Zoon Setup Guide

By: Team Planters

ARDUINO
OPEN-SOURCE
COMMUNITY

Contents

Introductory

General Information

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Equipments:

1x Laptop/PC
1x Windows/MacOS/Linux
1x Arduino UNO rev 3
1x USB A-B cable
3x 1N4001 Diode
1x Generic breadboard
2x Soil Moisture Sensor
1x Peristaltic water pump
3x PNP Transistor (S8550)
1x 9v 1.5A DC power supply
1x SD card logging shield
1x 1/8 inner diameter and 1/4 outer diameter fuel line.
10x Dupont wire (Male - Female)
10x Jumper wire (Male to Male)

Parts Shopping List:

SD card logging shield
https://www.microcenter.com/product/476328/velleman-sd-card-logging-shield---2-pack
Arduino and accessories parts
https://www.amazon.com/gp/product/B00D9NQDAG/ref=ppx_yo_dt_b_search_asin_title?ie=UTF8&psc=1

9v 1.5A DC power supply
https://www.amazon.com/Adapter-Switching-5-5x2-1mm-Connecter-LotFancy/dp/B07227SRSJ
Soil moisture sensor
https://www.amazon.com/HUABAN-Hygrometer-Humidity-Detection-Moisture/dp/B077PW1VW5/ref=sr_1_2_sspa?crid=1SEIRM5RSFYVV&keywords=arduino+soil+moisture+sensor&qid=1557621302&s=electronics&sprefix=arduino+soil+moi%2Celectronics%2C151&sr=1-2-spons&psc=1
Peristaltic water pump
https://www.amazon.com/Gikfun-Peristaltic-Connector-Aquarium-Analytic/dp/B01IUVHB8E/ref=sr_1_2?keywords=arduino+peristaltic+water+pump&qid=1557621364&s=electronics&sr=8-2

Safety Summary (General guidelines)

Turning the power off and taking proper static precautions also applies to Arduinos. Anorton's tip about not resting it on a conductive surface is also useful.

Some other things to keep in mind:

- Double check the polarities of any connections you make.
- Keep a consistent wiring color code. Use red for power and black for ground.
- Calculate the expected current through all components before you apply power.
- Connect and test one small part at a time, instead of in one big bang.
- Make sure the parts you buy expect the same voltage, or perform the appropriate conversion.

For keeping people safe:

- Know where the fire extinguisher is just in case.
- Don't put cords where people can trip on them.
- If your project has a propeller or something physically dangerous, build fail safes and kill switches into the system.
- Be careful what you touch while troubleshooting. Arduinos usually don't deal with very high voltages, but inductors and capacitors can build up higher charges than you expect, and hold it after power is removed.

Getting Started

Software Installation

Arduino IDE (https://www.arduino.cc/)

Online Tool (https://create.arduino.cc/)

PC Download (https://www.arduino.cc/en/Main/Software)

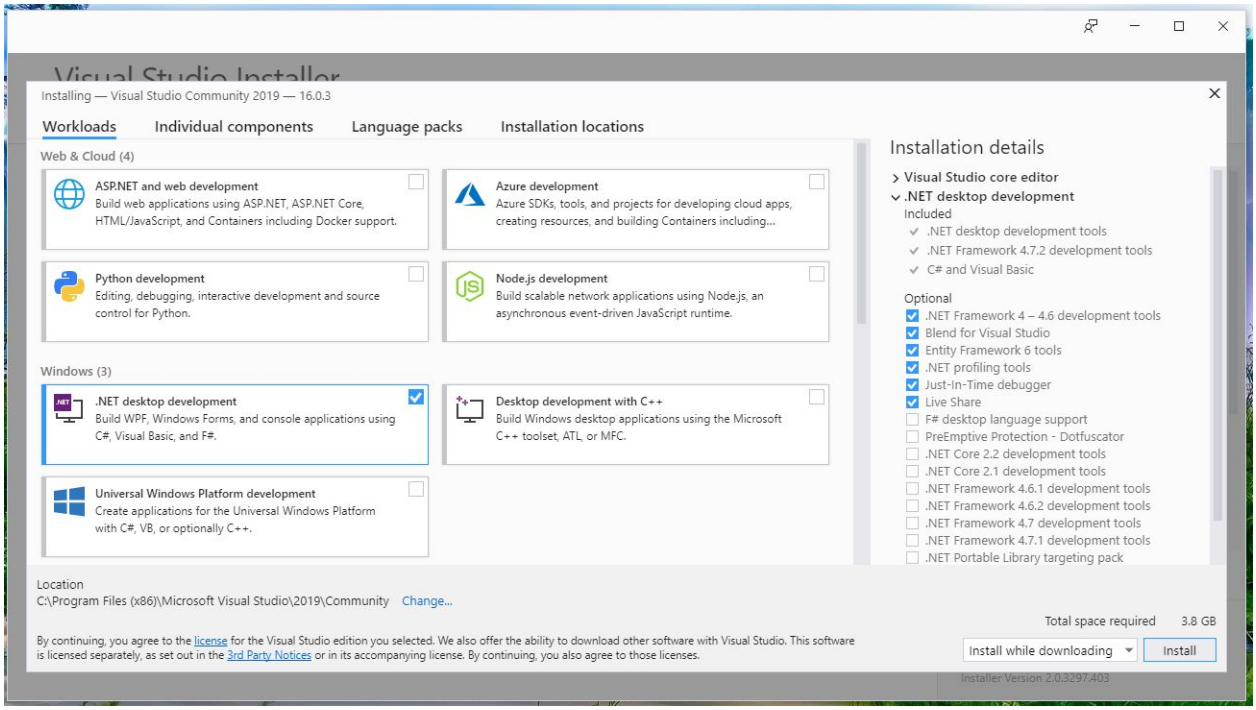
1. Arduino 1.8.9 support for Windows, Windows app, Mac OS X and Linux. For the purpose of this project, we went with the first option “Windows installer, for windows XP and up”

