NYU TANDON SCHOOL OF ENGINEERING

Green Thumb Box

ME-GY 5643 Mechatronics
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What is it?

Green Thumb Box is a smart autonomous indoor watering system

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Why this?

* Conventional autonomous irrigation systems mostly thought for outdoor environment.
* Not everyone has a private garden, but many have potted plants in their houses.
* Commercially available solutions are not automated.

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What's new:

* Continuous feedback from moisture sensor is what makes the difference with traditional automated watering devices.

* The ones on the market water at fixed times and days, risking to overwater the plant or let them dry.

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How is it made?

- Plant vase
- Water reservoir
- Microcontoller
- Water level sensor
- Pump and drip distributor
- Moisture soil sensor
- Temperature sensor
- Light sensor LCD
- LED strips
- RGB LED
- Batteries

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Microcontroller

* The embedded microcontroller, Basic Stamp 2, is what imparts intelligence to the box.

* It matches the criteria of simplicity of use and programming while ensuring a control over the numerous sensors and actuators that we needed.

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Moisture sensors

* Two resistive moisture sensors have been used so as to have differential reading and a more precise measurement.
* Determine moisture level on the basis of the electric resistance of the soil: the wetter the soil, the lower the resistance.
* The resistance is measured using a voltage divider and sending the signal to the analog pin.

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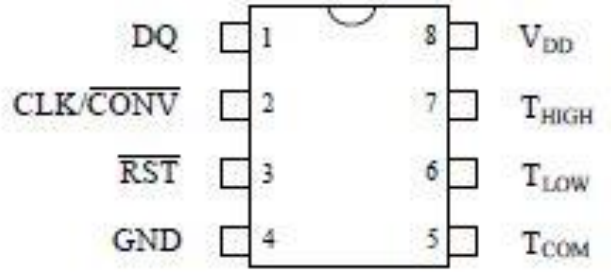
Temperature sensor

* Digital thermometer DS160



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Light level

* VT935G-B photoresistor

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Water level sensor

* Float switch sensor

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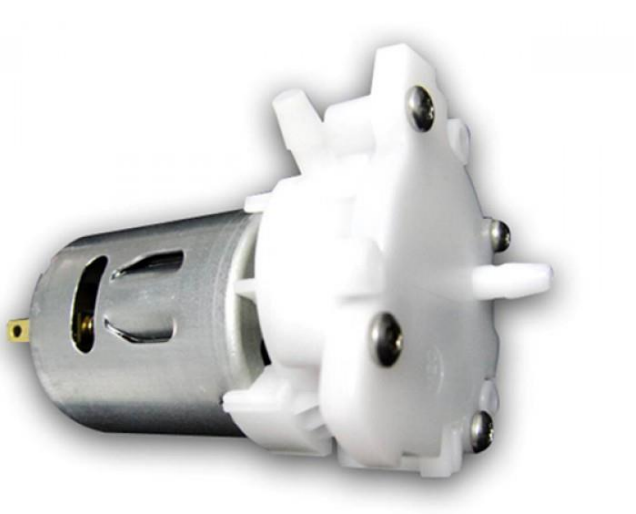
Pump

* Micro pump with RS-360SH DC motor



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LCD

* Parallax serial LCD

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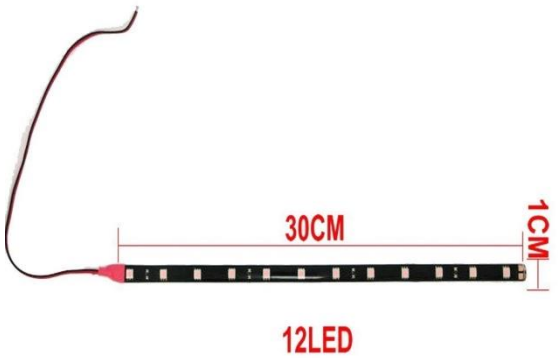
LED strips

