENCE IN EDUCATION

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ARTIE: Artificial Intelligence in Education - challenges and opportunities of the new era:
development of a new curriculum, guide for educators and online course for students
Project co-funded by European Union under Erasmus+ Programme, 2020-1-HR01-KA201-077800

TITLE: Connecting microcontroller with camera and PC and getting started

LEARNING SCENARIO		
School:	*Duration (minutes):*	90
Teacher:	*Students' age:*	13-14

Essential Idea:	Connecting microcontroller with camera and PC

Topics:

- Connecting microcontroller with camera and PC and getting started

Aims:

- Students connecting microcontroller with camera and PC and observing the operation of the device

Outcomes:

- Understanding how camera works

Work forms:

- work in pairs, group work

Methods:

- presentation, talk/discussion, interactive exercise

| ARTICULATION |
|---|
| **Course of action (duration in minutes)** |
| **INTRODUCTION** |

Before we start programing, we need to connect the camera to the microcontroller (micro:bit or Arduino UNO) and the microcontroller to the computer.

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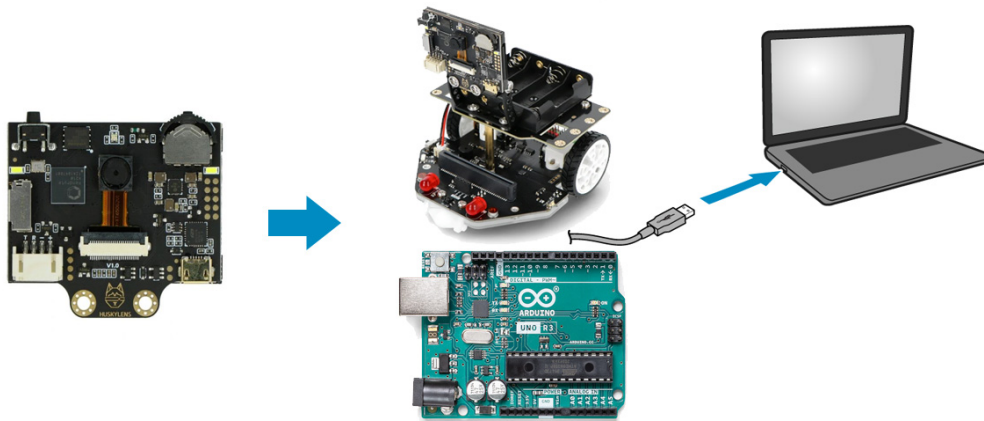
Option 1: Camera > I²Connection > **micro:bit/Maqueen plus** > USB cable > Laptop or PC
Option 2: Camera > I²Connection > **Arduino UNO** > USB cable > Laptop or PC

MAIN PART

There isn't much new to say about USB connection, but you probably haven't heard of I²C.
The Inter-Integrated Circuit (I²C) bus is a two-wire serial interface originally developed by the Phillips Corporation for use in consumer products. It follows a master/slave hierarchy, wherein the master is defined as the device that clocks the bus, addresses the slaves, and writes or reads data to and from registers in the slaves. The slaves are devices that respond only when interrogated by the master, through their unique address. The I²C bus uses only two bidirectional lines, Serial Data Line (SDA) and a Serial Clock Line (SCL).

Scheme
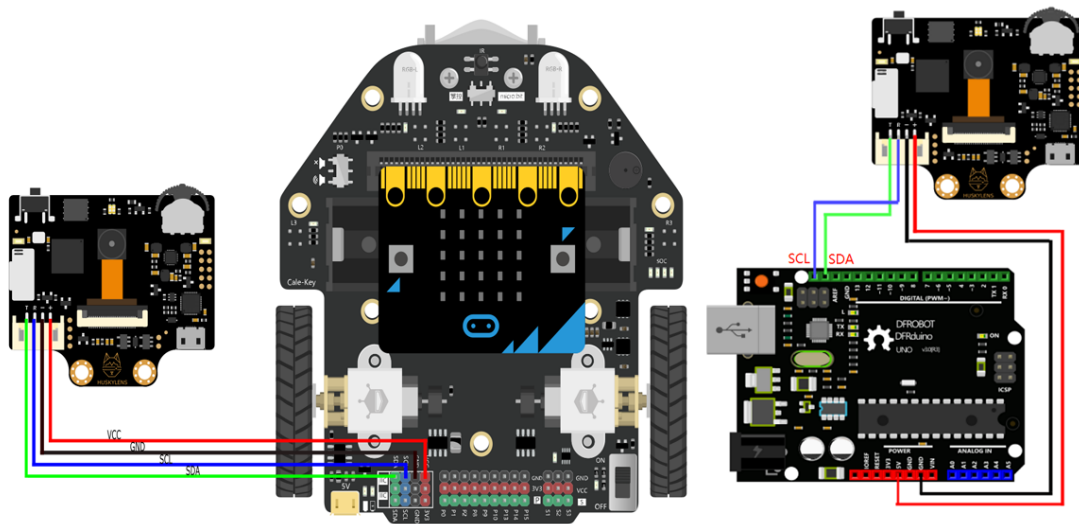
Option 1 (Maqueen plus)   Option 2 (Arduino UNO)

