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SYS-STEM

The Arduino SYS-STEM for Schools

Hellenic Mediterranean University

Deliverables of SYS-STEM

- ArdLAB HUB - an online booking system, which coordinates and manages reservations and remote connections to the available ArdLABs.
- 5 well equipped remote ArdLABs which can be reserved and connected to via the SYS-STEM ArdLAB HUB.
- A complete package of didactical materials in basic electronics using ArdLABs, including exercises and solutions, and guidelines for delivery with different age and competence level learners.
- An ArdLAB starter Guide for schools or centers who wish to establish their own ArdLAB, with support on how to make this a remote ArdLAB should they wish to share their facilities with other schools and register their ArdLAB with the SYS-STEM ArdLAB hub.

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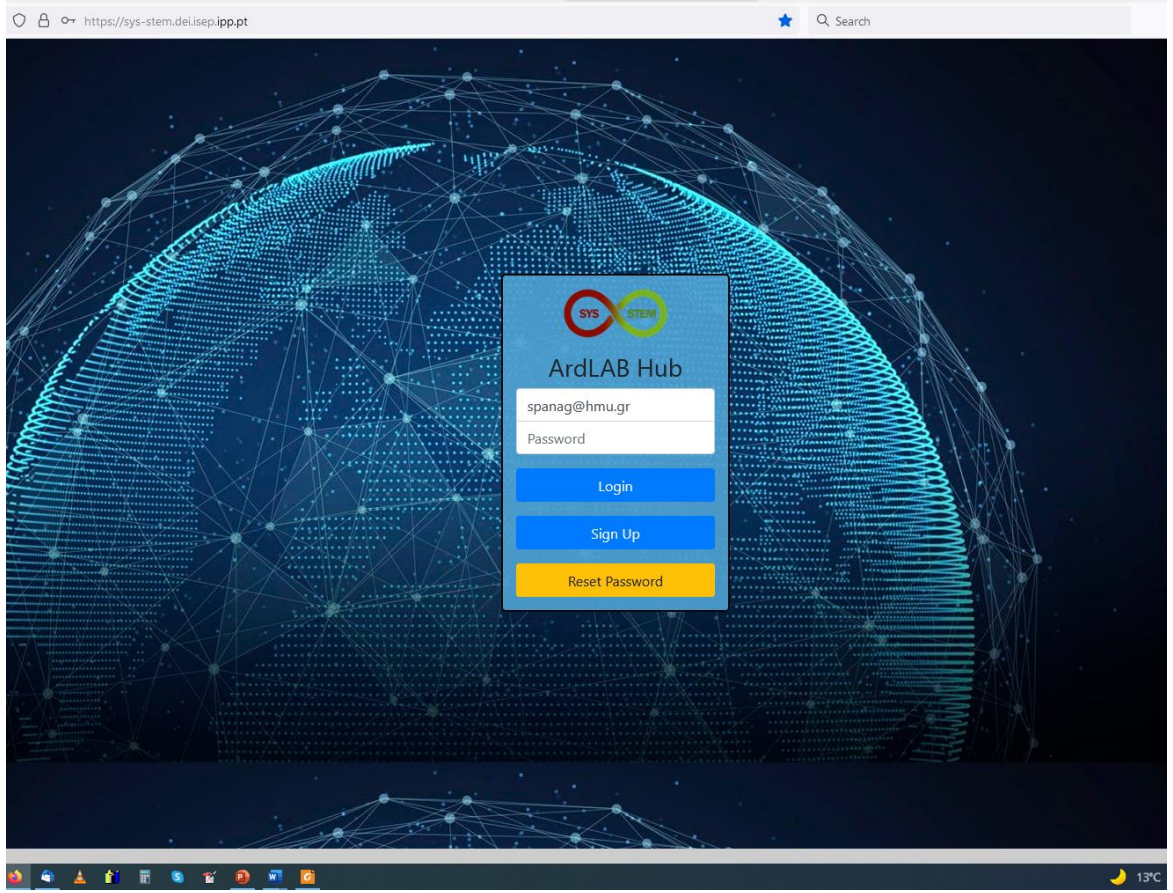
The SYS-STEM HUB

Available after registration via:

