User Manual for Water Monitoring System

Introduction:

This manual is for the building of a water monitoring system using the parts list below. This manual will cover how to construct the circuit for all sensors, the type of code needed, and how to view/store the data for testing or use. Some important information to note before continuing is that the Raspberry Pi is unable to take more than 3.3V at its inputs. In addition, the turbidity sensor is sensitive to light, so make sure to calibrate in a dark or dim room. Before beginning to build this project, make sure that your Raspberry Pi is up to date. Further below will be a list of software needed for this project.

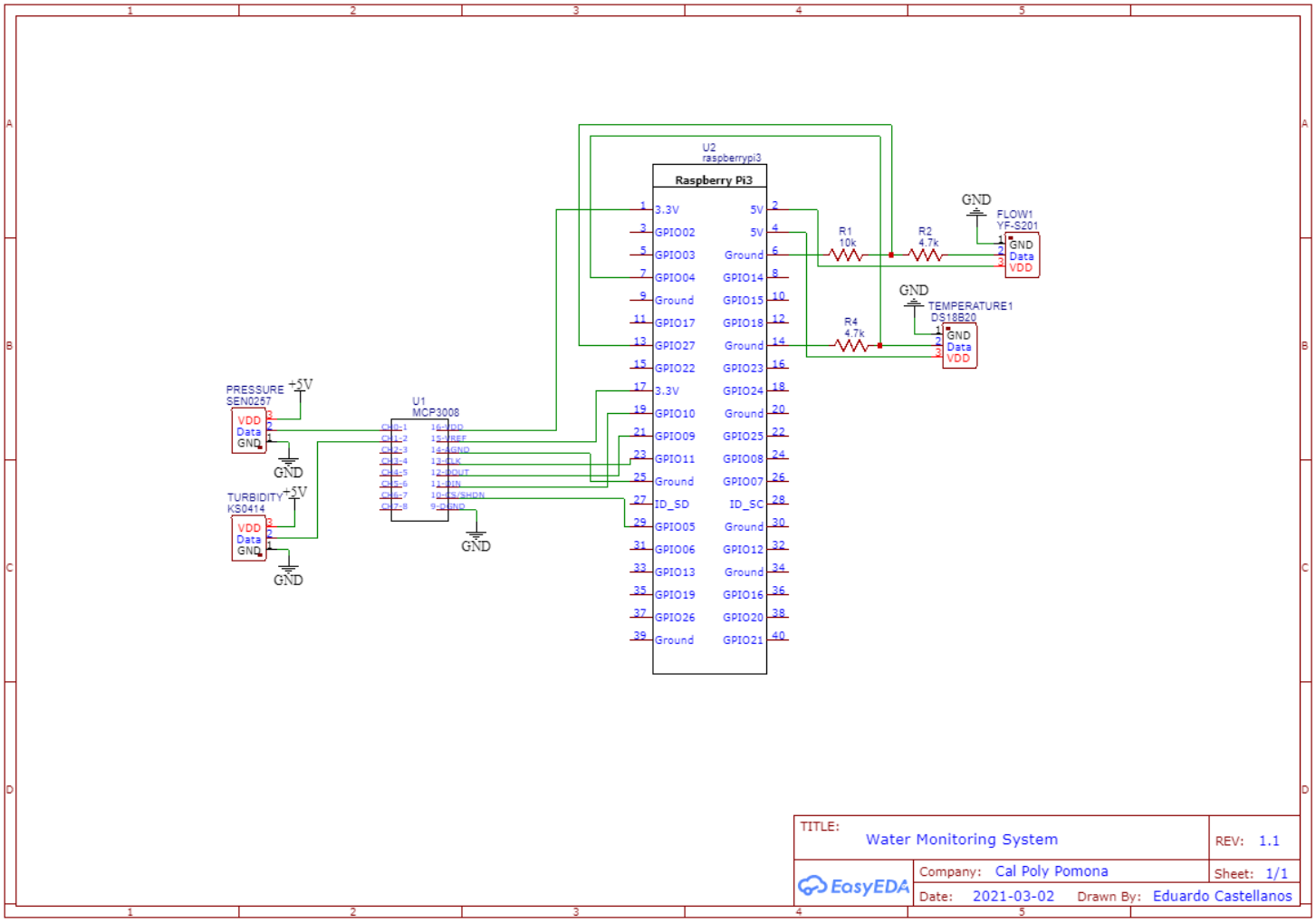
Parts List:

Water Flow Sensor [YF-S201]
Turbidity Sensor [KS0414 V1.0]
Water Pressure Sensor [SEN0257]
Temperature Sensor [DS18B20]
ADC Convertor [MCP3008]
BreadBoard
Female to Male Jumper Cables
Male to Male Jumper Cables
Raspberry Pi 3B
Resistors

The exact parts listed can be exchanged for other sensors, as long as they meet the voltage requirements when connecting to the Raspberry Pi. The water flow sensor and temperature sensor will be connected directly to the Raspberry Pi, so use the appropriate resistors to make sure the Pi will not be damaged. If possible, measure the voltages before running any code.

