Microprocessors Lab

1- Introduction

Instructor: Dr. Mohsen Raji

Graders:

- Mohammad Hossein Hashemi
- Negin Shirvani

Shiraz University – Fall 2022

Based on the slides by:

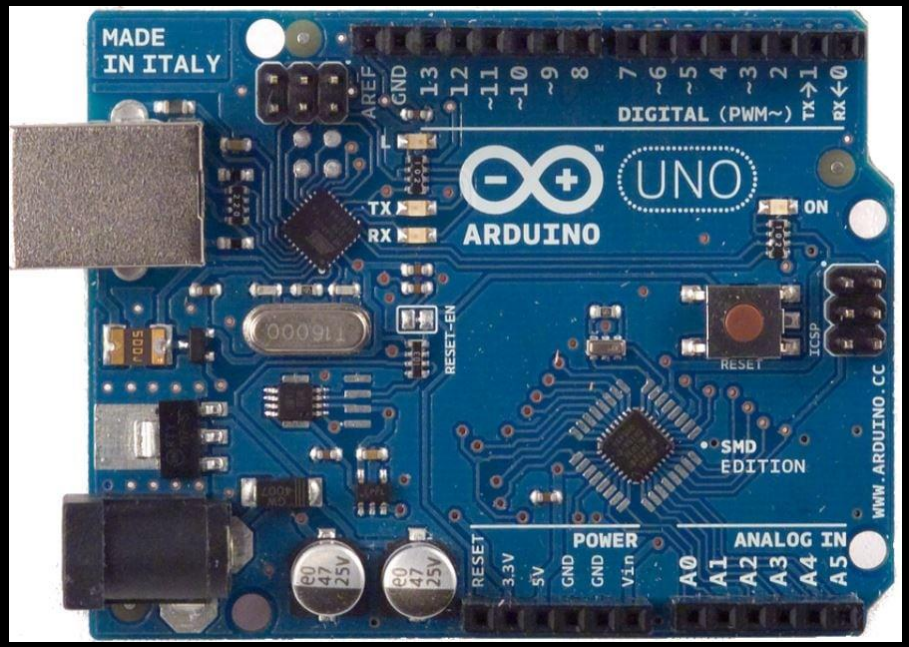
- Hossein Dehghanipour
- Mohammad Hossein Allah Akbari

What is Arduino?

- *Arduino* is the name of a series of boards that are structurally based on AVR or ARM microcontrollers.

- There is a Microcontroller on each of these boards as a core and besides that exist other essential elements.

For more information, feel free to visit its official website



Advantages?

- Arduino is open source, which means that anyone anywhere in the world can build a library and share it with others for FREE!
- It doesn’t require a surplus hardware as its programmer.
- We have access to all ports.
- Supports all Operating Systems (Windows, Mac, Linux)
- Huge number of sample projects and examples.
- Different Input/Output ports (GPIO)

Disadvantages?

- A little expensive compared to other development board
- Lack of multitasking (who cares at the very beginning?)
- Not very much optimized for performance or power-efficiency

But who cares about all these at the very beginning when it is so easy to start to learn/use it? (;

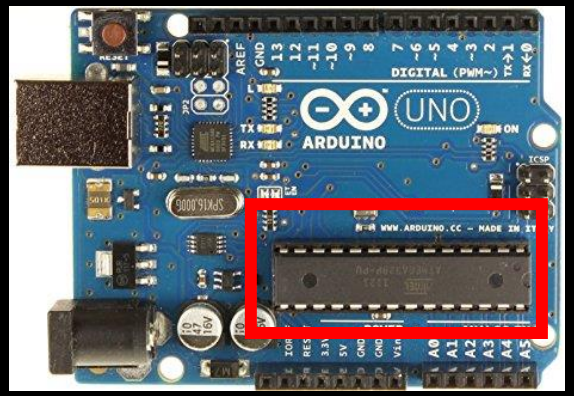
Arduino Types

- Each type of Arduino has different applications (usages).
- Arduino Uno and Arduino Mega are the types that most of new comers use.