https://sys-stem.dei.isep.ipp.pt/



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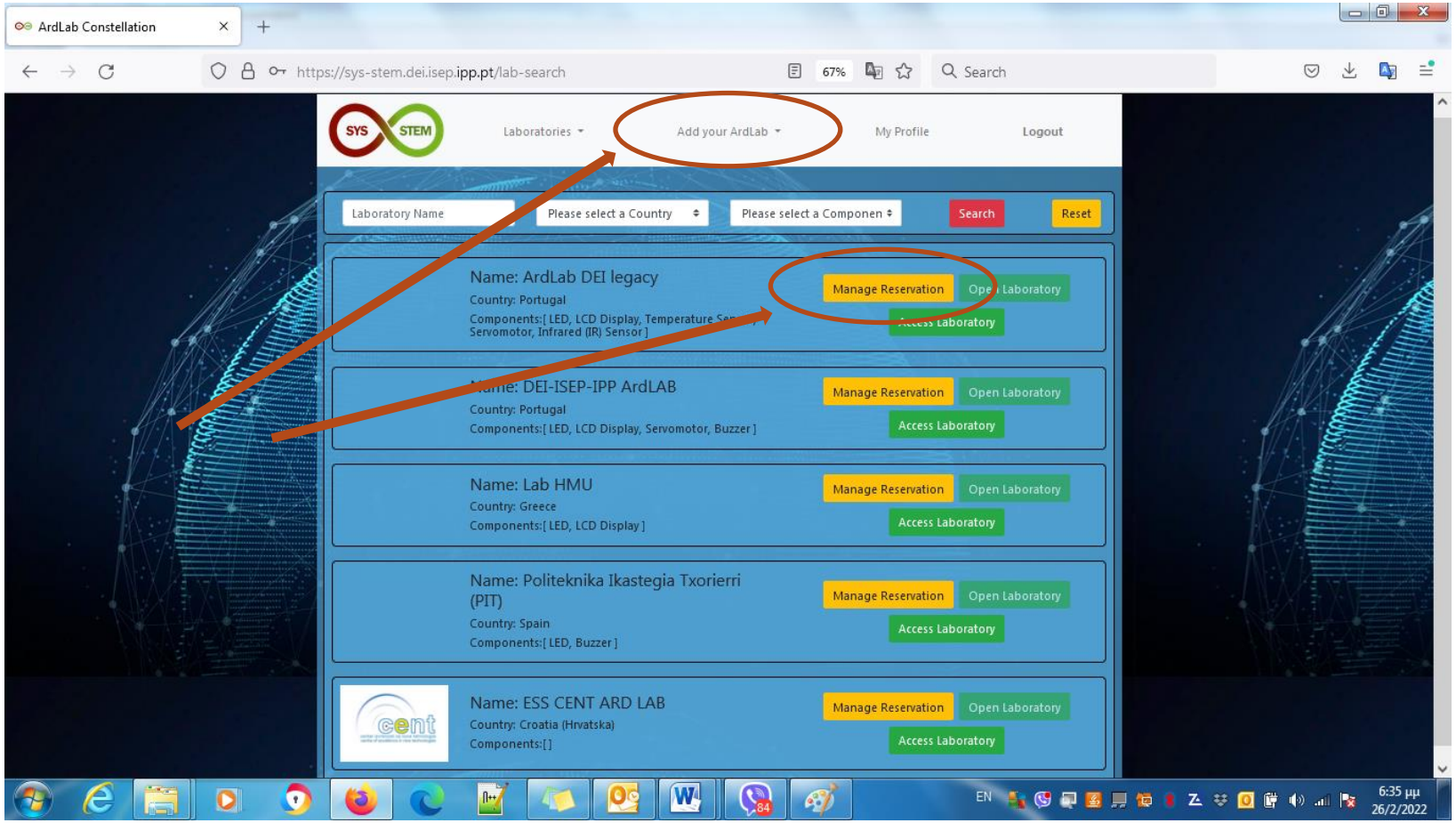
The SYS-STEM HUB

- Remote ArdLAB Search.
- Five ArdLABs available currently.
- One can book his slot for accessing an available ArdLAB.
- Or, to connect his ArdLAB to the HUB.



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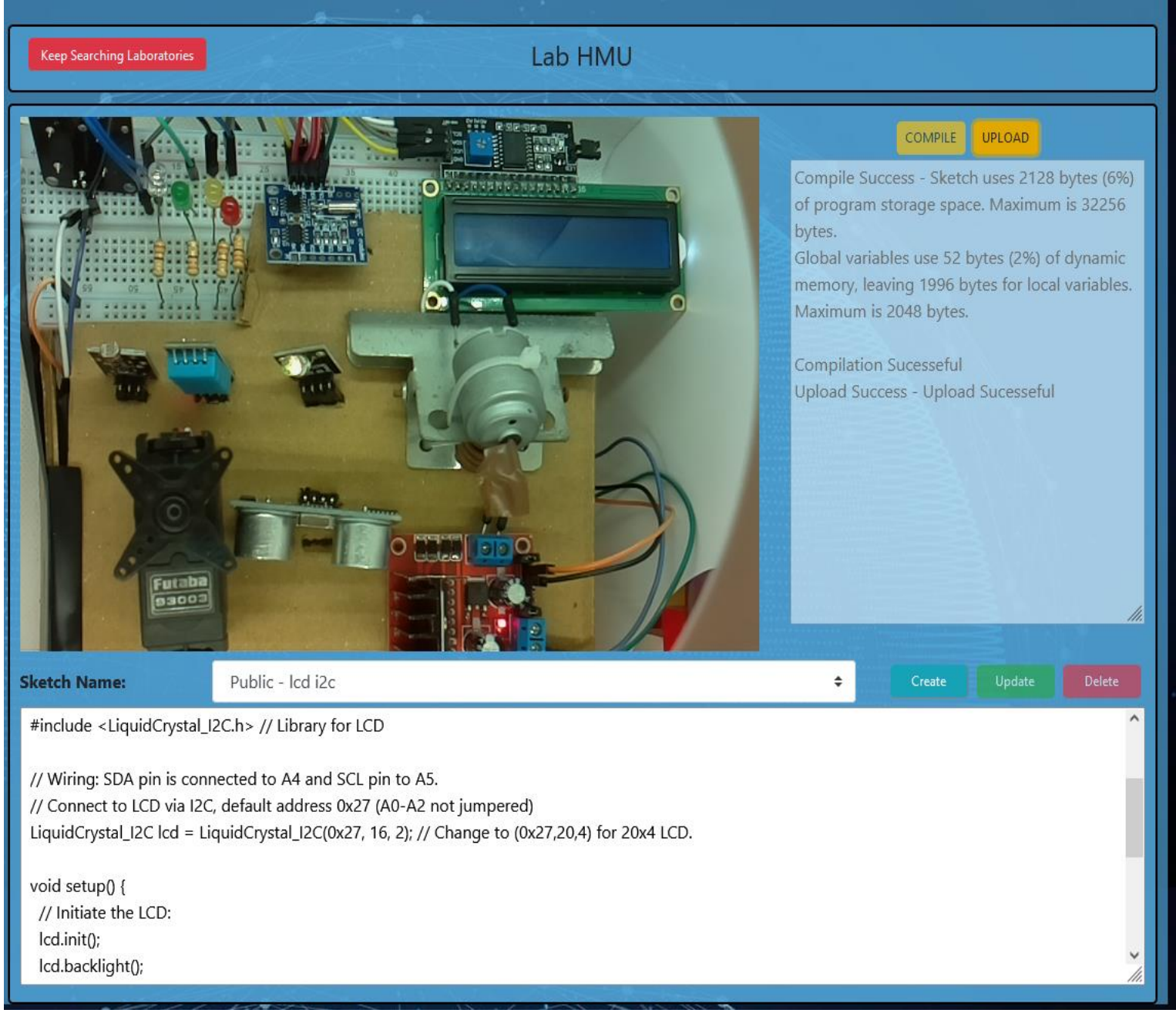
HMU ArdLab



