Smart Farm System

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PROJECT WEBSITE

https://github.com/multiprecision/smart_farm_arduino

VALUE PROPOSITION

Monitor your farm anytime, anywhere.

The Smart Farm System allows real-time monitoring of air temperature, air humidity, light intensity, and soil moisture on their farm. Users can monitor their farm from the web and mobile application via *thinger.io* IoT platform. The system gives users notification via LCD screen and web application if the soil is too dry. Project website: https://github.com/multiprecision/smart_farm_arduino

CONCEPTUAL MODEL

Prototyping board Arduino Yun is used. Arduino Yun has onboard Wi-Fi and Ethernet so it can directly connect to the Internet and send data to server.

There are 3 sensors used:

1. Temperature and humidity sensor.

Model	DHT22
Description	The DHT22 is a basic, low-cost digital temperature and humidity sensor. It uses a capacitive humidity sensor and a thermistor to measure the surrounding air.
Output	Digital

2. Luminosity Sensor

Model	TSL2561
Description	The TSL2561 luminosity sensor is an advanced digital light sensor, ideal for use in a wide range of light situations. Compared to low cost CdS cells, this sensor is more precise, allowing for exact lux calculations and can be configured for different gain/timing ranges to detect light ranges from up to 0.1 - 40,000+ Lux on the fly. It contains both infrared and full spectrum diodes.
Output	Digital (I^2C)

3. Soil moisture sensor.

Model	RobotDyn
Description	The soil moisture sensor is used for measuring the volumetric content of water in the soil.
Output	Analog

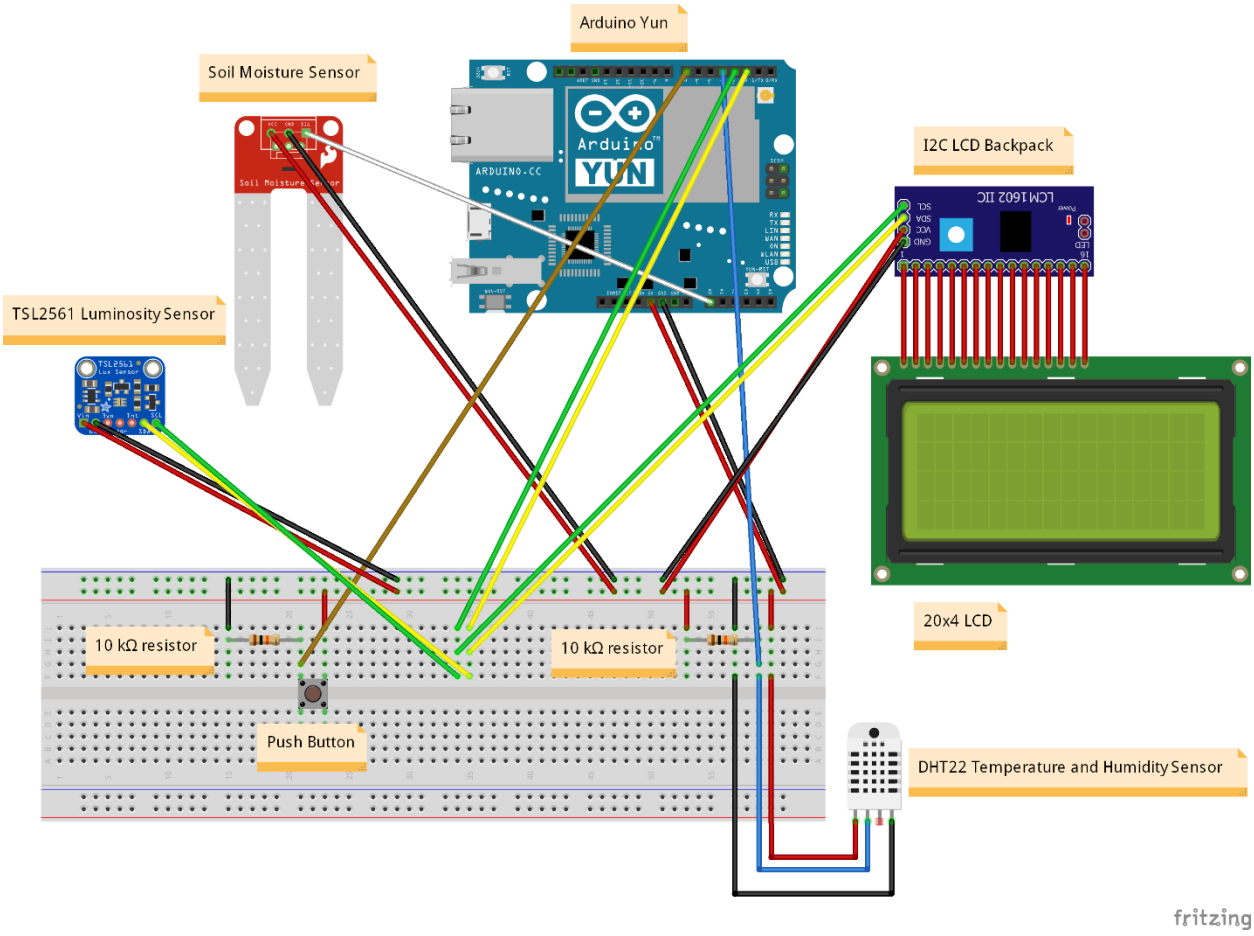
Plus, there's a 20×4 characters LCD screen with an I^2C backpack to display data from the sensors[1] and a button to toggle data transmission.