* Flexible adhesive green LED strips



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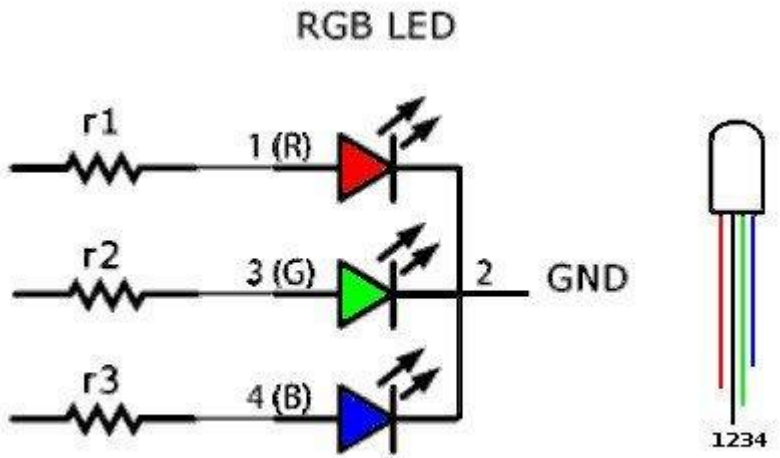
RGB

* RGB LED



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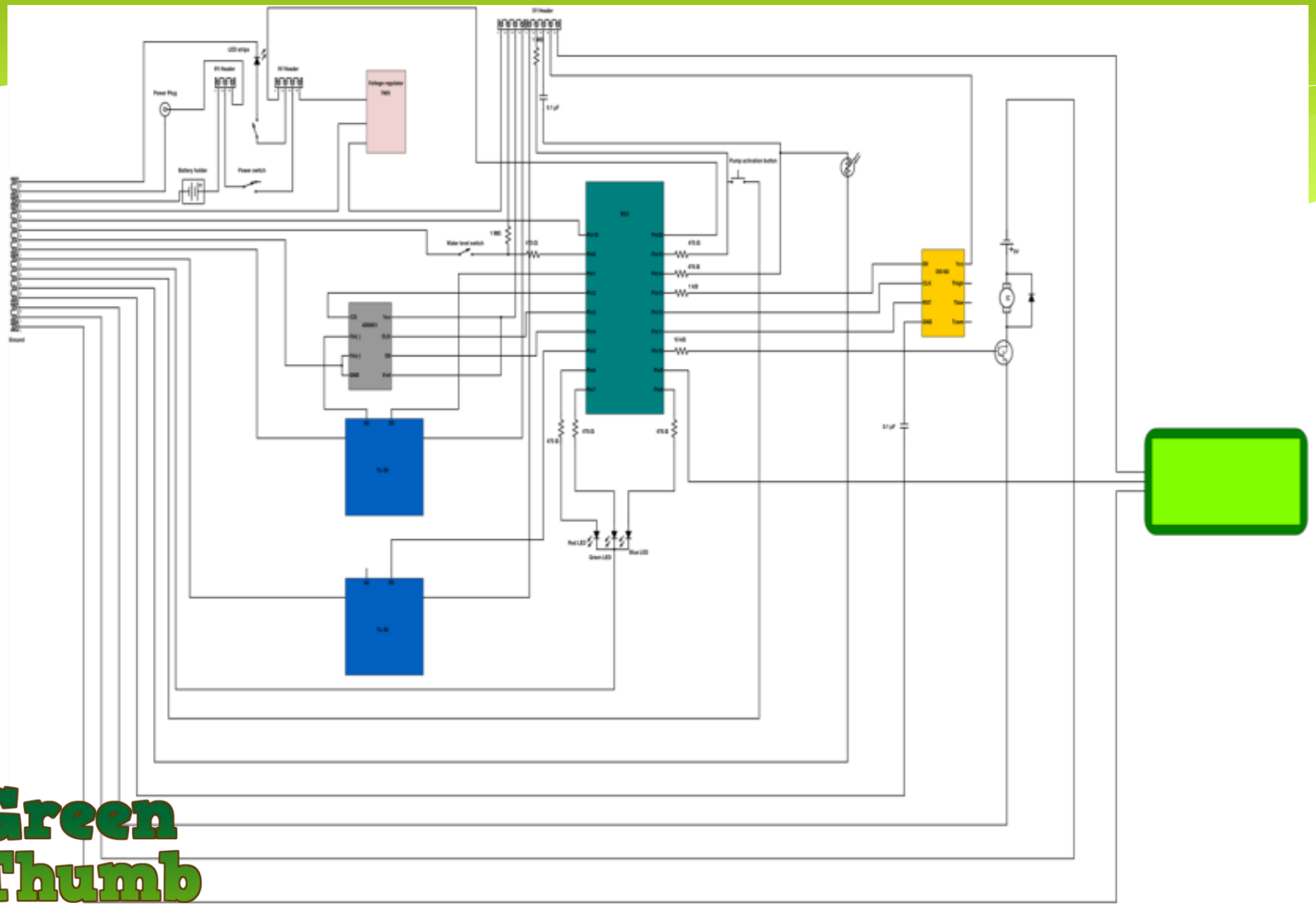
The circuit