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Laboratory components

Component	Pin
LEDs (red, yellow, green)	A1, A2, A3
RGB LED	A4 (R), A5 (G), 9 (B)
DHT11 sensor	6
Servo motor	7
DC motor	H bridge
RTC DS1307	I2C
Relay	13
Photo resistor (LDR)	A0
Ultrasonic detector	Echo (10), Trig (11)
LCD monitor	I2C
H bridge	4, 5

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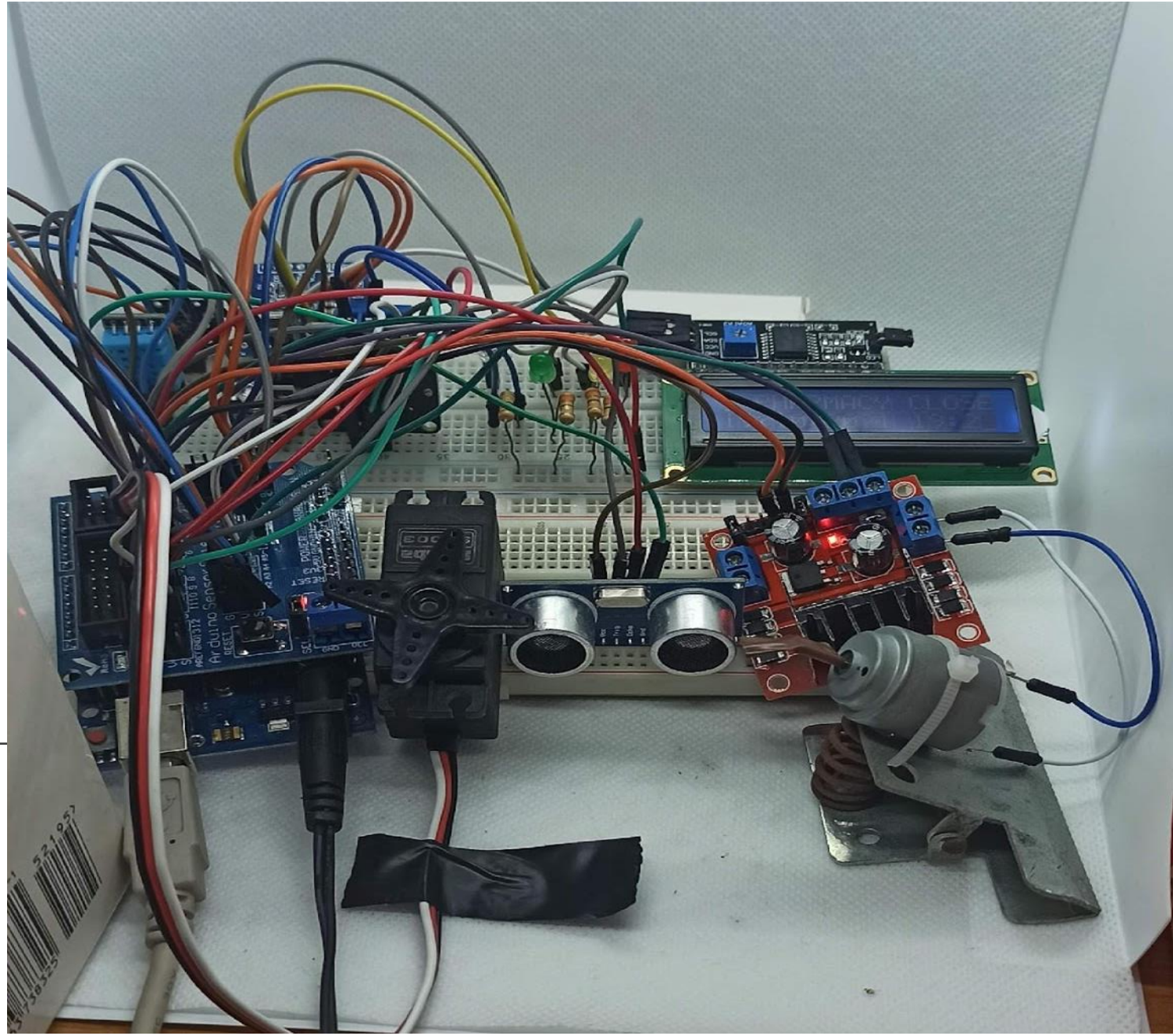
Equipment installation