The IoT platform *thinger.io* is used to store data and display data via web application and mobile application. The devices send data in binary JSON format (thinger.io internal protocol called protoson)

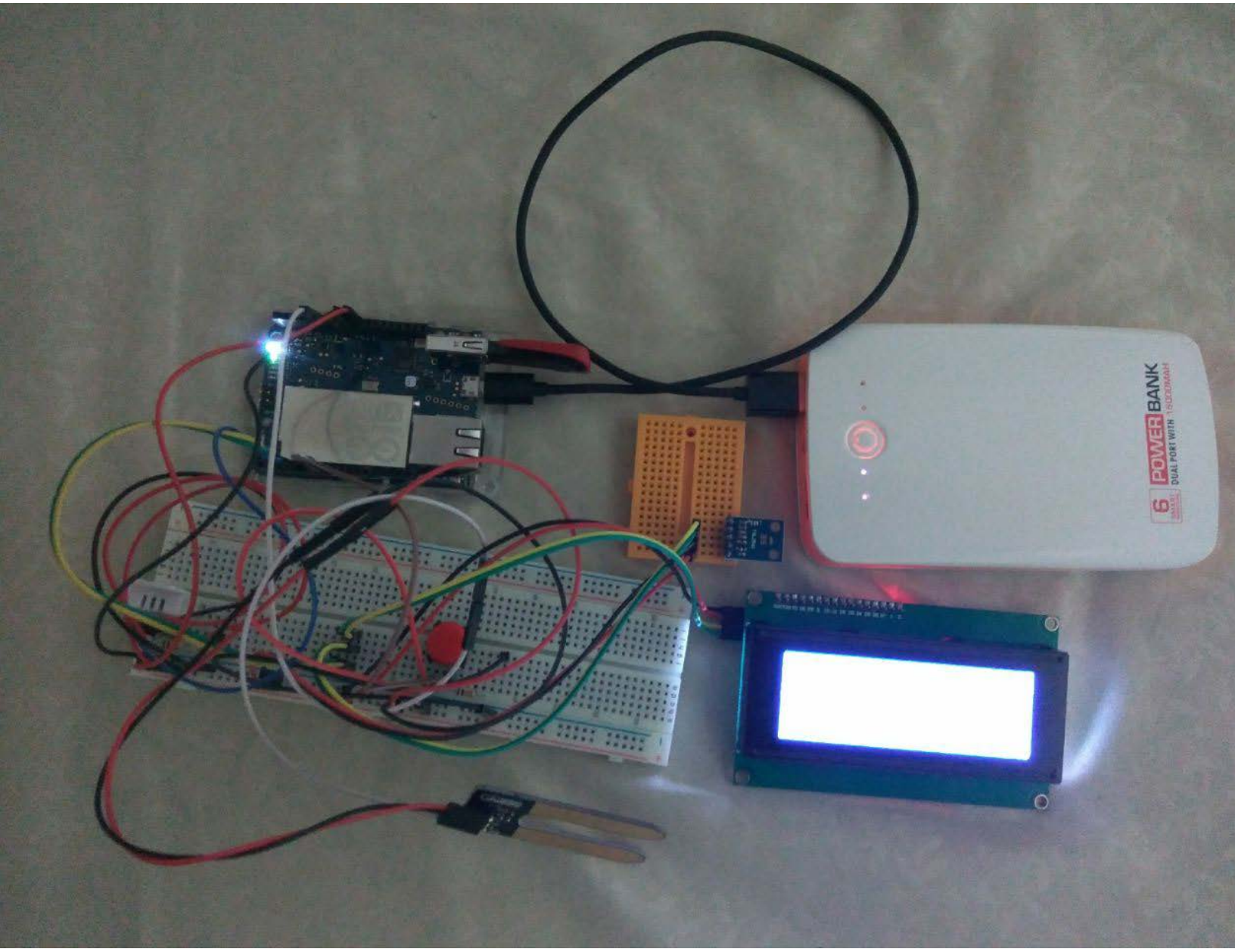
[1] An LED for when the soil is to dry is deemed redundant here.