2. Start the installer, click “I Agree”, “Next”, “Install”.
3. A few window security should pop up and you need to click “Install” on them so it can recognize your Arduino via USB ports.
4. Close the installer.
5. The Arduino IDE should now be ready, head over to your program list and start it up.
6. Allow access through the firewall when Windows requests it.

Visual Studio (https://visualstudio.microsoft.com/)

Visual Studio community 2019

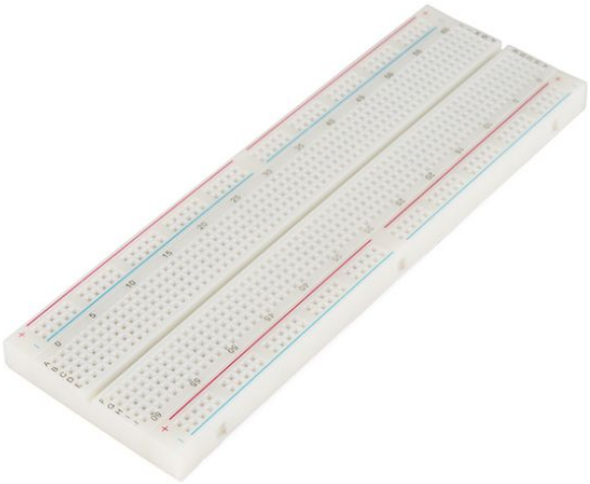
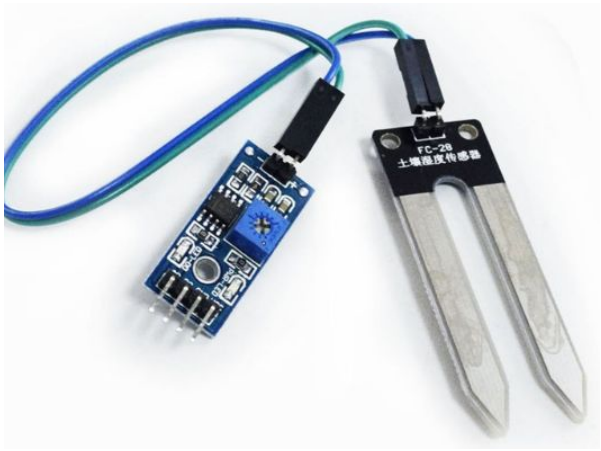
1. You can download visual studio community 2019 via the main webpage.
2. The installer should immediately start after download is finished.
3. Once in the installer, select option to include Windows .Net desktop development and then hit install. Afterwards, it should be ready for use.

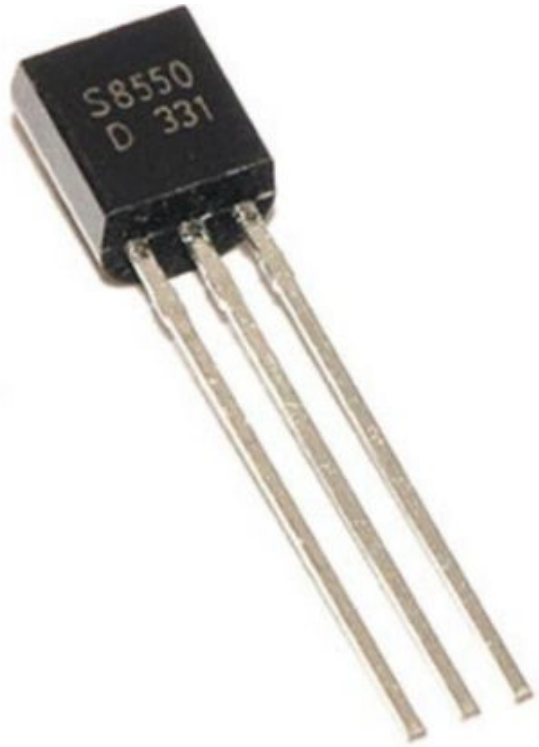


Hardware Installation

Equipment description

Arduino UNO R3	
USB A-B cable	
1N4001 Diode	

Generic breadboard	
Soil Moisture Sensor	
Peristaltic water pump with 1/8 inner diameter and 1/4 outer diameter fuel line.	