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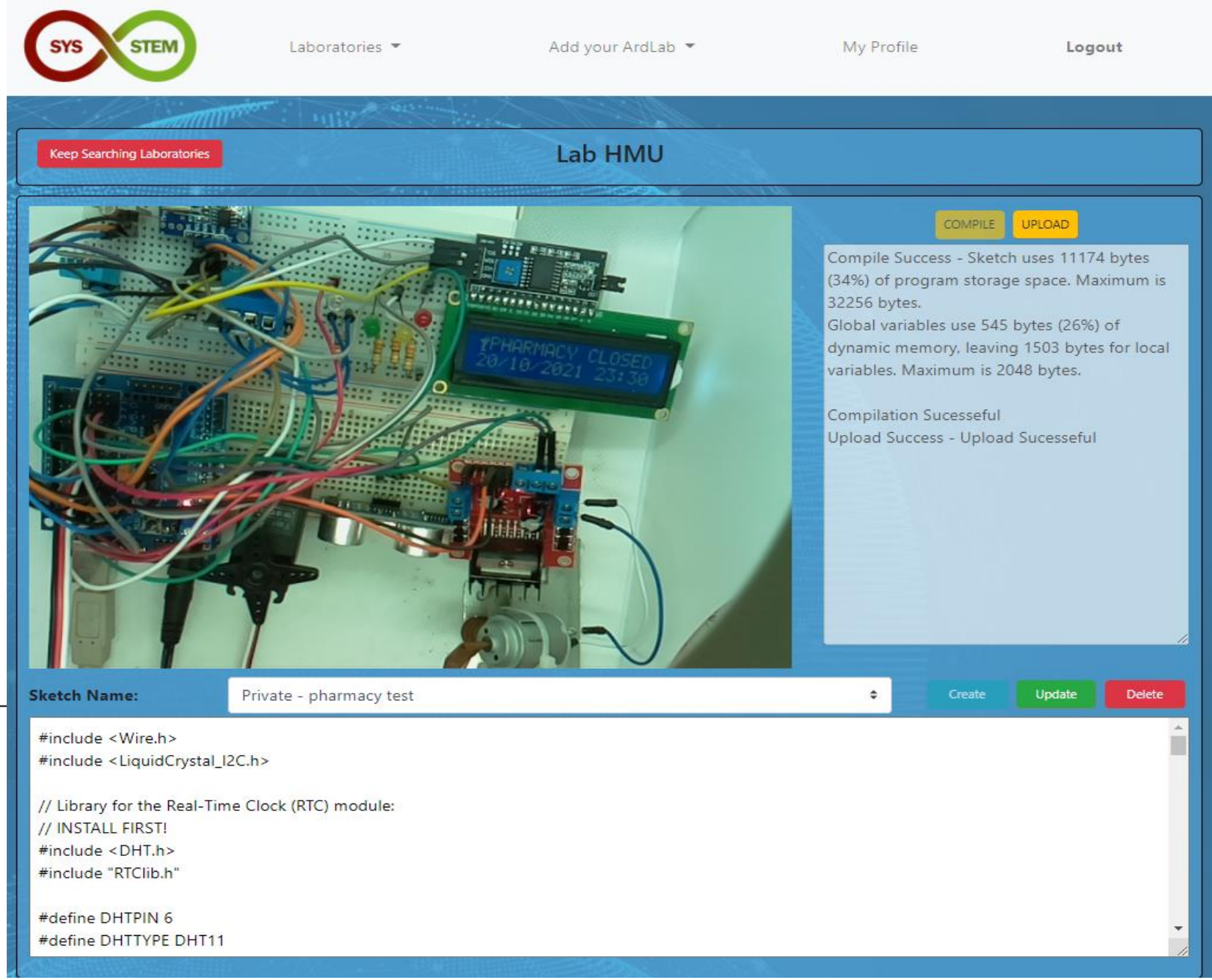
HMU First laboratory



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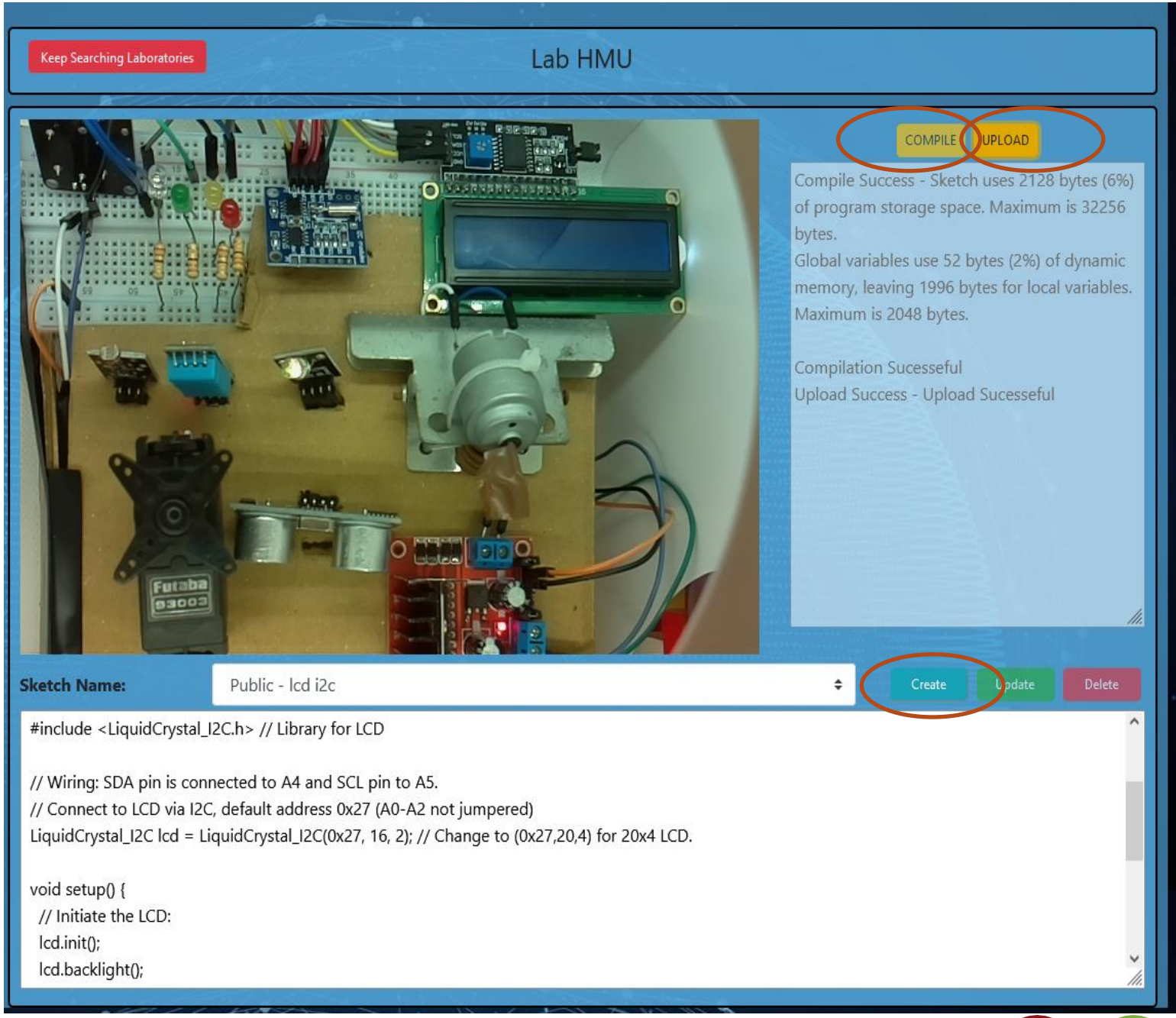
HMU Final laboratory