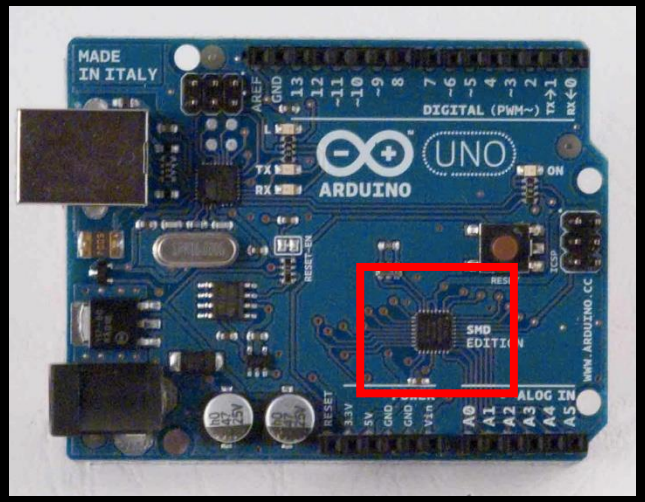
Arduino Uno

Arduino Uno is available in two types: R3 and R3 SMD. The only difference between them is the type of microcontroller that is used as their core (DIP or SMD).

If the Microcontroller is DIP, it can be easily removed and replaced by another microcontroller (portable)



But id the microcontroller's type is SMD, it cannot be removed but there is a little advantage here; there is a lot more space on the board to add other customized elements.



Arduino Uno

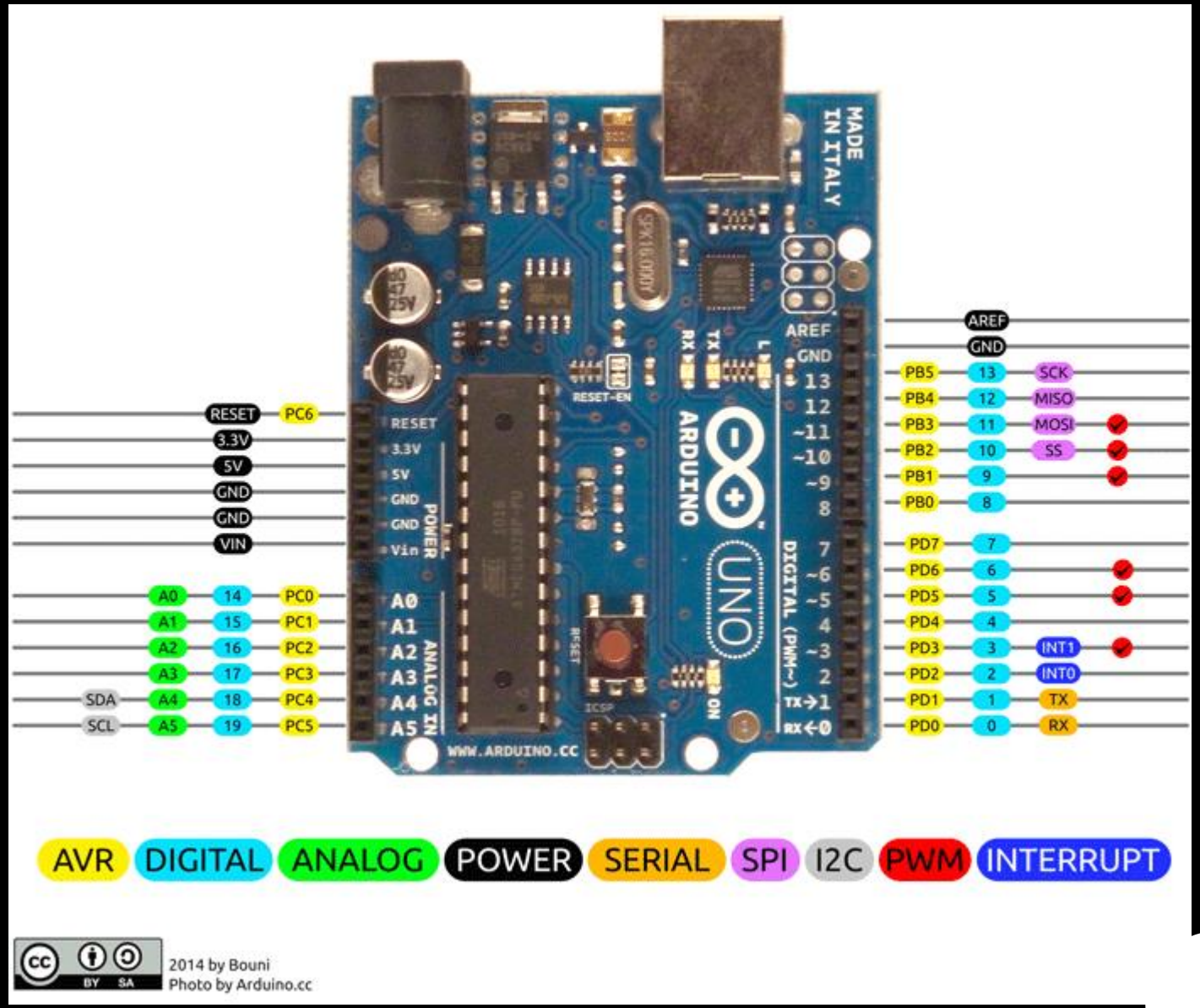
Processor	Atmega328
Source Voltage	5 V
Input Voltage	Between 7 to 12 V
Frequency	16 MGHz
I/O Ports	14 pins (6 PWM)
Analog Input Pins	6 pins
Flash Size	32 KB (0.5 KB Boot Loader)
SRAM Size	2 KB
EEPROM	1 KB