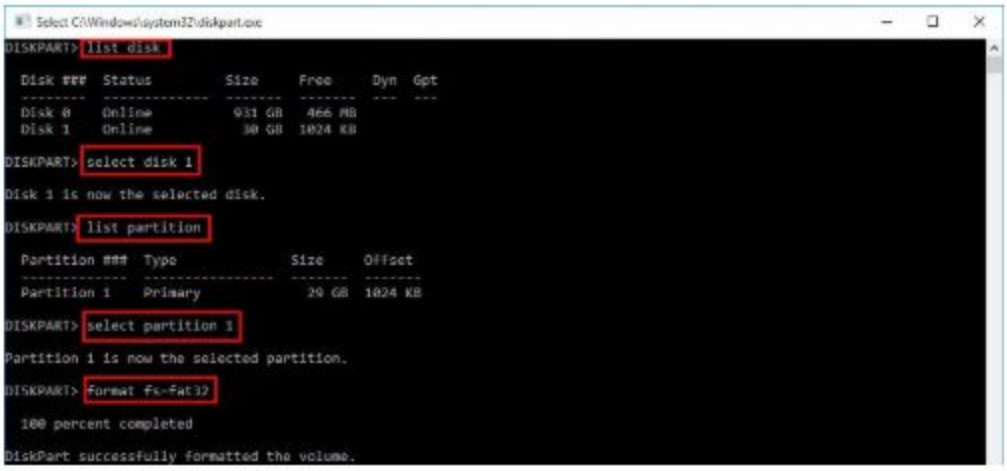
PNP Transistor (S8550)	
9v 1.5A DC power supply	
SD card logging shield	

Circuit Setup

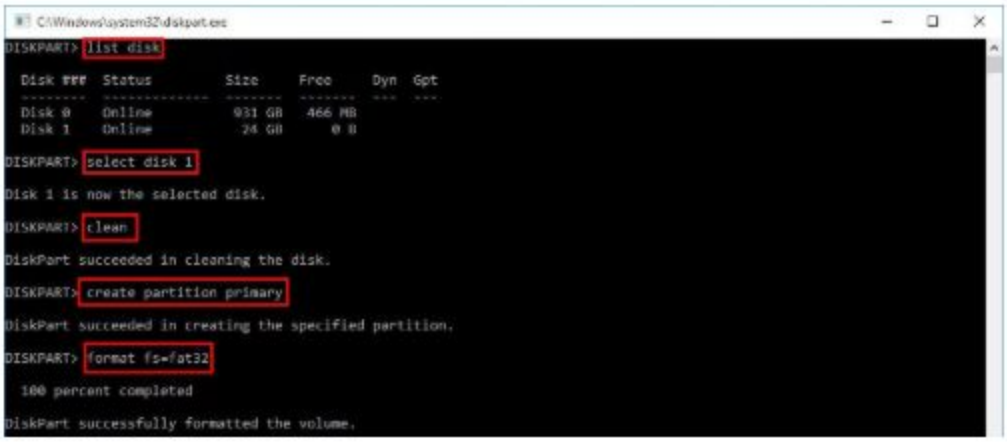
SD card format guide

Set up

1. Some SD card/SD card + microSD card does not come preformatted for the correct file system.
2. Easiest step is to right click on the SD/microSD card while its plugged into your laptop/PC, click format.
    a. Under file system, change the default type to FAT32, if that option is not there, don't worry, there's another way.
3. Second option is to run Diskpart as administrator in windows terminal.
4. Press Windows + R to open Run box and input "diskpart" and press "Enter Key".
5. Type the commands below and every command should be followed with hitting "Enter".
6. "list disk" – all disks connected to your PC will be listed.
7. "select disk n" – "n" is the number of your USB flash drive.
8. "list partition" – all partitions on the selected disk will be listed.
9. "select partition m" – "m" is the number of your USB flash drive partition.
10. "format fs= fat32" – the selected partition will be formatted as FAT32.