The visitor can:

- Create an Arduino Sketch
- Compile
- Upload



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Didactic Material

There are ten (10) available Modules:

- Module 01 - Introduction to STEM and SYS-STEM approach
- Module 02 - Arduino Basics and basic devices
- Module 03 - Digital inputs outputs and interruptions - Analog signals
- Module 04 - First programs
- Module 05 - Variables and Expressions
- Module 06 - Decision making and control functions
- Module 07 - LCD
- Module 08 - Sensors
- Module 09 - Servo_and_DC_Motors
- Module 10 - Real World Examples

AVAILABLE from: https://sys-stem.eu

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Didactic Material

- The Arduino SYS-STEM for Schools Methodology is a package of specific materials and projects for students aged 14-18 in Arduino that includes a structured step-by-step course in electronics and programming development using Arduino.
- Each Module includes all the necessary didactic planning tools and guidelines: learning outcomes that will be achieved, theoretical parts, complete sets of materials and examples, simulations, sample exercises in Arduino for students, and solutions.

AVAILABLE from: https://sys-stem.eu

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LCD Display Module

- Module 7 is dedicated to the Arduino LCD Display and has been authored by HMU.
- The two ways for connecting the LCD with Arduino are discussed:
  - in parallel,
  - using the I2C protocol.
- Different levels of exercises for familiarization with programming for the LCD display are provided.

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LCD Display Module

- The first three exercises are the entry level for letting the student know the LCD peripheral.
  - displaying “Hello World” on the LCD
  - reading and displaying temperature and humidity values collected from a DHT11 sensor
  - interchanging between two screens in the LCD Display.
- The next three exercises are for advanced users and guide the students to get involved in more complicated scenarios.
  - The last simulates a Pharmacy Display Panel.

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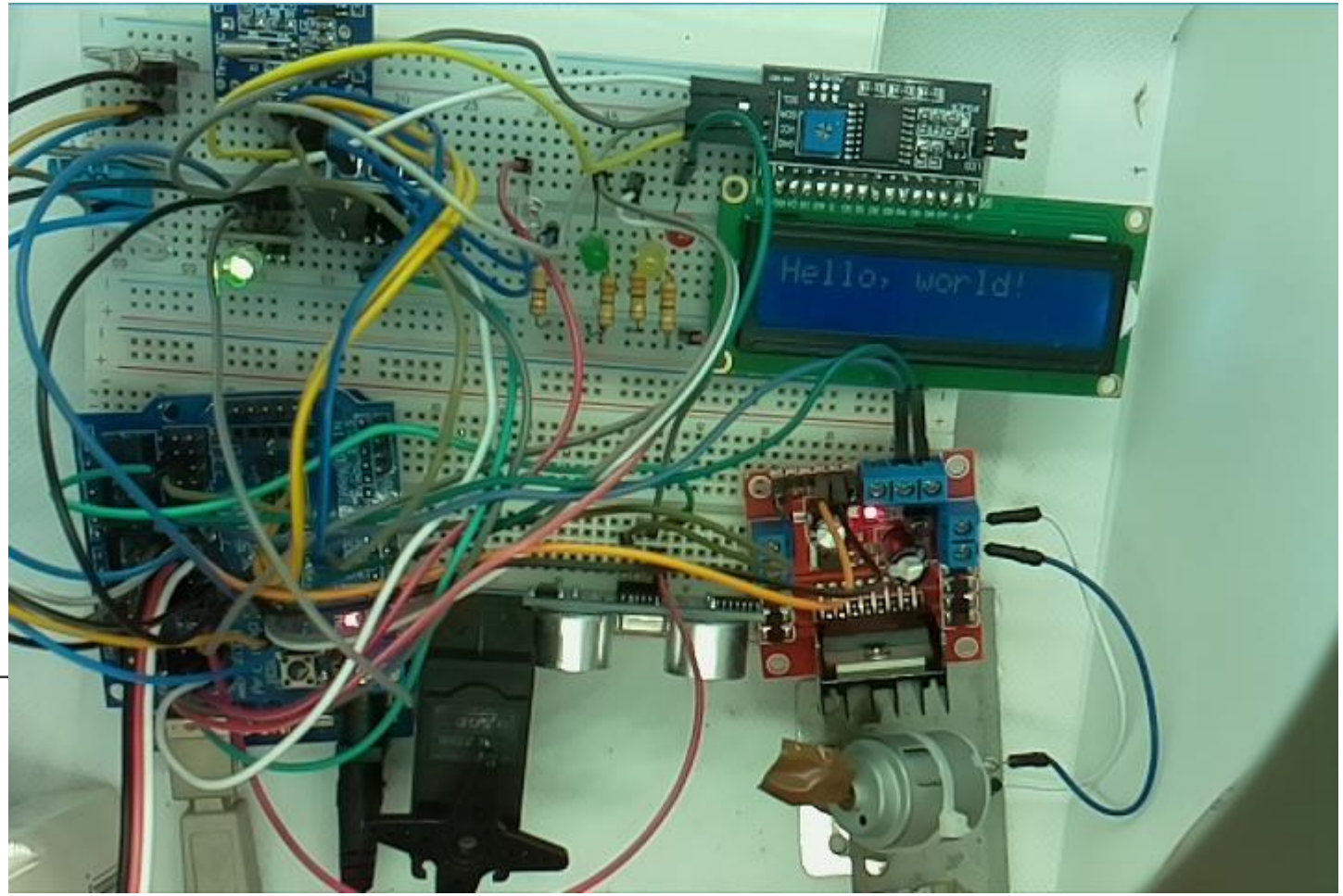
Exercise 1