Due to calibration limitations, we used a different wiring system for the water flow sensor and temperature sensor. We will use an interrupt based software approach to receive the most accurate data from the water flow sensor. Therefore, we will not run the water flow sensor or temperature sensor through the ADC convertor (MCP3008).

Schematic:


U2
raspberrypi3
Raspberry Pi3
3.3V
GPIO02
GPIO03
GPIO04
Ground
GPIO17
GPIO27
GPIO22
3.3V
GPIO10
GPIO09
GPIO11
Ground
ID_SD
GPIO05
GPIO06
GPIO13
GPIO19
GPIO26
Ground
5V
5V
Ground
GPIO14
GPIO15
GPIO18
Ground
GPIO23
GPIO24
Ground
GPIO25
GPIO08
GPIO07
ID_SC
Ground
GPIO12
Ground
GPIO16
GPIO20
GPIO21
R1
10k
R2
4.7k
R4
4.7k
GND
FLOW1
YF-S201
GND
Data
VDD
TEMPERATURE1
DS18B20
PRESSURE
SEN0257
TURBIDITY
KS0414
+5V
U1
MCP3008
TITLE:
Water Monitoring System
REV: 1.1
Company: Cal Poly Pomona
Sheet: 1/1
EasyEDA
Date: 2021-03-02
Drawn By: Eduardo Castellanos

Software/Code Guide:

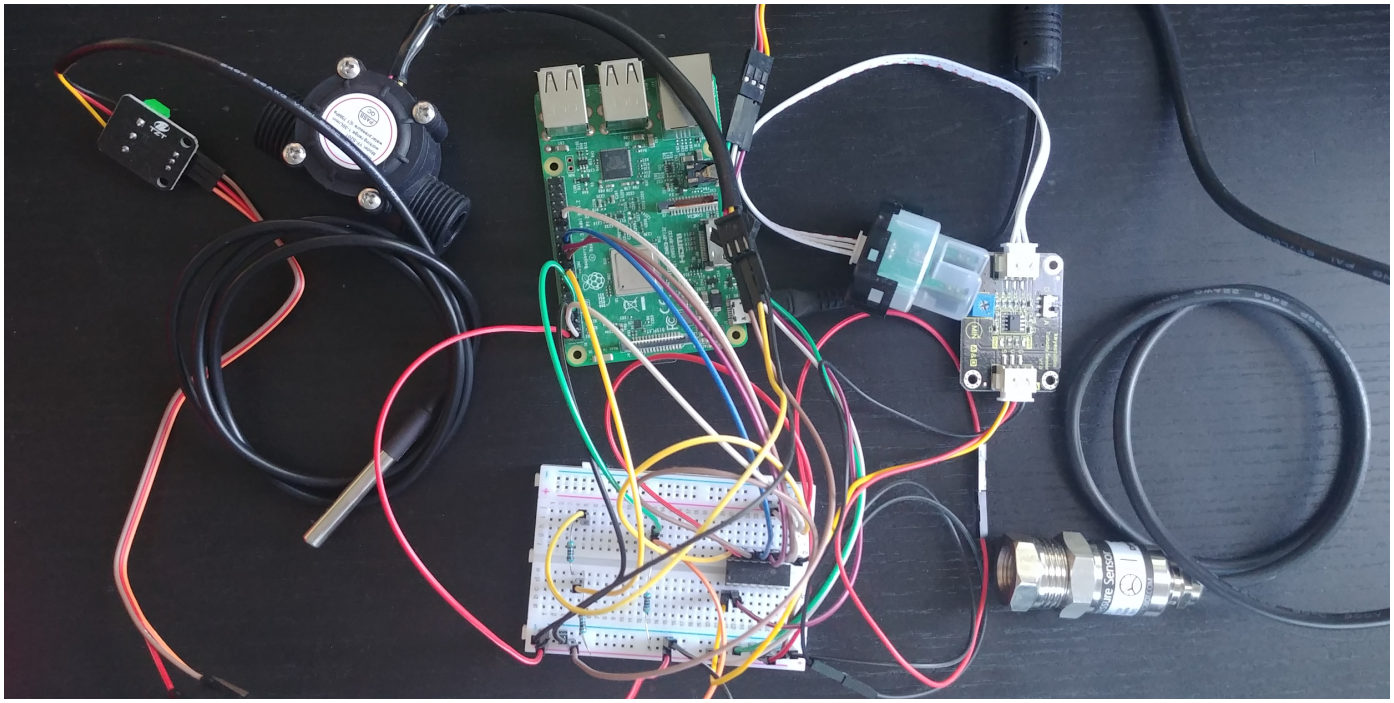
1. Apache 2
2. PHP
3. MySQL(MariaDB Server)
4. phpMyAdmin