Arduino Mega (Atmega 2560)

Processor	Atmega2560
Source Voltage	5 V
Input Voltage	Between 7 to 12 V
Frequency	16 MGHz
I/O Ports	54 pins (15 PWM)
Analog Input Pins	16 pins
Flash Size	256 KB (8 KB Boot Loader)
SRAM Size	8 KB
EEPROM	4 KB

Arduino Internal Units

- PWM
- Serial Communication Unit (USART, UART)
- SPI Unit
- I2C & TWI Unit.
- Interrupt Unit
- Digital/Analog Unit



Reference: https://components101.com/microcontrollers/arduino-uno

Part II

- Set up your IDE
- Set up the Emulator

I - Required Software and platforms

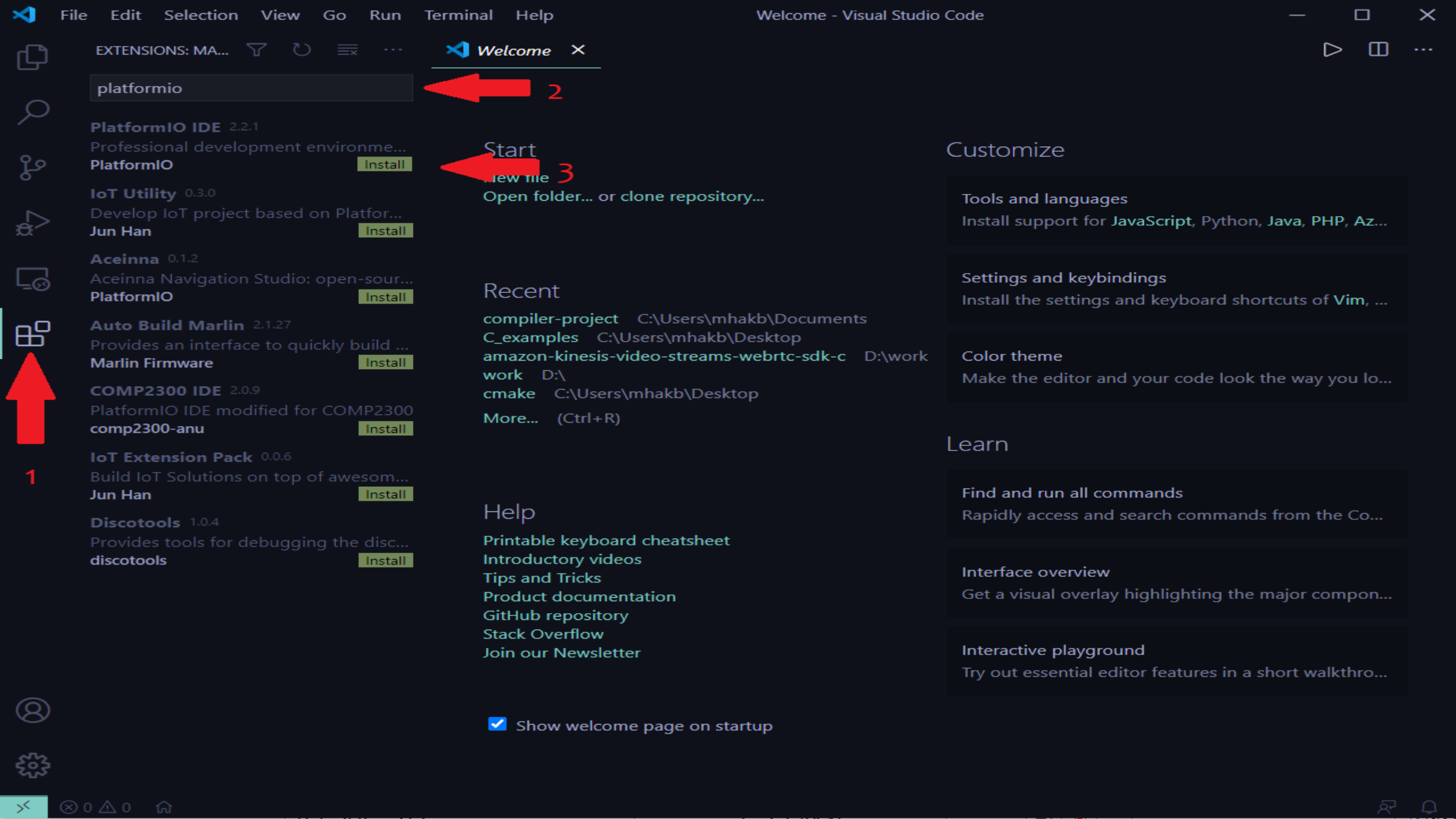
The development environment for this course is Visual Studio code and all of the projects should be built and executed using PlatfomIO extension.