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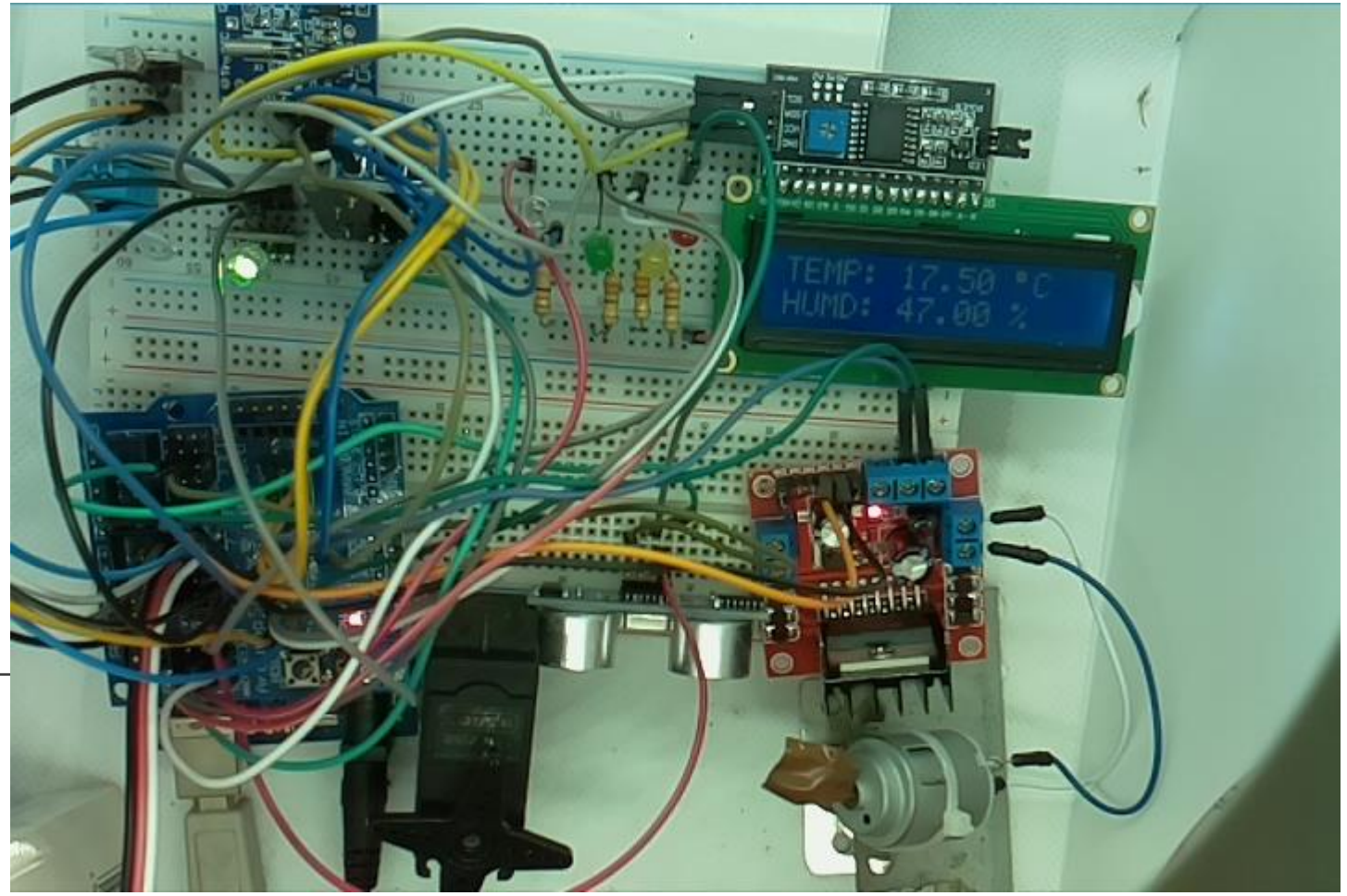
Exercise 2