In Option 1 - the solution is very simple and all you have to do is match colours on wires and the connector.

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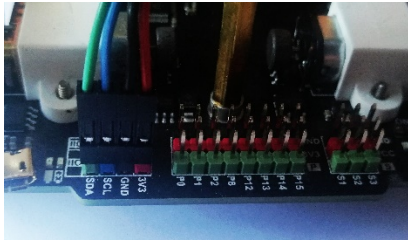
It will be a bit tricky in Option 2 to connect camera cable and Arduino UNO because both connectors are female type so we need 4 jumper wires male to male type which can be found in almost every electronic store which sells DIY parts.
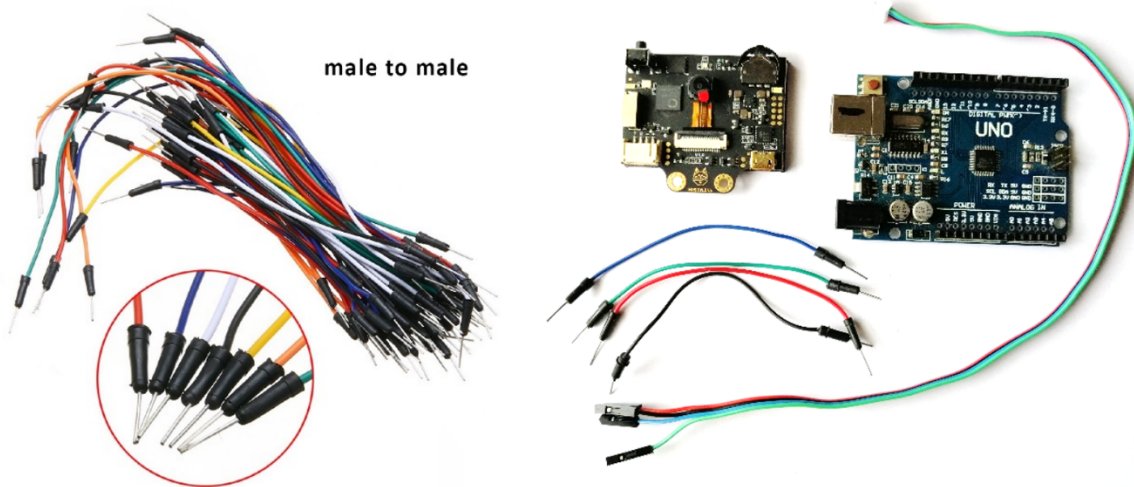

Pick 4 jumpers (red, black, green and blue) to match the corresponding camera pins.
First plug the red jumper to 5V pin on Arduino UNO, black jumper to GND, blue jumper to SCL and green jumper to SDA pin as shown in the pictures bellow.
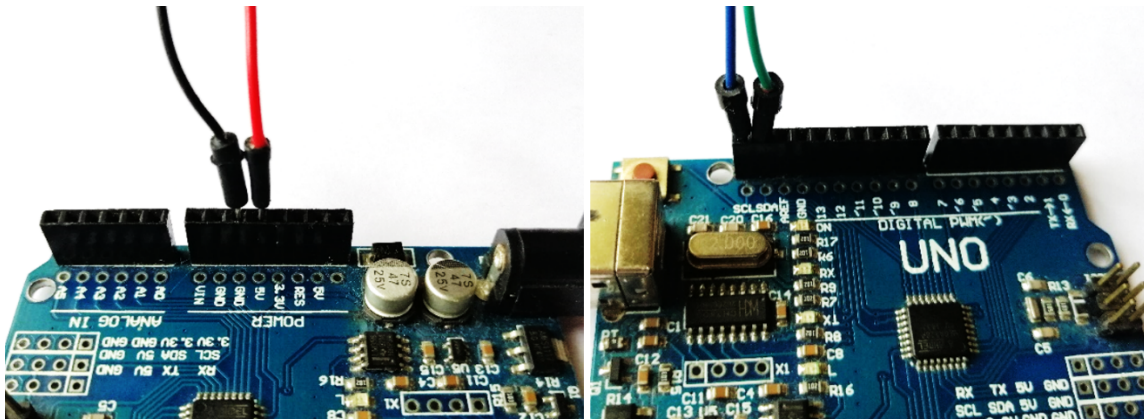

The only thing left to do is to plug the other side of these jumpers to camera connector. Match the colours of jumpers to camera connector wires (black to black, red to red, etc...).