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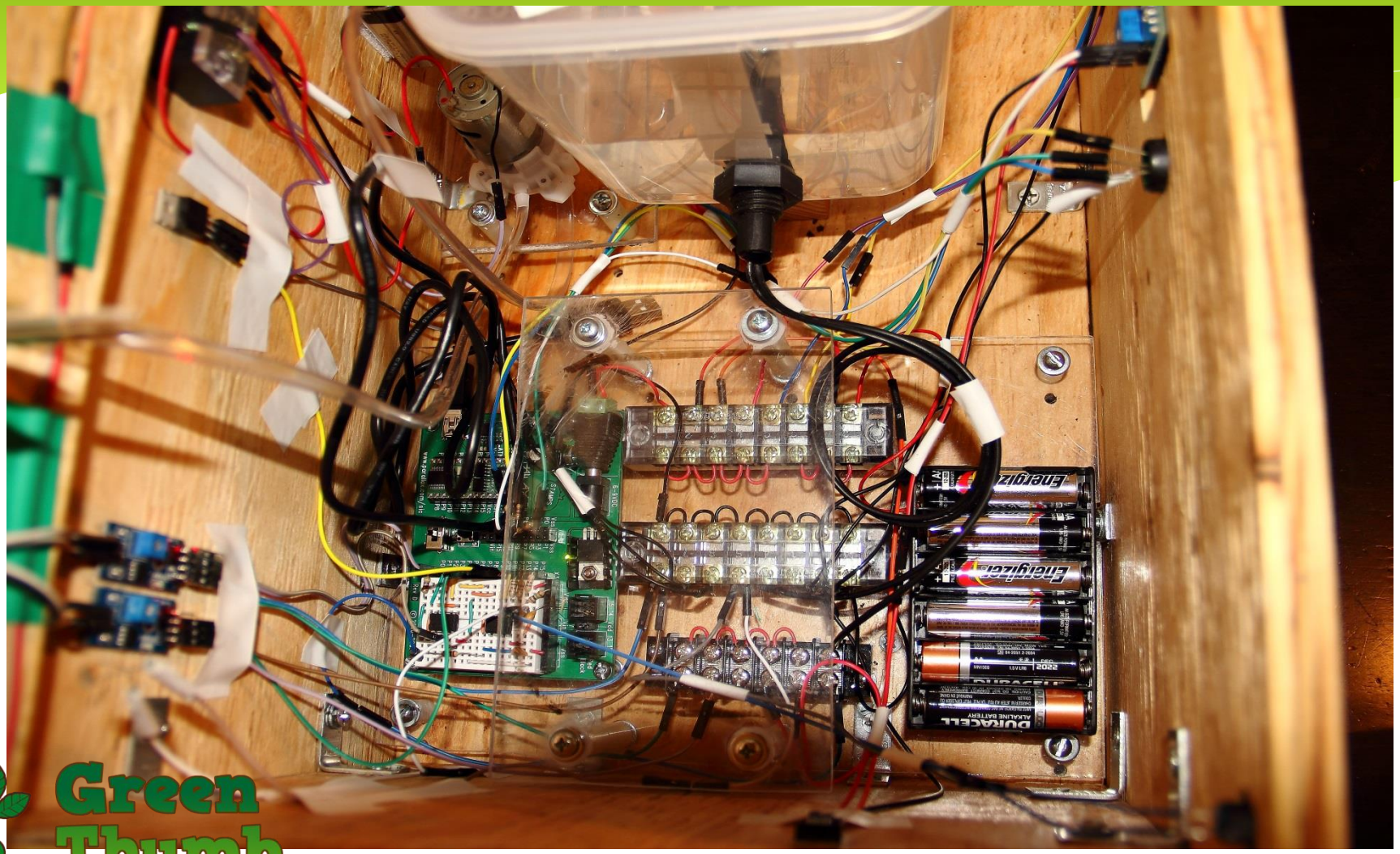
The circuit