I.I - Installing Visual Studio code

- Microsoft Visual studio code can be downloaded from Microsoft's official website.
- The installation process is explained in this link.

I.II - Installing PlatformIO

For installing PlatformIO, you need to open Visual studio code and search ‘platformio’ in the extensions section as described below:


File Edit Selection View Go Run Terminal Help
Welcome - Visual Studio Code
EXTENSIONS: MA...
platformio
PlatformIO IDE 2.2.1
Professional development environme...
PlatformIO
Install
IoT Utility 0.3.0
Develop IoT project based on Platfor...
Jun Han
Install
Aceinna 0.1.2
Aceinna Navigation Studio: open-sour...
PlatformIO
Install
Auto Build Marlin 2.1.27
Provides an interface to quickly build ...
Marlin Firmware
Install
COMP2300 IDE 2.0.9
PlatformIO IDE modified for COMP2300
comp2300-anu
Install
IoT Extension Pack 0.0.6
Build IoT Solutions on top of awesom...
Jun Han
Install
Discotools 1.0.4
Provides tools for debugging the disc...
discotools
Install
1
2
3
Welcome
Start
New file
Open folder... or clone repository...
Recent
compiler-project C:\Users\mhakb\Documents
C_examples C:\Users\mhakb\Desktop
amazon-kinesis-video-streams-webrtc-sdk-c D:\work
work D:\
cmake C:\Users\mhakb\Desktop
More... (Ctrl+R)
Help
Printable keyboard cheatsheet
Introductory videos
Tips and Tricks
Product documentation
GitHub repository
Stack Overflow
Join our Newsletter
Customize
Tools and languages
Install support for JavaScript, Python, Java, PHP, Az...
Settings and keybindings
Install the settings and keyboard shortcuts of Vim, ...
Color theme
Make the editor and your code look the way you lo...
Learn
Find and run all commands
Rapidly access and search commands from the Co...
Interface overview
Get a visual overlay highlighting the major compon...
Interactive playground
Try out essential editor features in a short walkthro...
Show welcome page on startup
0 0

I.III - Simulating Arduino Board

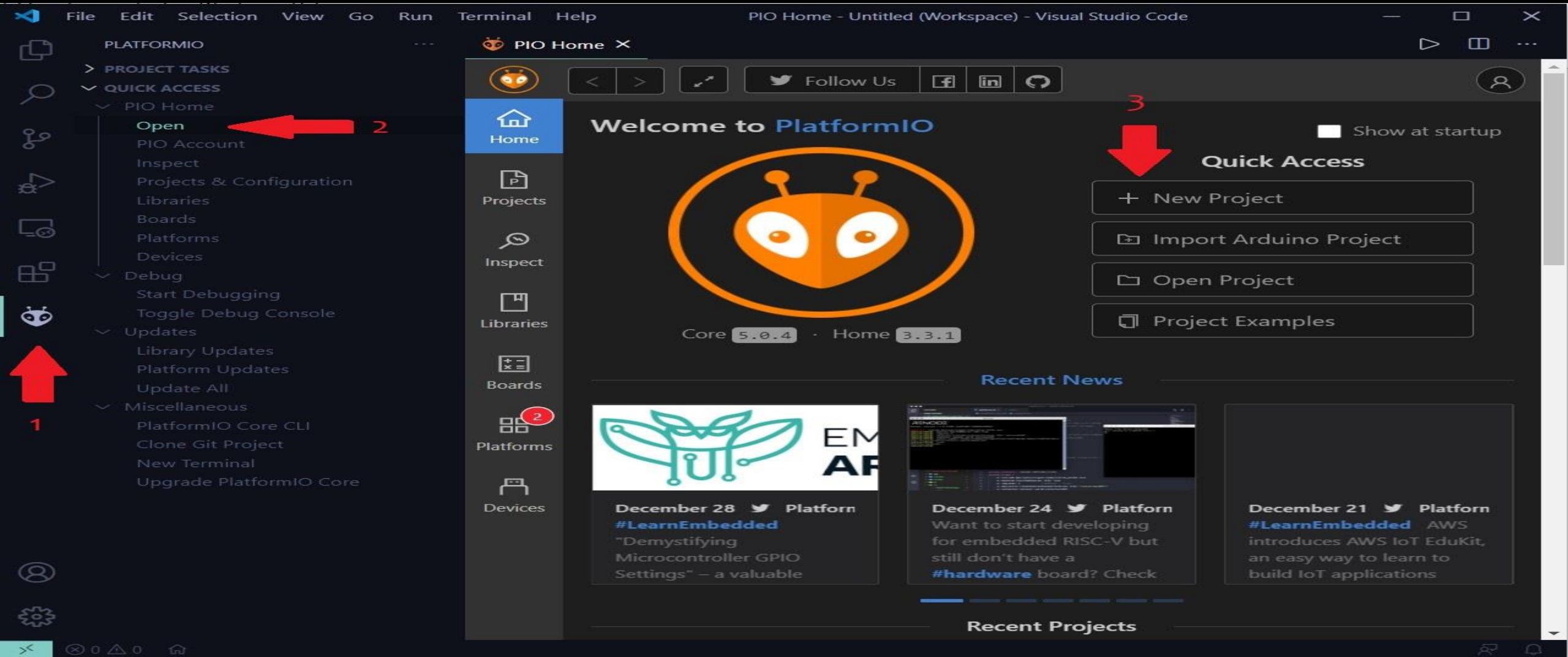
In order to execute your Arduino programs you'll need an Arduino simulator. For simulating the Arduino board you can install Proteus and add the following library to the Proteus library. Description and download link is available in the Link