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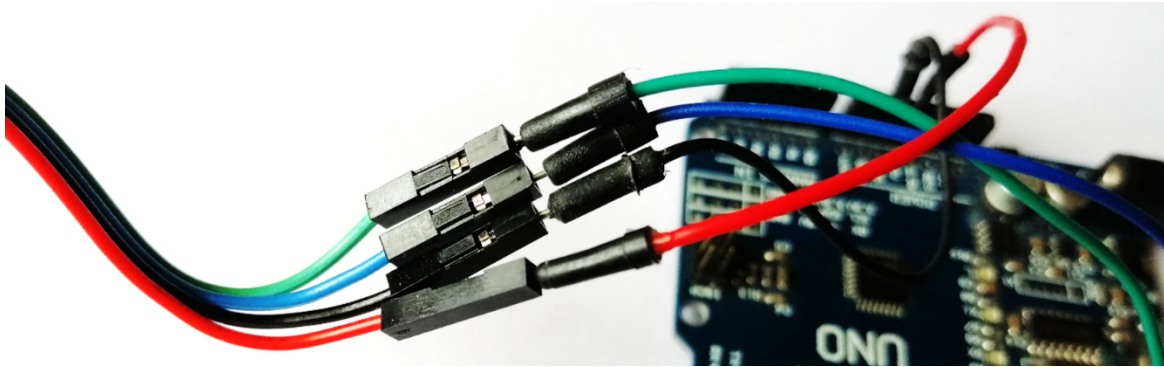
You now have your camera connected to the microcontroller. Plug in USB cable to your Maqueen plus robot or Arduino UNO board and connect it with your laptop or PC.
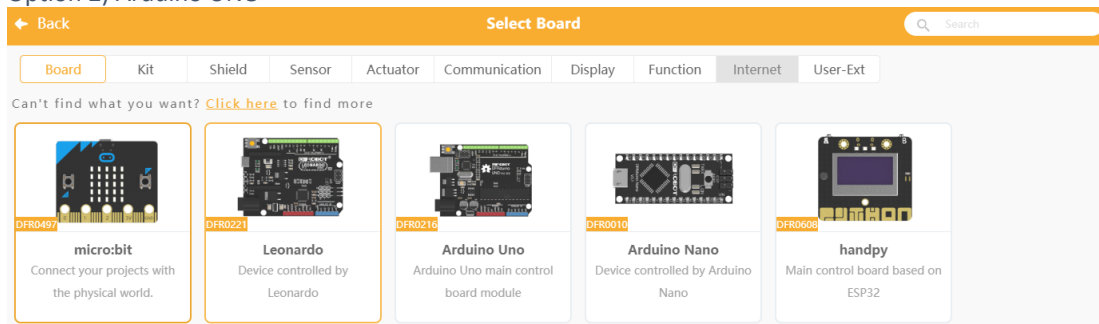
Go to: http://mindplus.cc/download-en.html and download version for your computer operating system. Install and start the Mind+. First, switch to **Offline** mode.
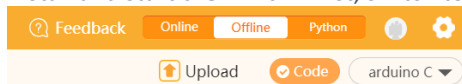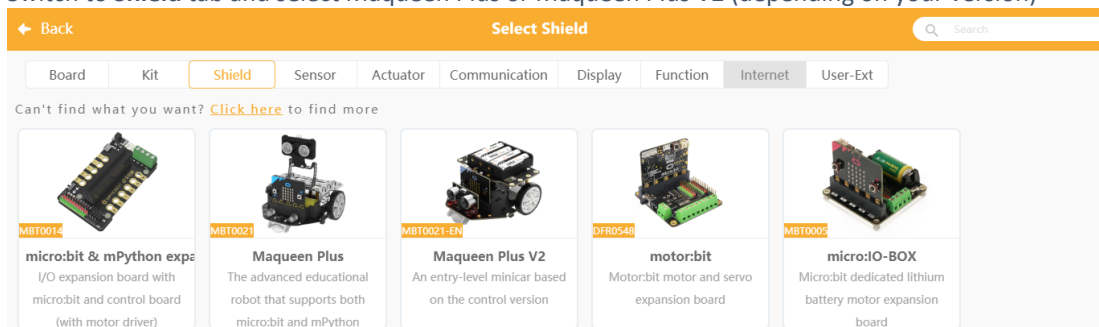