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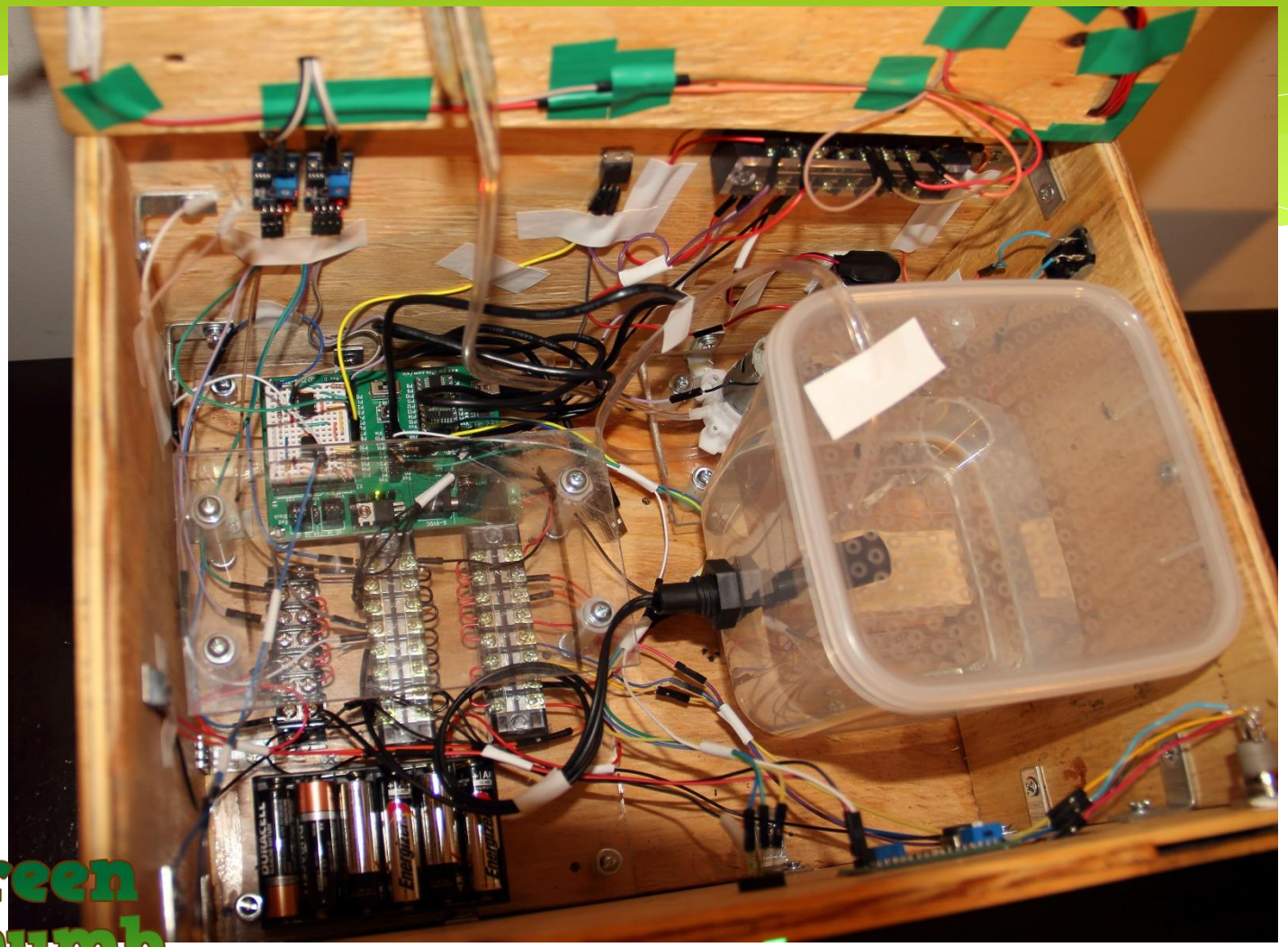
The circuit