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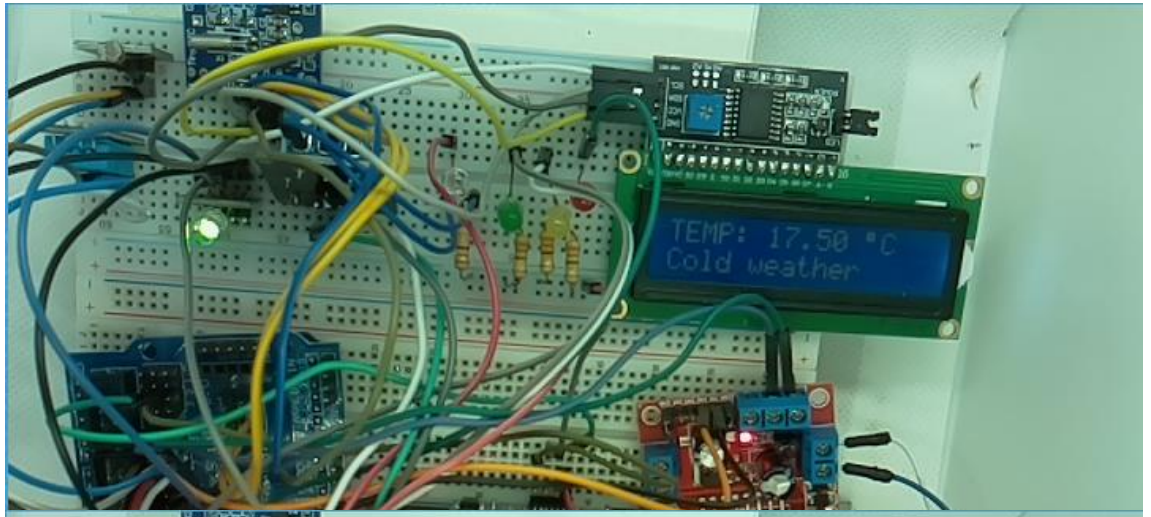
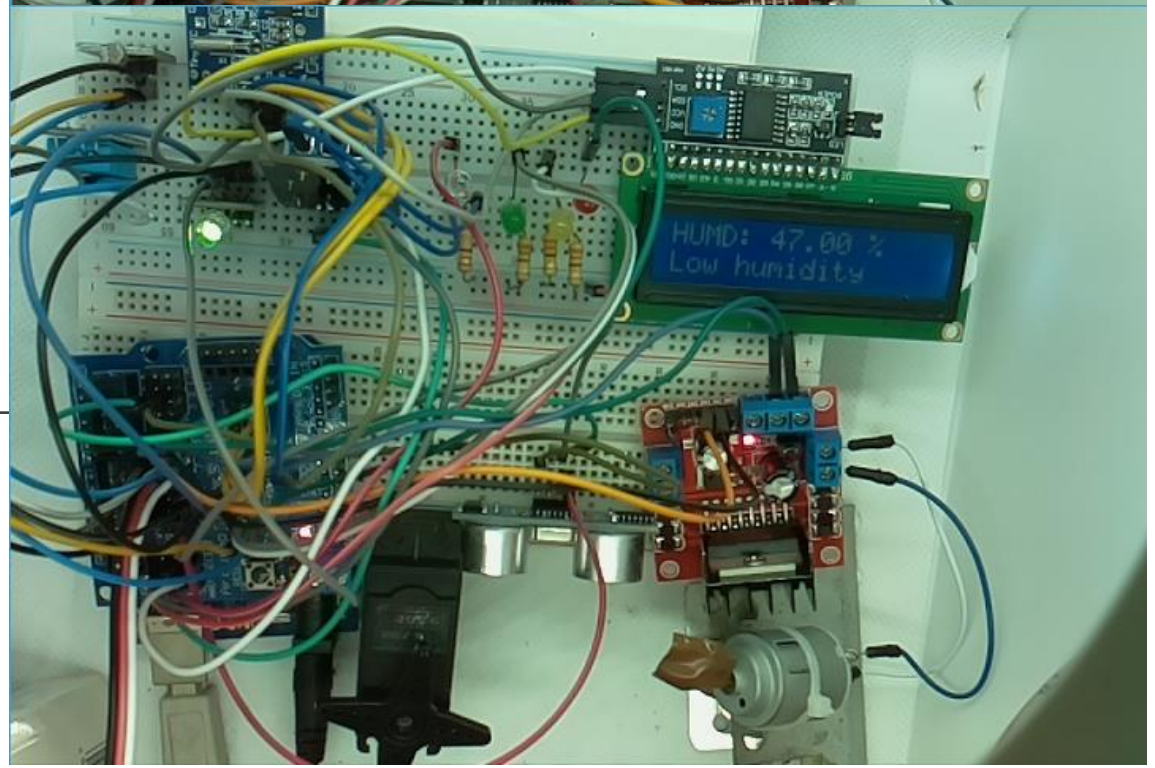
Exercise 3





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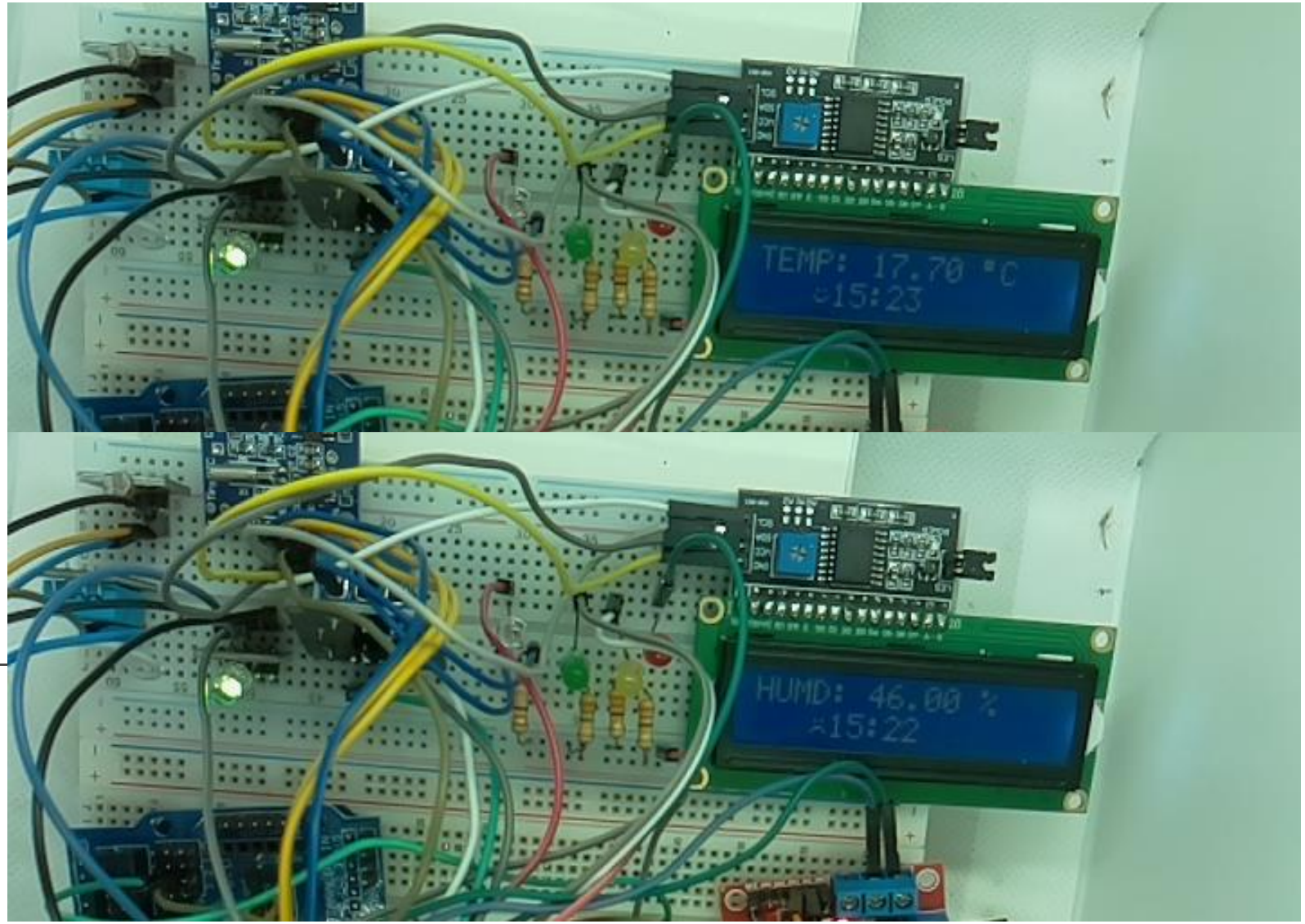
Exercise 4