to thinger.io servers. Data from the sensors is pulled every 2 seconds, i.e., the polling interval is 2 seconds, and then the data is sent to thinger.io server.

The schematics is shown below.



The prototype hardware is shown on below.



INTERACTION MODEL

The IoT platform thinger.io dashboard can be accessed from any device with a web browser, so desktops, laptops, and smartphones can access the dashboard. Users interact through the dashboard and can monitor their farms from here or set the threshold for when the soil is too dry. The local rule for the soil moisture too dry threshold is 25%. Users can modify this threshold via the dashboard (cloud rule).

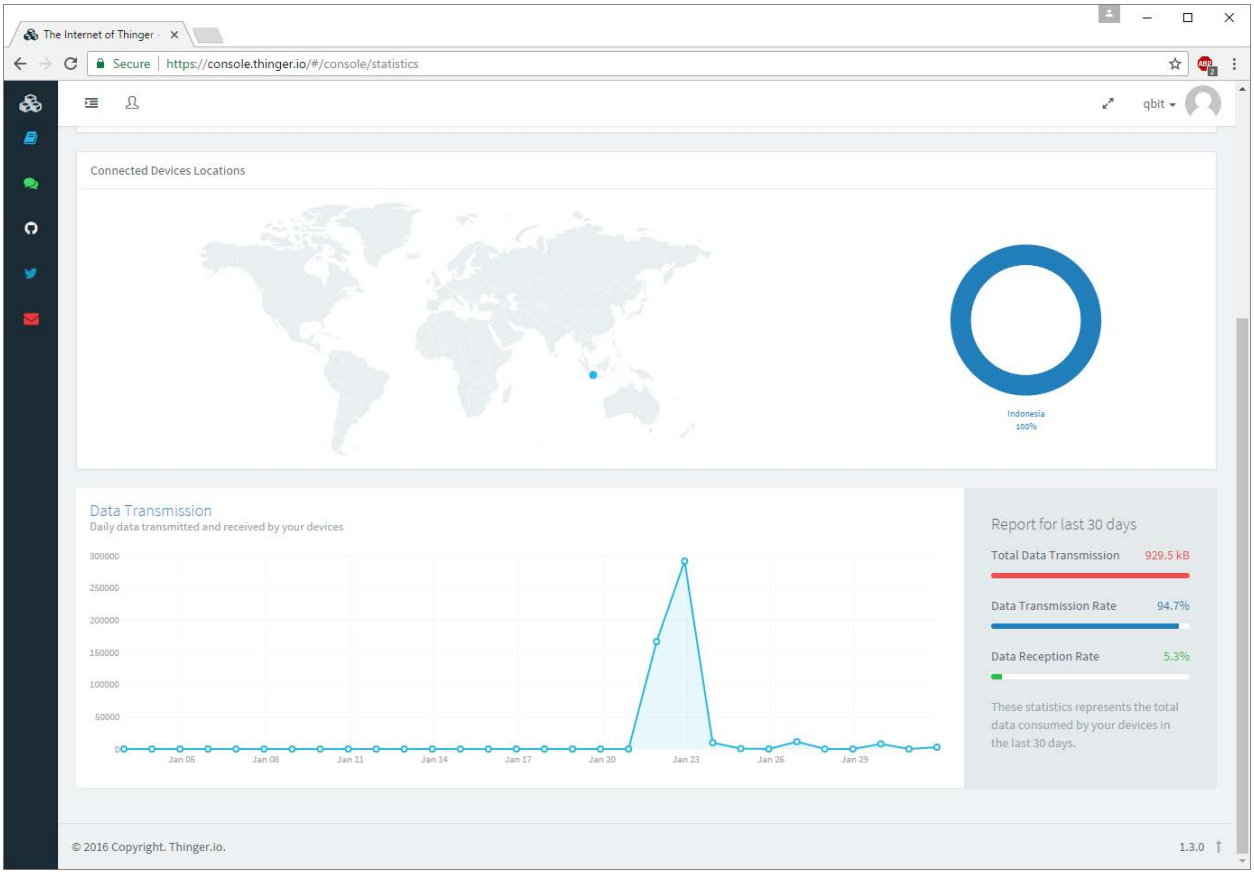
1. The web dashboard

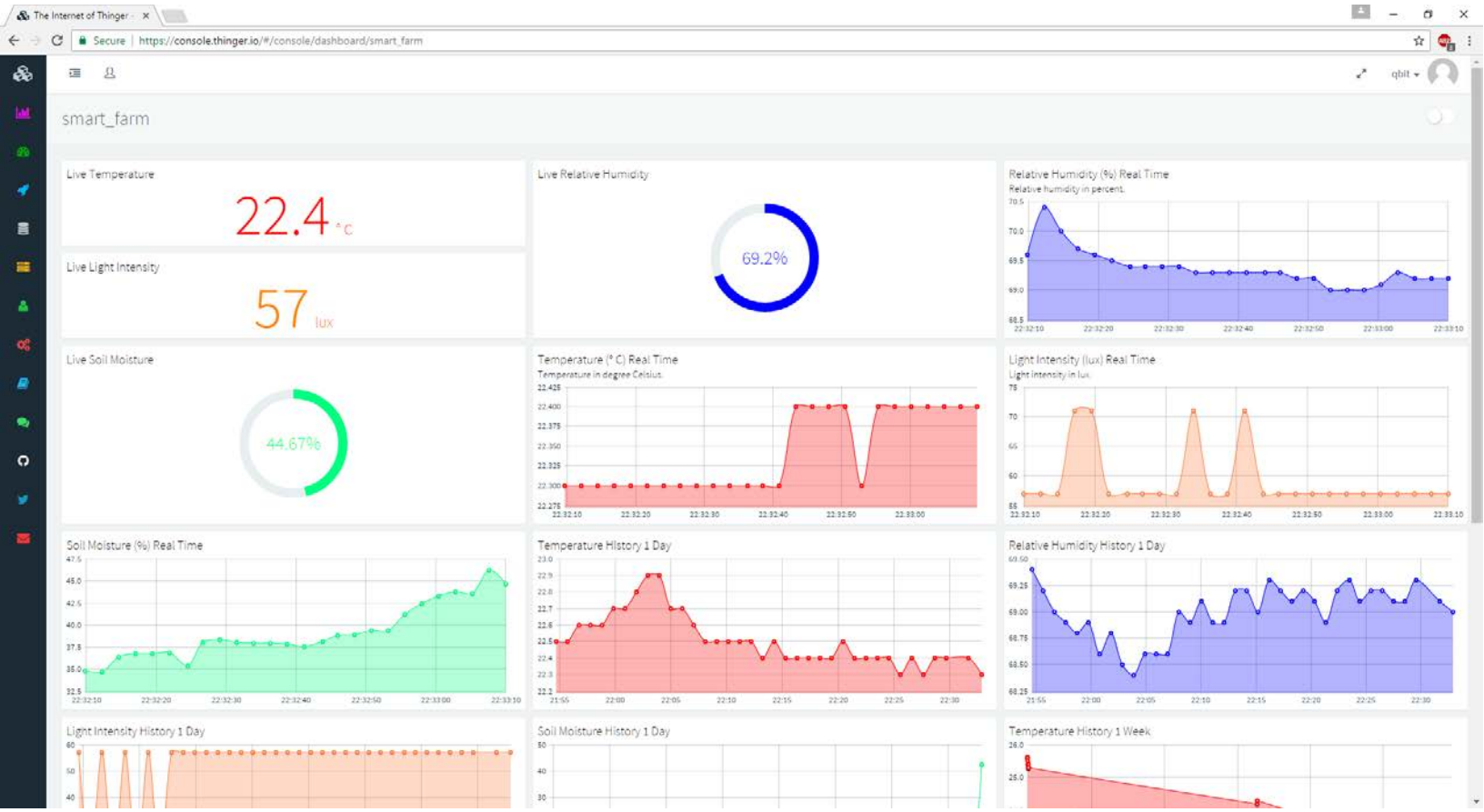
   Monitor:

   - Current air temperature, air humidity, soil moisture, and light intensity.
   - Average, minimum, and maximum air temperature, air humidity, soil moisture, and light intensity in 1 day, 1 month, or 1 year.

   Set:

   - Soil moisture threshold for notification.
   - Data transmission toggle (disable/enable).




The Internet of Thinger
Secure | https://console.thinger.io/#/console/dashboard/smart_farm
qbit
smart_farm
Live Temperature
22.4 °C
Live Light Intensity
57 lux
Live Relative Humidity
69.2%
Relative Humidity (%) Real Time
Relative humidity in percent.
Live Soil Moisture
44.67%
Temperature (° C) Real Time
Temperature in degree Celsius.
Light Intensity (lux) Real Time
Light intensity in lux.
Soil Moisture (%) Real Time
Temperature History 1 Day
Relative Humidity History 1 Day
Light Intensity History 1 Day
Soil Moisture History 1 Day
Temperature History 1 Week


The Internet of Thinger
Secure | https://console.thinger.io/#/console/dashboard/smart_farm
qbit
Soil Moisture (%) Real Time
Temperature History 1 Day
Relative Humidity History 1 Day
Light Intensity History 1 Day
Soil Moisture History 1 Day
Temperature History 1 Week
Relative Humidity History 1 Week
Light Intensity History 1 Week
Soil Moisture History 1 Week
Set Too Dry Threshold
Toggle Data Transmission
Turn this on to stop the device from sending and receiving data. You must press the button on the device manually to enable data transmission again.
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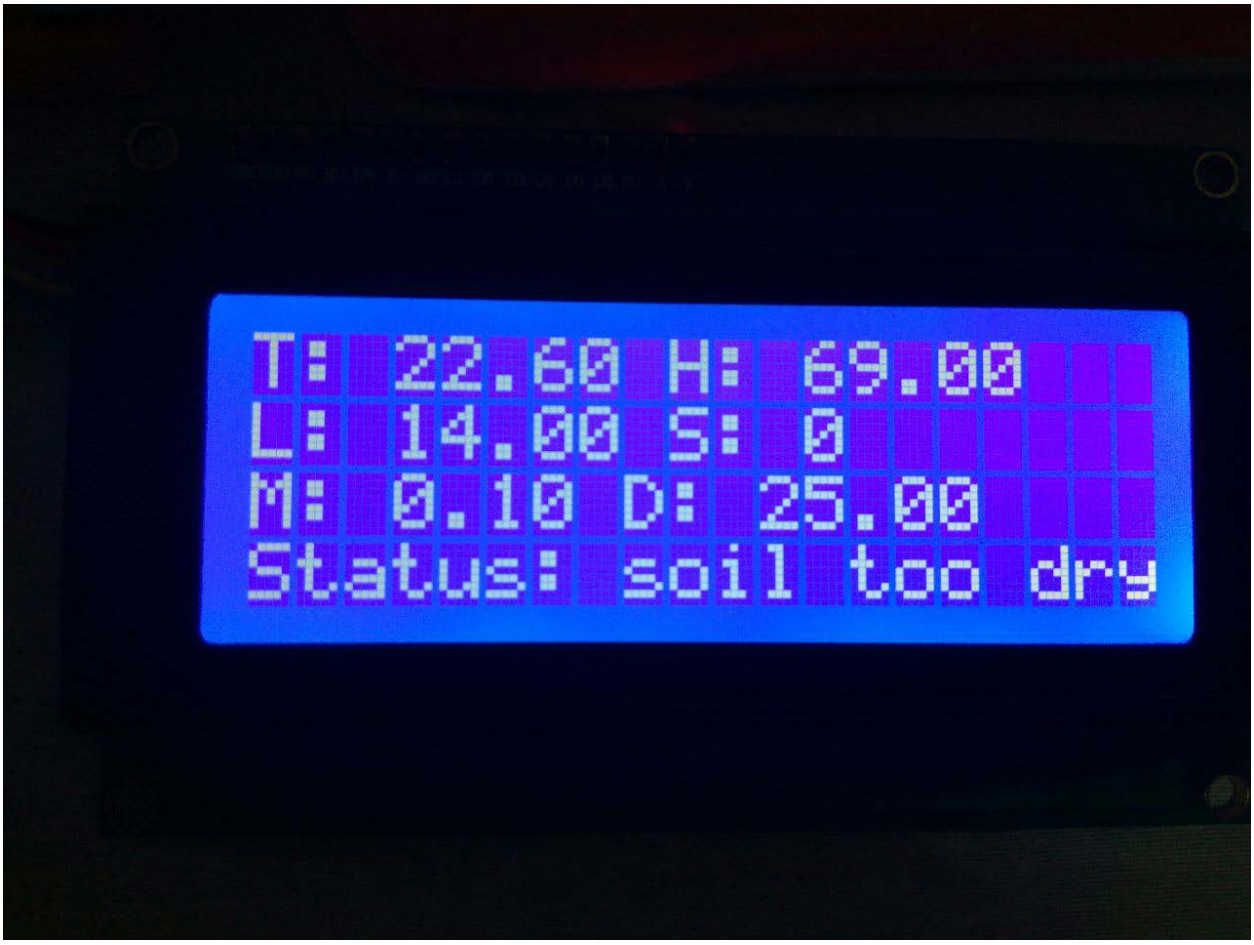
1.3.0