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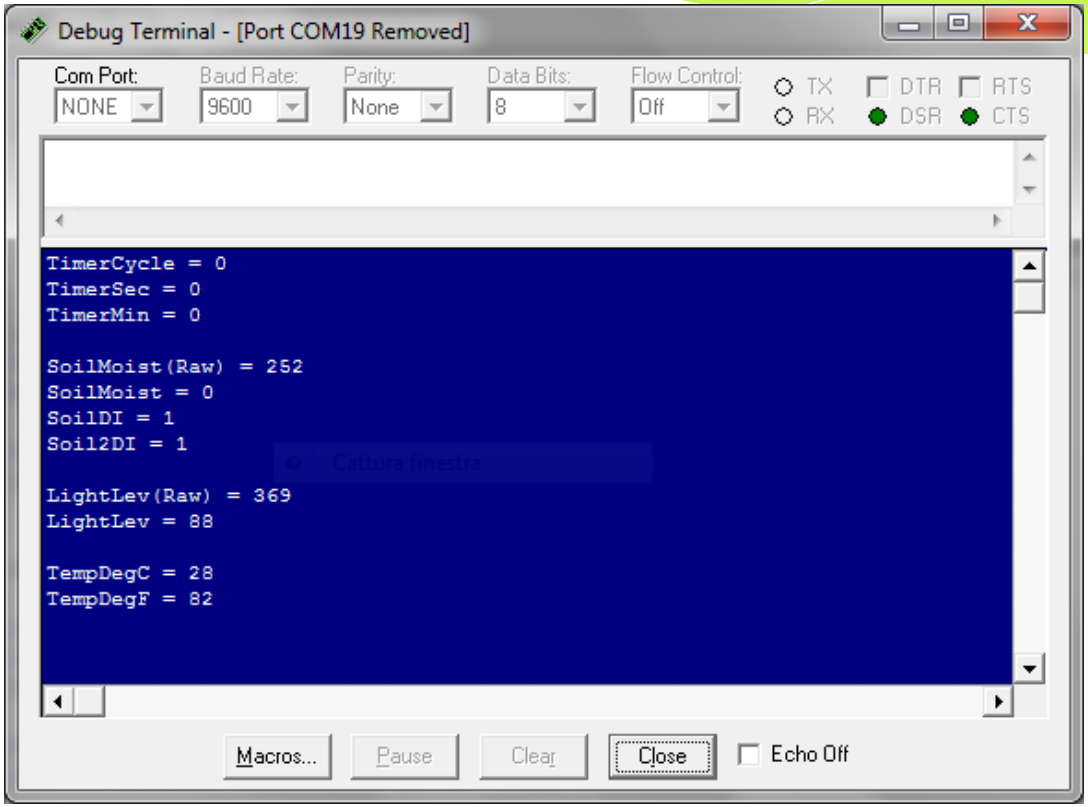
The code