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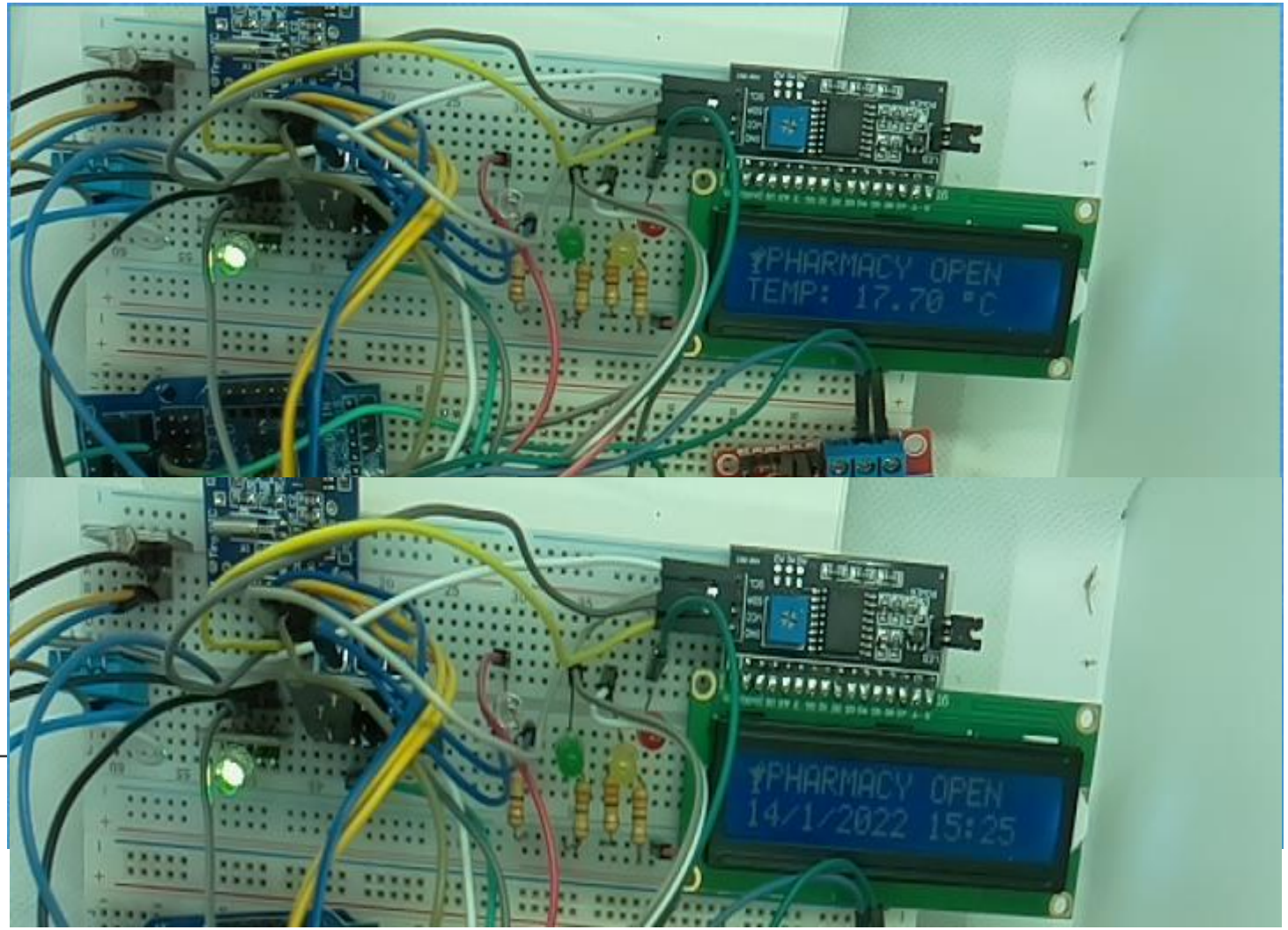
Exercise 5



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SetUp and share your own ArdLAB via SYS-STEM HUB

Detailed instructions are provided in the SYS-STEM web site (https://sys-stem.eu/).

To create your own ArdLAB you need:

- One Raspberry Pi Model 3B+
- One Pi camera or any web camera with HD resolution
- One Arduino microcontroller serially connected to the raspberry
- The sensors/actuators you wish to share with others via the HUB
- Internet connection for the Raspberry (wired is preferred)
- Permanent illumination of your ArdLAB

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SetUp and share your own ArdLAB via SYS-STEM HUB

To setup your ArdLab you should follow these steps:

- Install Python 3.0 and Dockers in the Raspberry PI
- Clone the ArdLab repository from github
- Setup and install the ArdLab Docker Containers
- Create the ArdLab configuration file

Video feed runs directly from your ArdLAB, so a public IP or NAT port forwarding is required along with a SSL certificate.

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SetUp and share your own ArdLAB via SYS-STEM HUB

To add your ArdLAB to the Sys-Stem HUB, you should follow these steps:

- Create a user account with the HUB (only if you don't have one)
- Register your ArdLAB to the HUB (must be approved by the HUB administrator)
- Run again the ArdLAB containers
- Add sample sketches and test your ArdLab in the HUB

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HMU ARDLab

Behind the scene

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Thank you

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