Open Extensions and select **Board**:
Option 1) micro:bit (if you work with) Maqueen plus
Option 2) Arduino UNO

Only for Option 1)
Switch to **Shield** tab and select Maqueen Plus or Maqueen Plus V2 (depending on your version)


Both Option 1) and Option 2)
Switch to **Sensor** tab and select sensor - HUSKYLENS AI Camera

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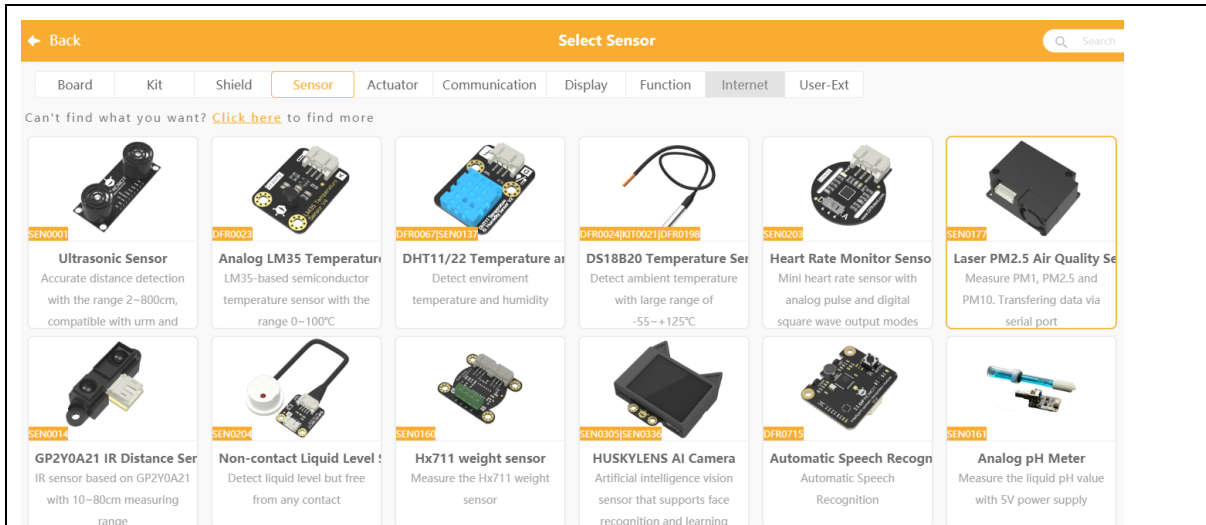
After selecting click on <- Back and you are ready to use selected board/robot and camera. Let's do a test to see if this works.

Before that you need to connect device. Click on Connect Device and select your port and device
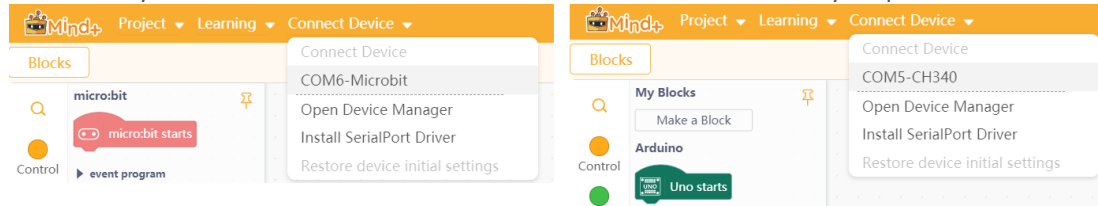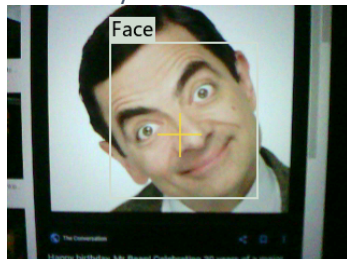

Take the camera and dial the function button to the left until the word "Face recognition" is displayed at the top of the screen.
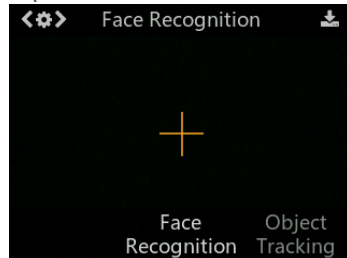

Learning and Detection
1. Face Detection: Point the HuskyLens at any faces. When a face is detected, it will be automatically selected by a white frame with words "Face" on the screen.