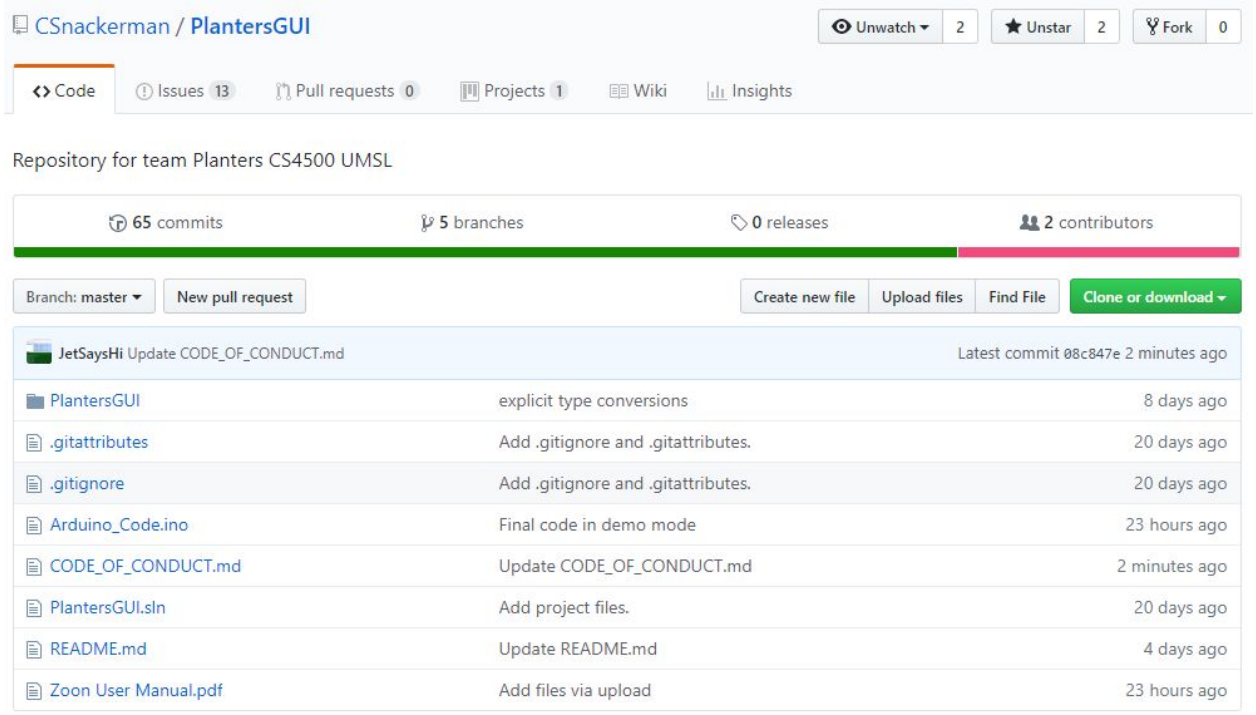


11. Then just wait the process finish and type exit to close the window. If there are multiple partitions on your external drive, follow the commands below:
    a. "list disk".
    b. "select disk n" – "n" is the number of your USB flash drive.
    c. "clean" – all data and partitions on the selected disk will be deleted.
    d. "create partition primary".
    e. "format fs=fat32".


C:\Windows\system32\diskpart.exe
DISKPART> list disk
Disk ### Status Size Free Dyn Gpt
Disk 0 Online 931 GB 466 MB
Disk 1 Online 24 GB 0 B
DISKPART> select disk 1
Disk 1 is now the selected disk.
DISKPART> clean
DiskPart succeeded in cleaning the disk.
DISKPART> create partition primary
DiskPart succeeded in creating the specified partition.
DISKPART> format fs=fat32
100 percent completed
DiskPart successfully formatted the volume.

Coding & GitHub

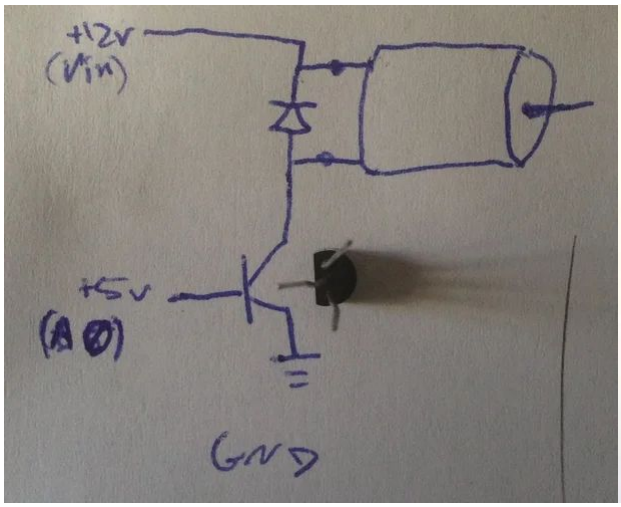
Download repository (https://github.com/CSnackerman/PlantersGUI)

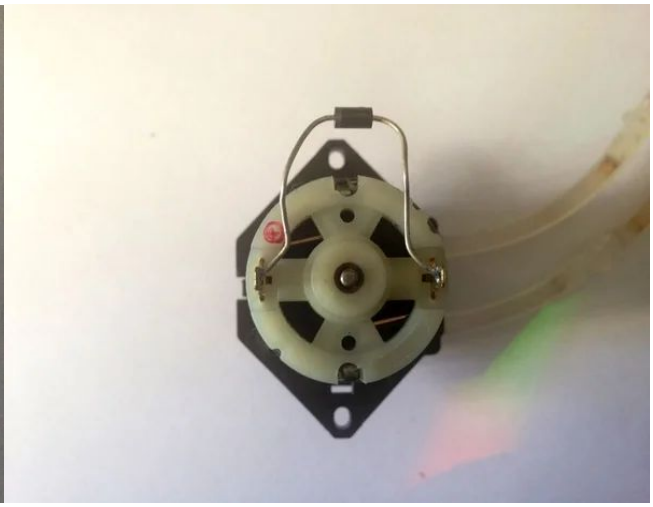


Planters GUI Repository

In the repository main page, you can see the important files that is needed for our project. You can download the whole repository using the green button labeled “Clone or download”. The Arduino code that's need for our Arduino UNO R3 is under “Arduino_Code.ino”. The GUI interface for our visual studio is labeled “PlantersGUI.sln”, this will allow you to play with the code more freely with unlimited customization on the functions. Also, we included our code of conduct and a readme file, as well as this user manual you’re reading right now, along with other tidbits you can check out in the other tabs like contributions.