After downloading the library, copy its content and paste it in the following path:

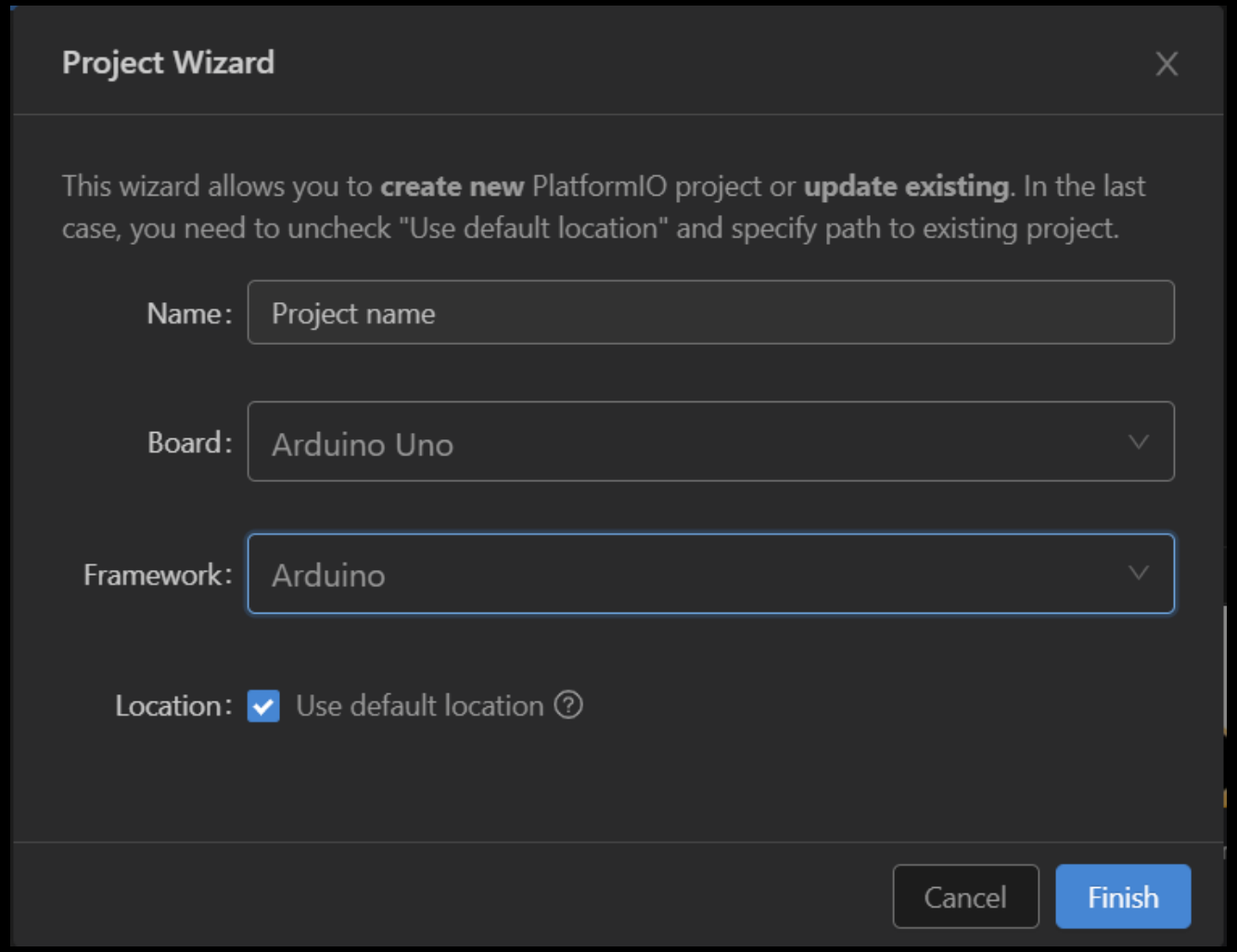
Ex : E:\Programs\Proteus_8_11_DataPath\Library