Tips: If you want HuskyLens to learn or recognize your face, that is, take a selfie, you can't see the screen at this time, you can determine the status according to the different colours of the RGB indicator.
2. Face Learning: Point the "+" symbol at a face, short press the "learning button" to learn the face. If the same face is detected by HuskyLens, a blue frame with words "Face: ID0" will be displayed on the screen,which indicates that HuskyLens has learned the face and can recognize it now.

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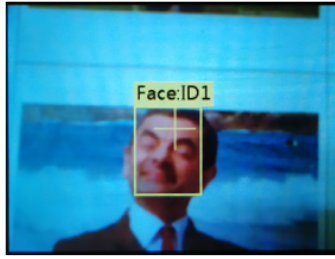
Visit: https://wiki.dfrobot.com/HUSKYLENS_V1.0_SKU_SEN0305_SEN0336#target_15 for complete Face recognition reference.

Go to Mind+ and start programming. After micro:bit/Uno starts use HuskyLens initialize pin until success block and configure it for I^{2}C as shown on picture below for each option.
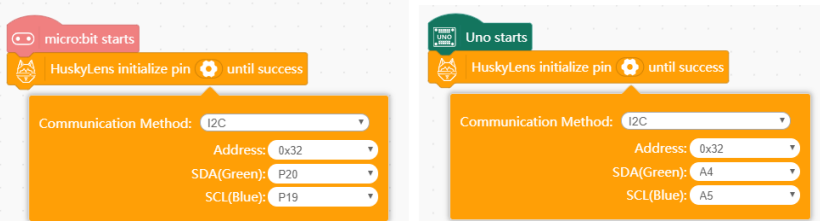
Next, use the block **HuskyLens switch algorithm to Face recognition** for both options.

It is followed by the forever loop which detects if face on camera is recognized as Face ID0.
If face is detected in Option 1), you will see face on micro:bit display. If not, you will see X sign.
If face is detected in Option 2), it will turn on the onboard LED (D13). If not, LED is turned off.
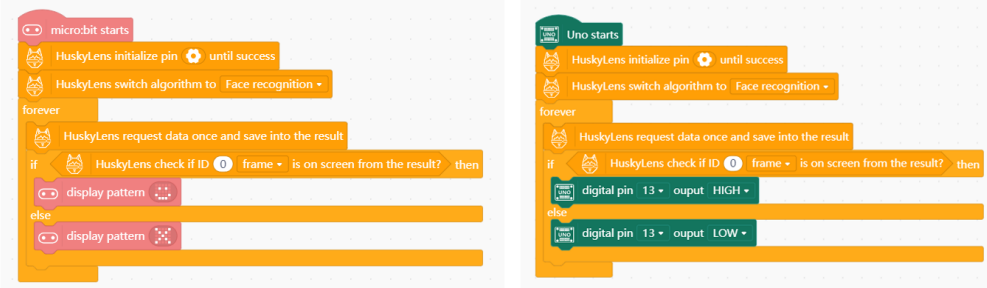
Press the **Upload** to transfer this code to the micro:bit or Arduino UNO.

After code is transferred, point the camera at the "learned" face and LED on D2 should be turned on. If you move it away from face, D2 is turned off.

If it works as described – everything is fine and ready for use in our mobile AI robot.

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CONCLUSION

HuskyLens is an easy-to-use AI machine vision sensor with 7 built-in functions: face recognition, object tracking, object recognition, line tracking, colour recognition, tag recognition and object classification. Through the UART / I2C port, HuskyLens can connect to Arduino and micro:bit to help you make very creative projects without dealing with complex algorithms.

Do the K.W.L. (**K**now, **W**ant, **L**earned) chart with your students.

What I **K**now	What I **W**ant to Know	What I **L**earned

Methods   **Work forms**

presentation   *interview*   *individual work*
talk/discussion   *demonstration*   *work in pairs*
work on the text   *group work*
                                                     frontal work

Material:

- http://mindplus.cc/download-en.html
- https://wiki.dfrobot.com/HUSKYLENS_V1.0_SKU_SEN0305_SEN0336#target_15

Literature

PERSONAL OBSERVATIONS, COMMENTS AND NOTES

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