2. The hardware

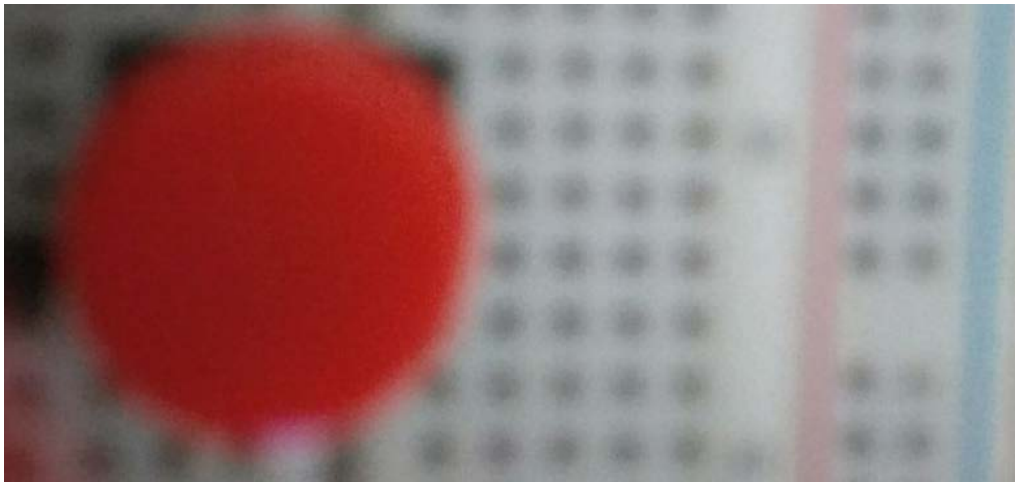
2.1. The LCD



Legends

T	Temperature in degree Celcius.
H	Relative humidity in percent.
L	Light intensity in lux.
M	Soil moisture in percent.
D	Soil moisture too dry threshold in percent. An asterisk (*) will be shown next to the number if this value is modified from the online dashboard (cloud rule).
S	Data transmission toggle. 1 means the device won't transmit/receive data. 0 means the device will transmit/receive data. An asterisk (*) will be shown next to the number if this value is modified from the online dashboard (cloud rule). Pressing the button on the device will hide the asterisk.
Status	The current status of the soil.

2.2. The button



Push this button to toggle data transmission, e.g., when you need to save bandwidth or when online monitoring isn't needed (monitoring from the LCD is enough).