II. Creating your first project

After the installation is complete you should be able to see the PlatformIO's icon on the Visual studio code's sidebar. Click on it's icon, select open and after the menu appeared select '+New project' as described in the picture:

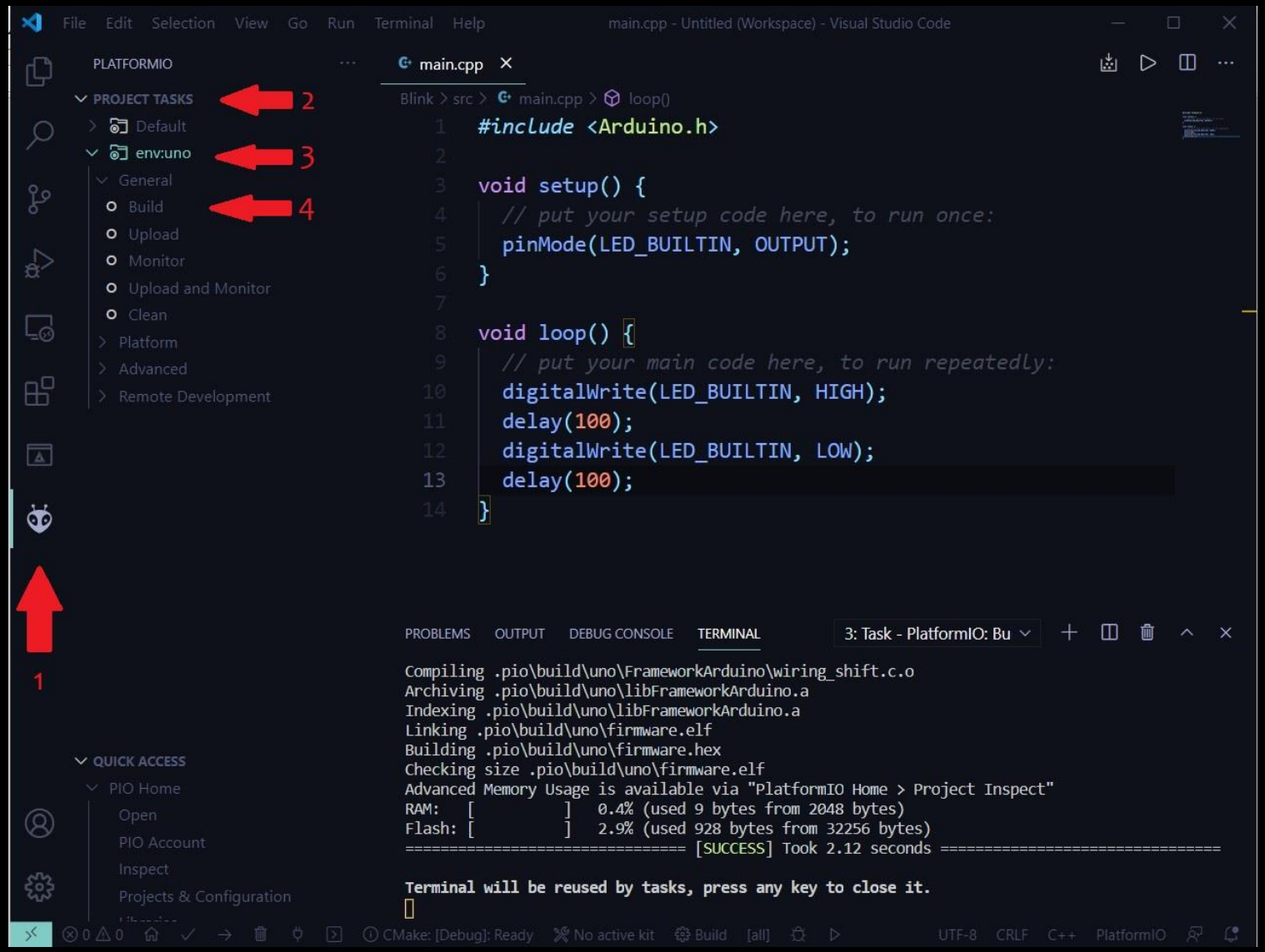


After pressing the new project card a pop screen will appear and asks you to enter the project name and the desired board. Select the values according to the picture and press finish.