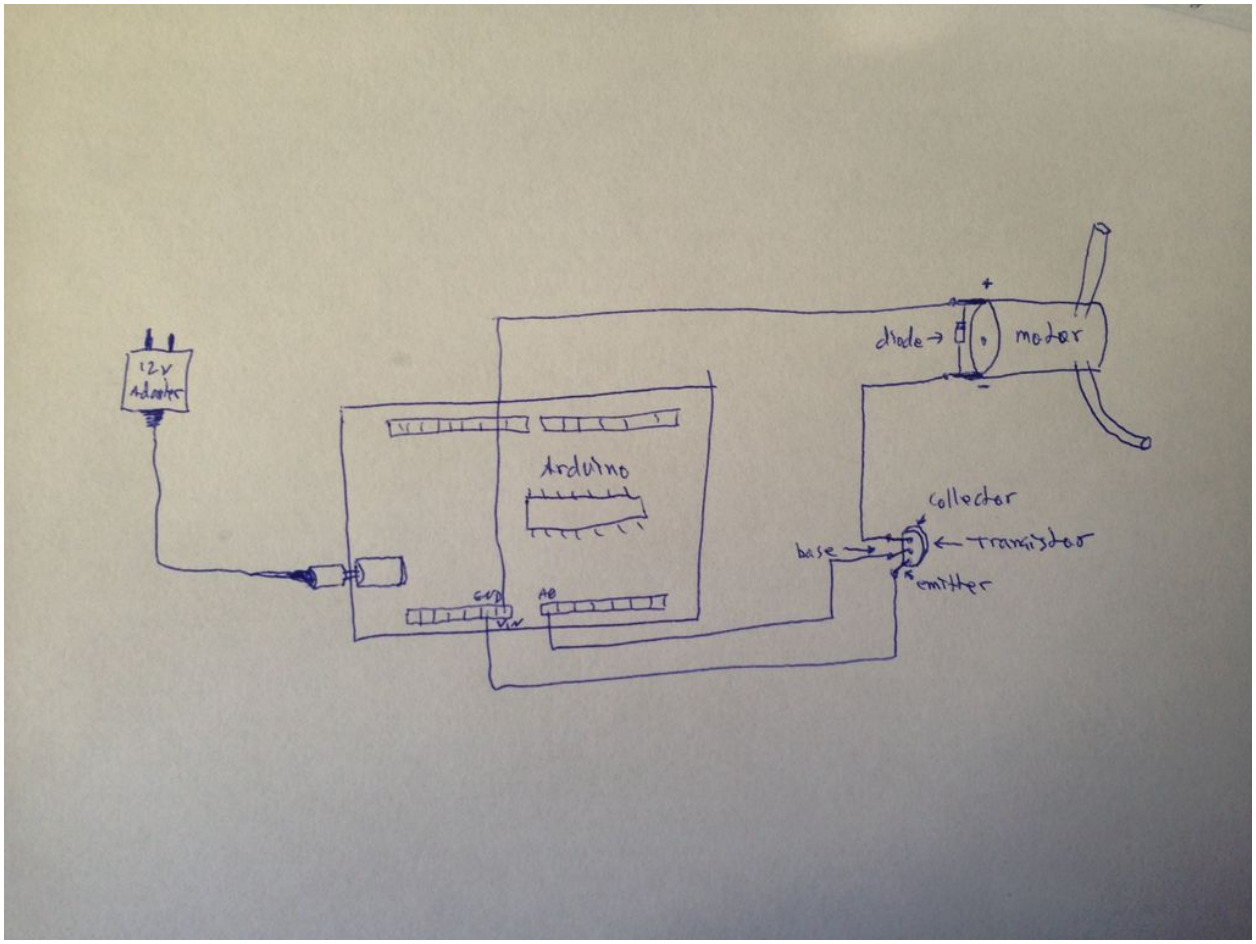
Experiment





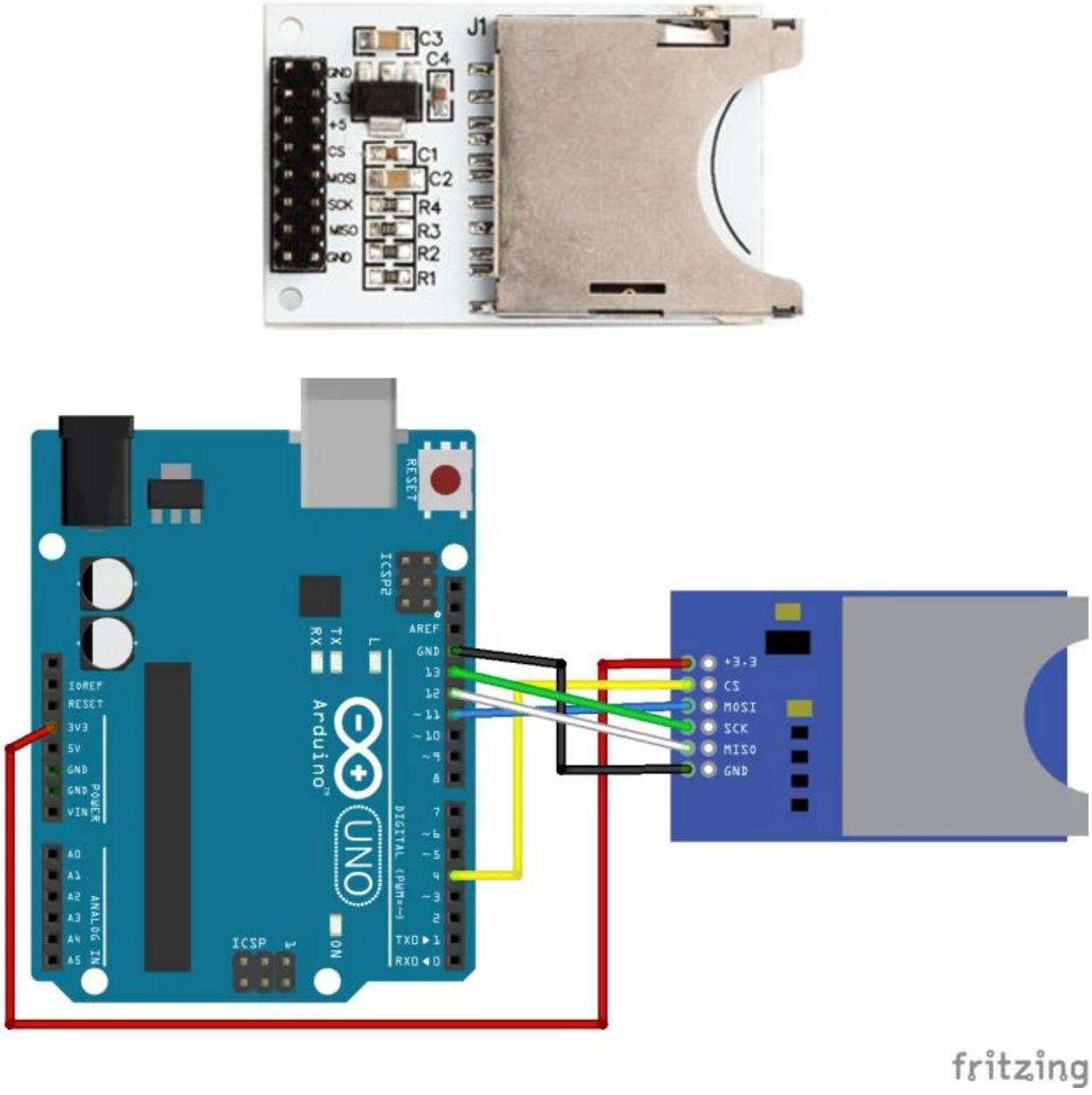
PNP Transistor (S8550) - Use to connect to +5v power, ground and Vin, so our base, collector and emitter. Follow the circuit diagram above. This transistor will allow us to use 5v from the Arduino to switch to the 12v required by the pump motor. **WARNING:** If the pump is connected directly to the pins, it will short out our Arduino board.

1N4001 Diode - Connect the diode in the above orientation, where the grey/silver band is on the side of the positive terminal of the pump. This can prevent potential damage from energy surge when the motor is switched off during the experiment.



This is an overall diagram for the motor pump set up, you can use female/male wires to connect to the pump in anyway that fits your orientation.