Before starting this project, follow any guide online to set up your Raspberry Pi (remember to keep it up-to-date using 'sudo apt update && sudo apt upgrade -y'). This project was coded using Python. Below are samples of libraries used, as well as, portions of the code needed to connect the data from the sensors to a database. For this project specifically, we used phpMyAdmin as the database.

```
from datetime import datetime       #need this for NOW()
import RPi.GPIO as GPIO
import time, sys, os, glob
import MySQLdb                      #for server


global dbHost
global dbName
global dbUser
global dbPass

dbHost = 'localhost'
dbName = 'Data'
dbUser = 'admin'          #your username
dbPass = 'cpp'            #your password

while True:
    dbConnection = MySQLdb.connect(host=dbHost, user=dbUser, passwd=dbPass, db=dbName)
    cur = dbConnection.cursor(MySQLdb.cursors.DictCursor)

mySql_insert_query="INSERT INTO Sensor_Flow_Temp(Flow_Rate,Total_Liters,Temperature,Time) Values(%s,%s,%s,%s)"
val=(LperM,TotLit,read_temp(),datetime.now())

cur.execute(mySql_insert_query,val)
dbConnection.commit()
```

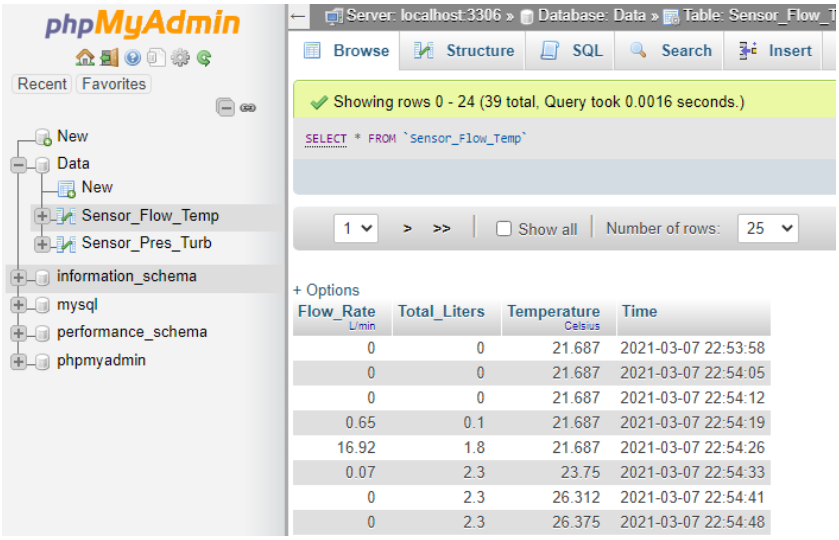
For more information regarding coding towards a phpMyAdmin server, follow the instructions/tutorial over at the MySQL website.

Photos:



Water Flow and Temperature Test

```
============== RESTART: /home/pi/Documents/Sensor_Flow_Temp.py ==============
Monitoring Start Time Thu Apr  8 16:54:45 2021
Input desired report interval in seconds 3
Reports every  3  seconds
CTRL+C to exit

Liters/min:  0.0
Total Liters:  0.0
Temperature (Celsius):  24.812
Thu Apr  8 16:54:53 2021


Liters/min:  0.0
Total Liters:  0.0
Temperature (Celsius):  24.812
Thu Apr  8 16:54:58 2021


Liters/min:  0.0
Total Liters:  0.0
Temperature (Celsius):  27.5
Thu Apr  8 16:55:03 2021
```



Turbidity and Pressure Test

```
============== RESTART: /home/pi/Documents/Sensor_Pres_Turb.py ==============
Monitoring Start Time:  Thu Apr  8 16:55:36 2021
Input desired sample interval in second(s): 3
Samples every  3  second(s)
CTRL+C to exit
Pressure:  -0.157  psi
Turbidity:  0.0  NTU
Thu Apr  8 16:55:41 2021

Pressure:  -0.157  psi
Turbidity:  0.0  NTU
Thu Apr  8 16:55:44 2021

Pressure:  -0.157  psi
Turbidity:  0.0  NTU
Thu Apr  8 16:55:47 2021
```