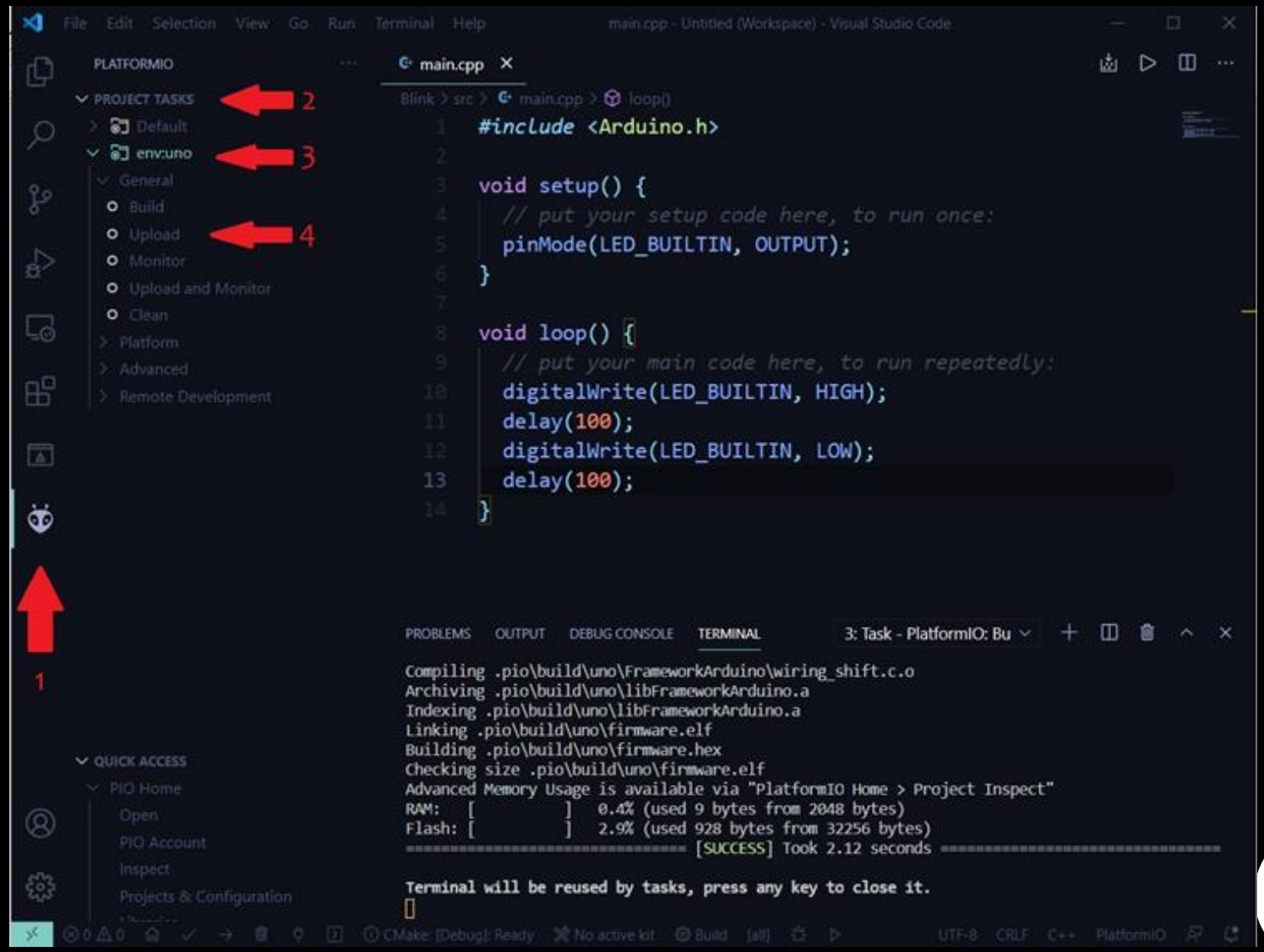
III - Compiling and executing the sketch