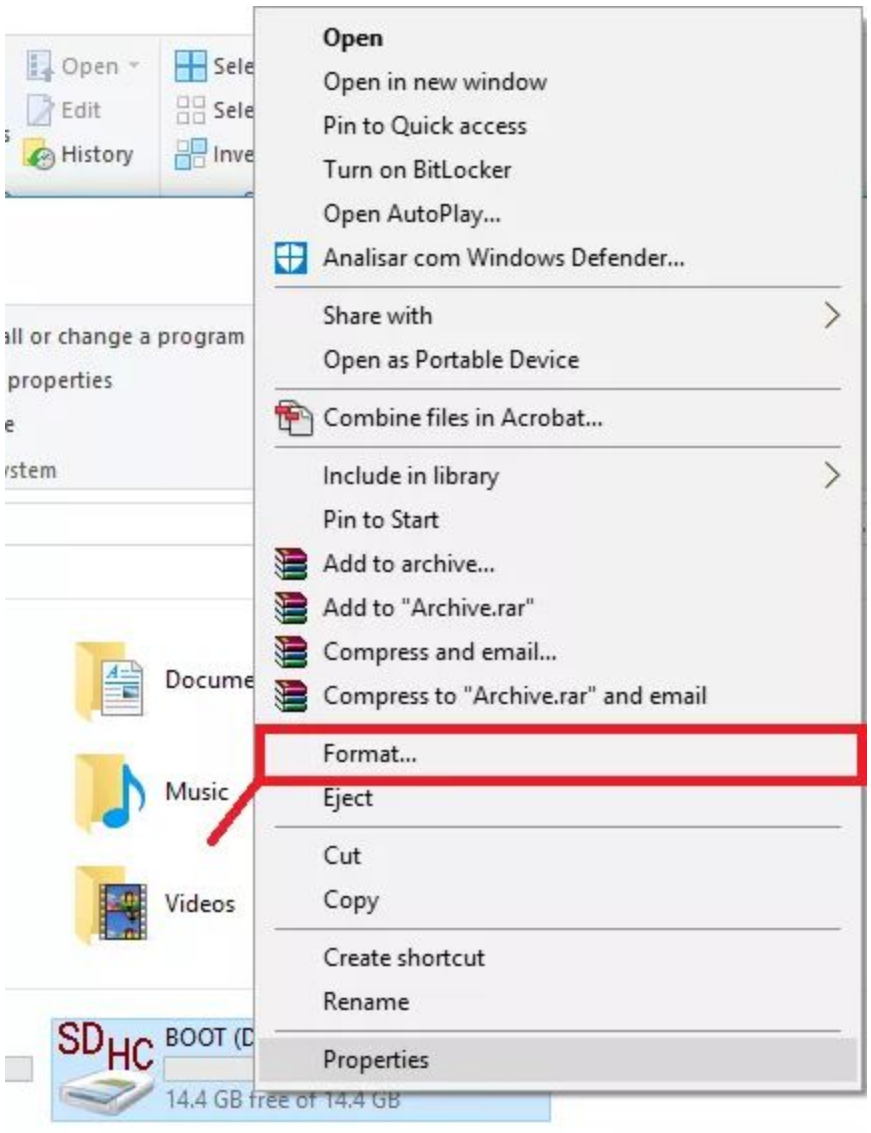
Using the above picture as a reference point, we can plug in our soil moisture sensor. Connect the sensor to the amplifier/A-D circuit board using x2 male to female wires. On the amplifier/A-D circuit board, there should be 4 terminals we can plug in our female to male wires, but the ones we are using are: Vin, Sig and GND. Connect Vin to the arduino “7” on the digital PWM. Connect the Sig to the analog A1 and GND to GND by the 5v and Vin part of the arduino under “Power”.



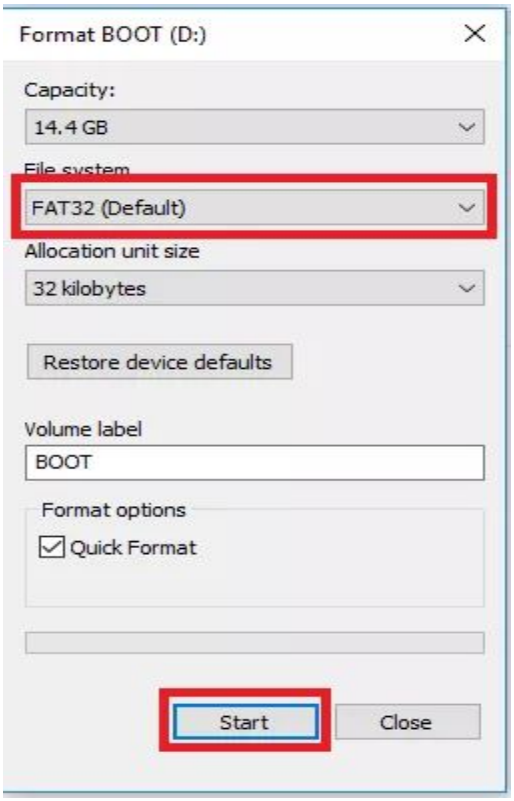
The pins we will be using are the outermost pins of SD card shield. We will be using GND, MISO, SCK, MOSI, CS, 3.3v. Connect the GND from the bottom of the SD card shown above to the GND right by digital pin 13. Connect MISO to digital pin 12. Connect SCK to digital pin 13. Connect MOSI to digital pin 11. Connect CS to digital pin 4. Connect 3.3v to 3.3v

Format SD Card

1. To format the SD card, insert it in your computer. Go to My Computer and right click on the SD card. Select Format as shown in figure below.

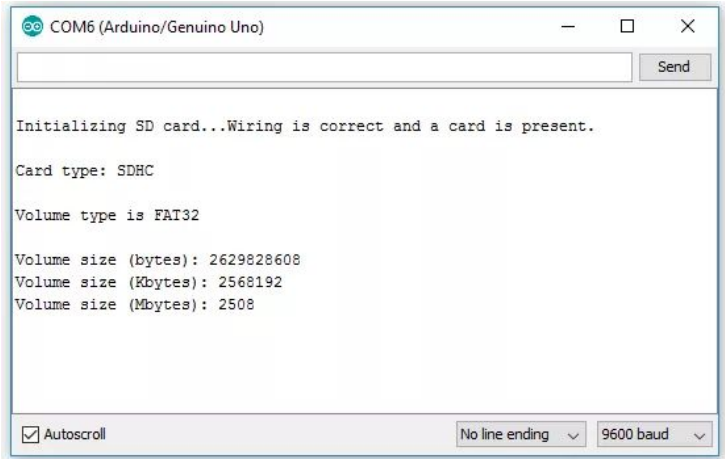


2. A new window pops up. Select FAT32, press Start to initialize the formatting process and follow the onscreen instructions.



Test SD Card Module

1. To make sure everything is wired correctly and the SD card is working properly, in the Arduino IDE window go to File> Examples > SD > CardInfo.
2. Upload the code to your Arduino board. Make sure you have the right board and COM port selected.
3. Open the Serial Monitor at a baud rate of 9600 and you should see your SD card information. If everything is working properly you'll see a similar message on the serial monitor.



Classroom Experiment

Upload Code

Following all the steps above, your Arduino is ready to be tested. Last step we need to take is to upload the code we downloaded from the GitHub repository and open up “Arduino_Code.ino” using the Arduino IDE. From there, you can compile to make sure the code works and then with the Arduino connected to the PC/laptop, you can upload the code. The Arduino will not self sufficiently water the plant for you

USER GUIDE

USER GUIDE

Home use

Upload and Modify Code

Following all the steps above, if you want to use the Arduino for home usage for your plant, using the code downloaded from GitHub, you will need to play with the code for a little bit. Some value you need to change to adjust to the plant and the environment are: “int watertime = ??”, “int waittime = ?”. You can remove line # 23 - #36 if you don’t want to collect any data, as well as line #57 - #69. You can change the delay value on line #78 to let your soil moisture sensor check in a longer delay than every second of the day. Change the value on line 87 for the water time to a longer time if you don’t want your pump to accidently flood your plant.

Troubleshooting

Hardware

SD Card format

Usually, you can format exFAT to FAT32 via CMD successfully. However, if you try to format partition over 32GB, you'll receive the error message that the volume size is too big. And there are chances that you'll be prompted by "the media is write-protected" error . In such case, it is a wise decision to turn to a professional third party format tool.

Peristaltic Pump

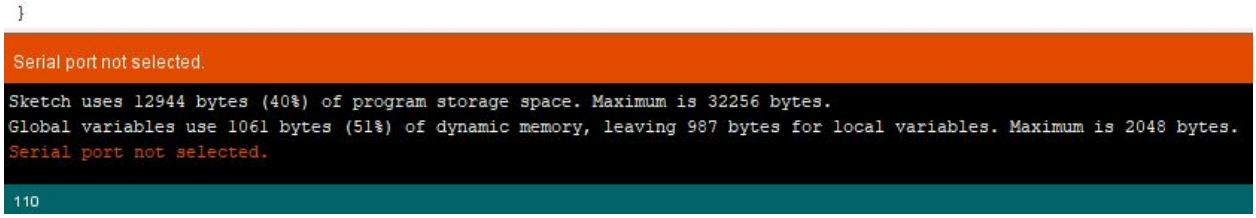
1. One simple way to test if the pump is getting proper power is to connect an LED to it with the short end of the LED wire on negative of the pump and the long wire of the LED on the positive side of the pump, marked as a purple +.
2. The transistor can easily short out if you did not use a resistor with it, easily swap one out for a new one or make sure you're using a 220 ohm resistor connecting the resistor to A0 analog port on the Arduino.
3. The diode is in the wrong direction connected on the positive and negative terminal on the pump.

Soil Moisture Sensor

1. You can test if it is reading any value by holding both prong of the sensor.

Software

Arduino Serial Port Error



It either means the Arduino is not plugged into your PC or that the serial port is not naturally selected for you when you plug in the Arduino. Once you have the Arduino is plugged in, under the Tools tab, scroll down to Port, select "COM3/COM2/COM1" then your IDE should be able to communicate and compile with the Arduino now.

Arduino Driver Error

The easiest way to check if the drivers for your board are installed correctly is by opening the Tools > Serial Port menu in the Arduino software with the Arduino board connected to your computer. Additional menu items should appear relative to when you open the menu without the Arduino connected to your computer. Note that it shouldn't matter what name the Arduino board serial port gets assigned as long as that's the one you pick from the menu. On Windows 7+ (particularly the 64-bit version), you might need to go into the Device Manager and update the drivers for the Uno. Just right click on the device (the board should be connected to your computer), and point Windows at the appropriate .inf file again. The .inf is in the drivers/ directory of the Arduino software (not in the FTDI USB Drivers sub-directory of it).

Other Common Errors (https://www.arduino.cc/en/Guide/Troubleshooting)