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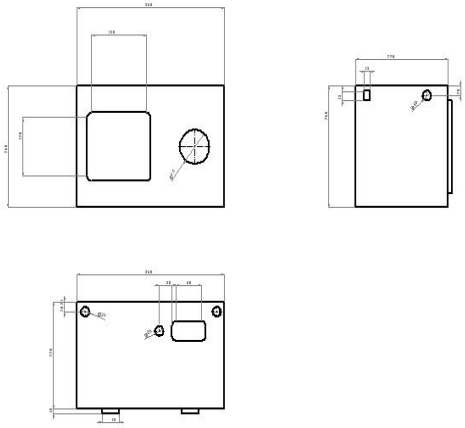
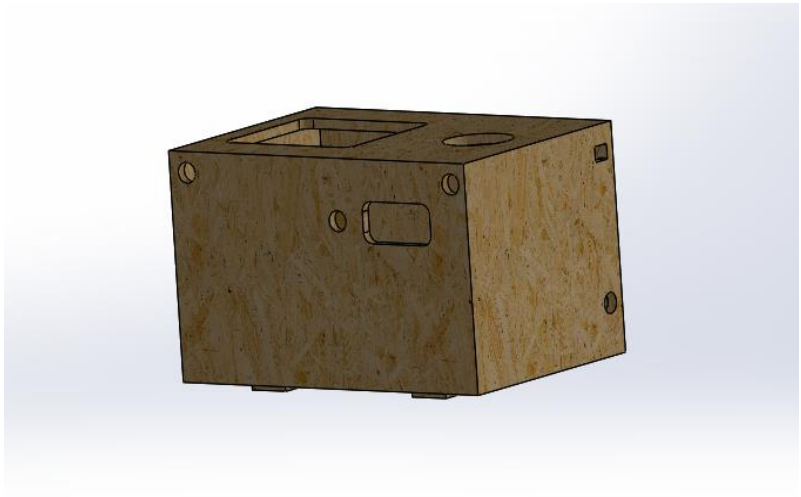
Mechanical design





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Cost analysis

PART NAME	UNITARY COST ($)	QUANTITY	TOTAL COST ($)
Basic Stamp 2 Microcontroller	49	1	49
Board of Education	70	1	70
Photoresistor	2	1	2
Digital thermometer	8	1	8
Float switch	5	1	5
Soil moisture sensor	4	2	8
AD converter	6	1	6
Pump	5.50	1	5.50
TIP120 Transistor	2	1	2
LCD	28	1	28
Voltage regulator	2	1	2
RGB LED	1	1	1
Green LED strips	2	4	8
Pushbuttons	3	3	9
Barrier strip block	4	4	16
Capacitor	0.20	2	0.4
Plywood	5	2	10
AA Battery	0.5	6	3
9V Battery	2	1	2
Acrylic sheet	2	1	2
Additional Material (Screw, Nut, Spacer, Bracket, Washer, Pipe, PVC container, Jumper wire, Resistor, Diode)			25
TOTAL			**261.9**

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Further improvements

* Rechargeable batteries
* Battery status check
* Enable outdoor use
* Remote control
* Rotating base
* UV lights

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References

* Kapila Vikram, *Notes for the ME3484 - Mechatronics Course*.
* Pace Scientific Data Loggers and Sensors, *Installation and Setup Instructions EC5 and EC20 Soil Moisture Sensors.*
* Parallax Inc. *Applied Sensors Student Guide*, Version 2.0.
* R. Munoz-Carpena. *Field devices for monitoring soil water content*. Bulletin 343, Dept. of Agricultural and Biological Engineering, Univ. of Florida, IFAS Extension.
* Smith, Keith A. *Soil and environmental analysis: physical methods, Revised, and Expanded*. CRC Press, 2000.
* http://www.liquidlevel.com/pages/how-does-a-liquid-level-work.
* http://us.clickandgrow.com/.
* http://www.cynergy3.com/blog/how-select-correct-float-switch.

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Thanks

Many thanks go to Jared, Sai Prasanth and Ashwin for making the lab facilities available to us at every time

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Thank you for your attention!