In order to execute your code you will first need to build your project and then feed it's executable file to the Arduino simulator in Proteus. For building your project follow these instructions:



III(For real boards) - Compiling and executing the sketch

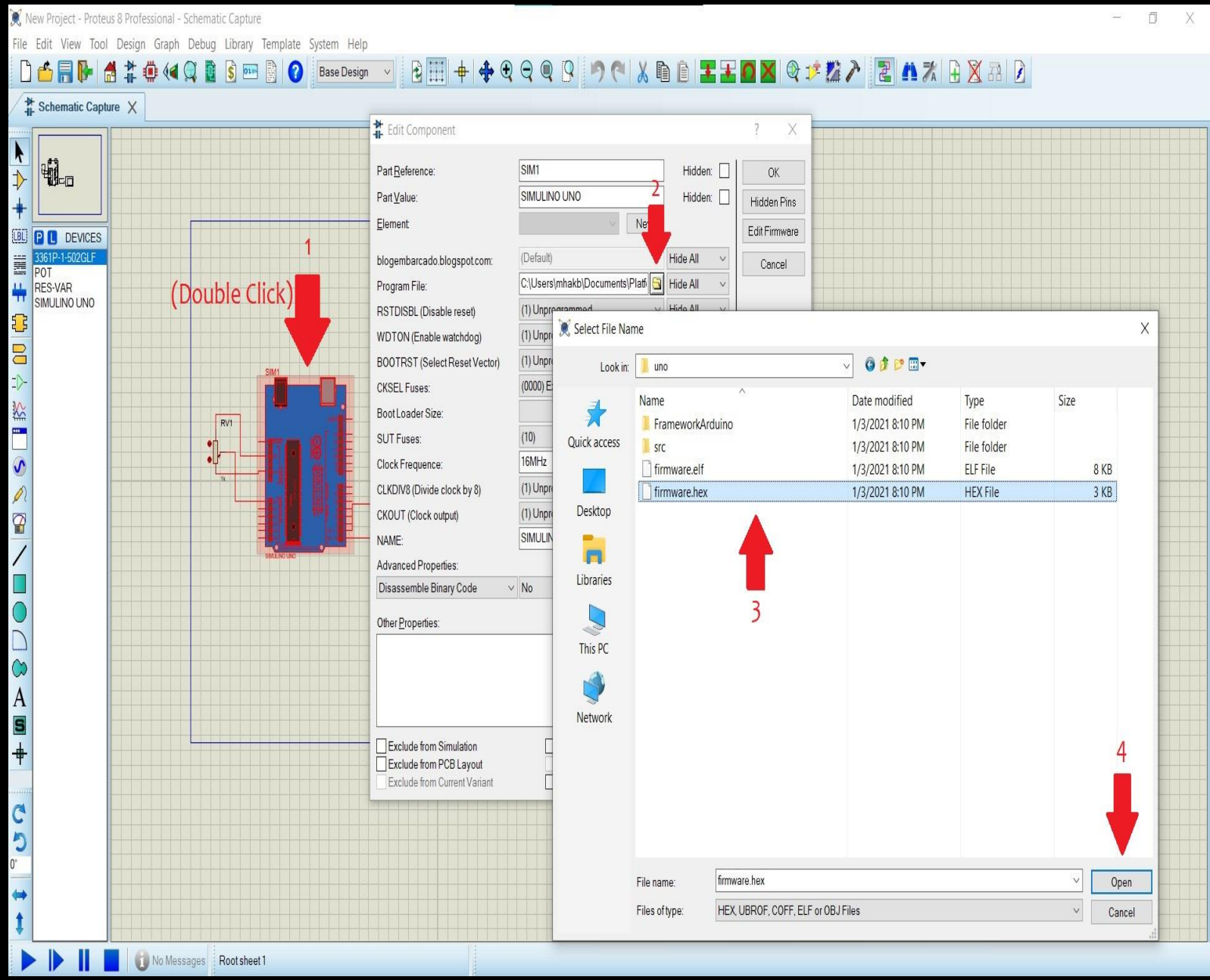
In order to upload your code on an Arduino board you will need to hit the upload button. You can also use upload and monitor option to see UART output or send data to Arduino. For flashing your project follow these instructions:



Now in order to execute your program you will need to open Proteus, select the Arduino Uno board and select the hex file in the path :

YourProjectName/.pio/build/uno/firmware.hex

as the executable.



If you had any questions:

1. Google is your friend!
2. If you did not find your answer on Google, search it on YouTube. There is definitely an Indian fellow answering your questions.
3. After all, you can also ask your graders (: