Green Thumb Box is a smart autonomous indoor watering system.
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.
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.
How is it made?

* Plant vase
* Water reservoir
* Microcontroller
* Water level sensor
* Pump and drip distributor

* Moisture soil sensor
* Temperature sensor
* Light sensor LCD
* LED strips
* RGB LED
* Batteries
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.
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.
Temperature sensor

* Digital thermometer DS160
Light level

- VT935G-B photoresistor
Water level sensor

* Float switch sensor
* Micro pump with RS-360SH DC motor
* Parallax serial LCD
LED strips

* Flexible adhesive green LED strips
* RGB LED
The circuit
The circuit
The circuit
The code

```
TimerCycle = 0
TimerSec = 0
TimerMin = 0

SoilMoist(Raw) = 252
SoilMoist = 0
Soil1DI = 1
Soil2DI = 1

LightLev(Raw) = 369
LightLev = 88

TempDegC = 20
TempDegF = 82
```
Mechanical design
## Cost analysis

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

* Rechargeable batteries
* Battery status check
* Enable outdoor use
* Remote control
* Rotating base
* UV lights
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.
* http://us.clickandgrow.com/.
Thanks

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