

# Automated Sprinkler System

## Motivation:

UH runs the sprinkler system regardless of the amount of rain received in a day. The purpose of this project would be to turn the water off when the soil moisture content has reached a number conducive for a healthy lawn .

## Environment:

Start small. Probably work within a specific spatial regime(e.g. grass area surrounding Kennedy Theater.

# Automated Sprinkler System

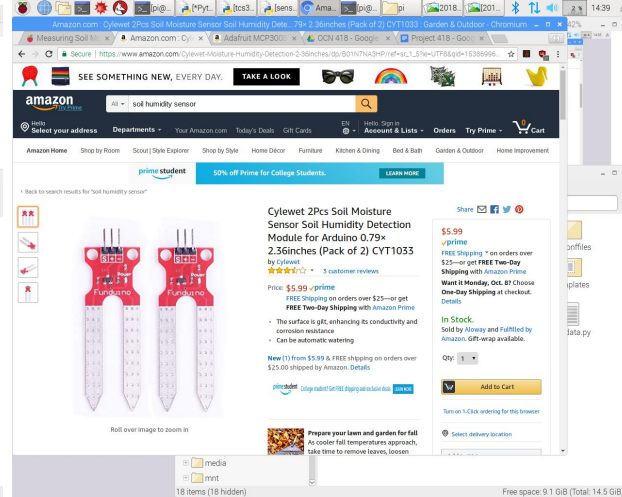
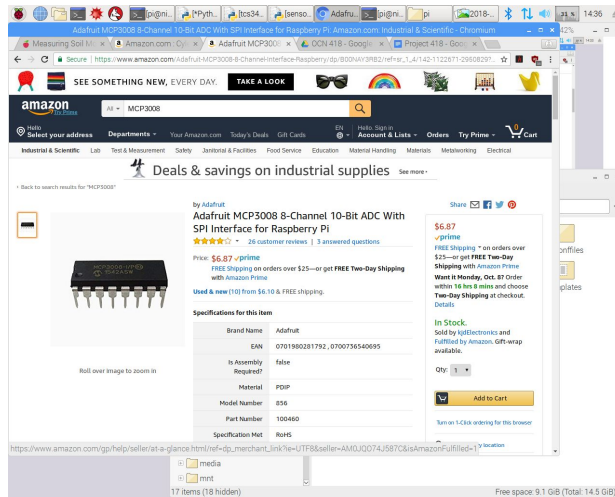
Measurement Possibilities:

Soil moisture content

Rain gauge measurement

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## Project Cost



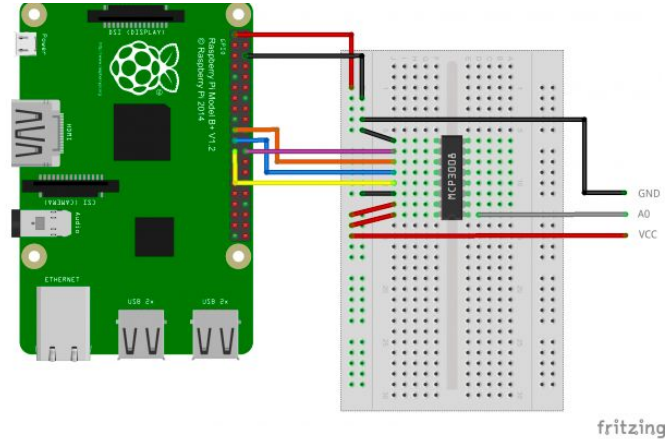
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## Equipment limitations

The soil moisture sensor is reported to break down rather quickly due to soil acidity. I think that buying this sensor is justified for short term use. They will be beneficial for testing in lab. It is worth considering a longer lasting sensor if this project is implemented.

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## Analog-Digital

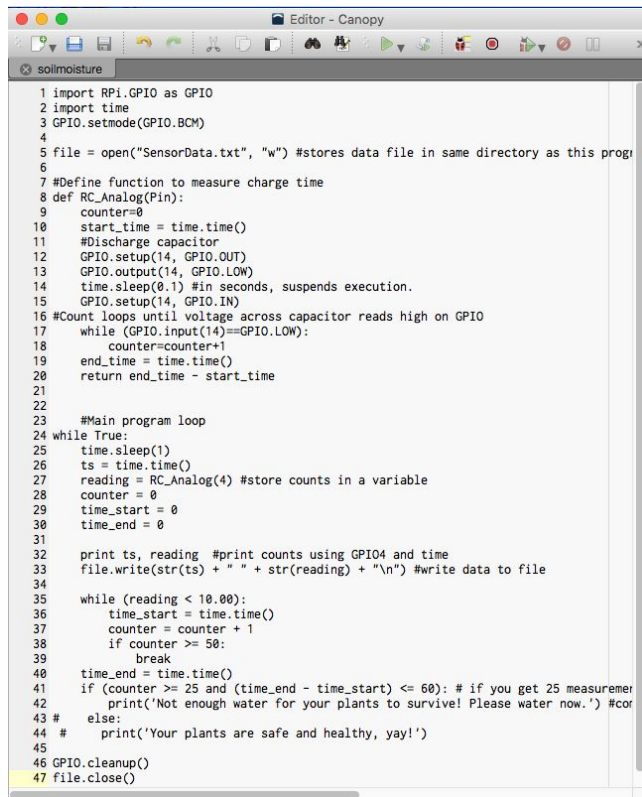


The connections to the MCP3008 are as follows:

CH0	1	16	<input type="checkbox"/> $V_{DD}$
CH1	2	15	<input type="checkbox"/> $V_{REF}$
CH2	3	14	<input type="checkbox"/> AGND
CH3	4	13	<input type="checkbox"/> CLK
CH4	5	12	<input type="checkbox"/> $D_{OUT}$
CH5	6	11	<input type="checkbox"/> $D_{IN}$
CH6	7	10	<input type="checkbox"/> $\overline{CS}/SHDN$
CH7	8	9	<input type="checkbox"/> DGND

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## Code Example



```
1 import RPi.GPIO as GPIO
2 import time
3 GPIO.setmode(GPIO.BCM)
4
5 file = open("SensorData.txt", "w") #stores data file in same directory as this prog
6
7 #Define function to measure charge time
8 def RC_Analog(Pin):
9     counter=0
10    start_time = time.time()
11    #Discharge capacitor
12    GPIO.setup(14, GPIO.OUT)
13    GPIO.output(14, GPIO.LOW)
14    time.sleep(0.1) #in seconds, suspends execution.
15    GPIO.setup(14, GPIO.IN)
16    #Count loops until voltage across capacitor reads high on GPIO
17    while (GPIO.input(14)==GPIO.LOW):
18        counter=counter+1
19    end_time = time.time()
20    return end_time - start_time
21
22
23 #Main program loop
24 while True:
25     time.sleep(1)
26     ts = time.time()
27     reading = RC_Analog(4) #store counts in a variable
28     counter = 0
29     time_start = 0
30     time_end = 0
31
32     print ts, reading #print counts using GPIO4 and time
33     file.write(str(ts) + " " + str(reading) + "\n") #write data to file
34
35     while (reading < 10.00):
36         time_start = time.time()
37         counter = counter + 1
38         if counter >= 50:
39             break
40     time_end = time.time()
41     if (counter >= 25 and (time_end - time_start) <= 60): # if you get 25 measureme
42         print('Not enough water for your plants to survive! Please water now.') #cor
43     else:
44         print('Your plants are safe and healthy, yay!')
45
46 GPIO.cleanup()
47 file.close()
```

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## Genral Concerns

I do not know the actual UH sprinkler system operations. Next step will be to talk to the grounds crew/campus arboretum

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Zone: 10

Kimberly Ching

For development purposes only

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Map data ©2018 Google

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Report a problem

**Landscape Services Staff**

Above you will find a map of the University of Hawaii at Mānoa separated in zones. Simply click your cursor on the area of interest and name of the associated groundskeeper will be listed.

Jameson Daniels  
Landscape Manager

**Contact Us**

Landscape Services

2092 East-West Road

Honolulu, HI 96822

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**Related Links**

- Landscape Master Plan
- Tree Care Plan
- ISA Tree Risk form (I)
- Plant Rentals
- Feral Cat Management
- UH Open Areas
- Campus Arboretum
- UH Foundation acct

Support the Campus Arboretum

More:

[uhlandscape.wordpress.com](#)

[Landscape Blog](#)

[instagram/campusarboretum/](#)

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**Hours of Operation**

- Office: Monday-Friday 8<sup>00</sup> a.m. - 4<sup>30</sup> p.m.
- Building Services: Monday-Friday 8<sup>00</sup> a.m. - 4<sup>30</sup> p.m.
- Landscape Services: Monday-Friday 6<sup>00</sup> a.m. - 2<sup>30</sup> p.m.
- Campus Arboretum: Monday-Friday 8<sup>00</sup> a.m. - 4<sup>30</sup> p.m.

Scheduled tours before 9<sup>00</sup> a.m. & after 5<sup>00</sup> p.m.

In accordance with the UH Academic Calendar, we observe State of Hawaii Holidays, which in 2018 are:

- Jan. 1 - New Year's Day - Monday
- Jan. 15 - Dr. Martin Luther King, Jr. Day - Monday
- Feb. 19 - President's Day - Monday

**Contact Us**

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## General Concerns

What is a more accurate measurement of water with respect to grass? Can I make the pi “talk” to an established rain gauge on campus? Or is it more accurate to measure soil moisture content?

The answer to the soil moisture idea is a question of soil mechanics. Soil is saturated if 55 percent of the soil column is filled with water. It seems to me that a soil moisture probe would be more efficient/accurate in measuring when the grass needs....question for botany department? Further literature review?