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| **Artifact Information** | | | | | | | | |
| **Artifact ID** | | **Artifact Title** | | | | | | |
| RPS-001 | | Raspberry Pi Setup | | | | | | |
| **Capstone Team** | | | | | **Revision** | | **Artifact Date** | |
| Capstone Team 27 - Granustem | | | | | 1.1 | | Apr 13, 2019 | |
| **Prepared by** | | | | | **Checked by** | | | |
| Jonathan Meldrum | | | | | Tanner Gaskin | | | |
| **Revision History** | | | | | | | | |
| **Revision #** | **Date** | | **Prepared by** | **Checked by** | | **Description** | | **Approved by** |
| 1.0 | Feb 11, 2019 | | Jonathan Meldrum | Tanner Gaskin | | Initial Version | | Reese Bastian |
| 1.1 | Apr 13, 2019 | | Jonathan Meldrum | Tanner Gaskin | | Added dependencies and configuration so that the image is compatible with the PCB | | Reese Bastian |

1. Summary

This artifact contains instructions for how to set up the Raspberry Pi SD Card to run the plant stalk measurement software. An image with this setup already exists in “FIELDAQ\_SD\_Image.img”. To skip this process, download the image file from the link below and flash the image to an SD card 16GBs or larger using Etcher.

https://byu.box.com/s/9otxs4tt3f2d651gqqrp8gnffg5g0zf4

https://www.balena.io/etcher/

Username: pi

Password: granustem

2. Flashing the SD Card

Download "Raspbian Stretch Lite" from:

* <https://www.raspberrypi.org/downloads/raspbian/>

I used version: November 2018 (2018-11-13). Follow the instructions on the website to download Etcher and flash the SD Card. You could also use lsblk (Linux) or diskutil list (Mac) to find the SD Card’s device file (in /dev/), and then use dd to flash the SD Card.

3. Initial Setup

Run sudo raspi-config

* Change pi's password to "granustem"
* Boot options:
  + Desktop / CLI
    - Set to “Console Autlogin”
  + Disable “Wait for Network at Boot”
* Localization options:
  + Change locale to en\_us (and set default to C.UTF\_8)
  + Change timezone to Denver
  + Change keyboard layout to US
  + Change WiFi country to US
* Interfacing options:
  + Enable SSH
  + Enable I2C
  + Serial:
    - Disable Login Shell
    - Enable Serial Port Hardware
* Network options:
  + Setup WiFi (if you do not have access to an ethernet cable)
* Install vim (optional):
  + sudo apt-get install vim

4. Update Packages

Once connected to the internet, run:

sudo apt-get update

sudo apt-get upgrade

sudo apt-get clean

5. Installing Kivy

These commands can take a while (hours for some).

* Install PIP:

sudo apt-get install python3-pip

* Install dependencies:

sudo apt-get update

sudo apt-get install libsdl2-dev libsdl2-image-dev libsdl2-mixer-dev libsdl2-ttf-dev \

pkg-config libgl1-mesa-dev libgles2-mesa-dev \

python-setuptools libgstreamer1.0-dev git-core \

gstreamer1.0-plugins-{bad,base,good,ugly} \

gstreamer1.0-{omx,alsa} python-dev libmtdev-dev \

xclip xsel

* Install python dependencies:

sudo pip3 install Cython

* Install Kivy (from the latest commit used by KivyPie image):

sudo pip3 install git+https://github.com/kivy/kivy.git@4d42804b30690918c957a1c0c52d51cf908955a6

6. Kivy Setup

* On the Raspberry Pi, Kivy uses ‘gl’ instead of SDL2, so add the following to your ~/.bashrc:

export KIVY\_GL\_BACKEND='gl'

* To (optionally) show a cursor for debugging, add the following lines to the [modules] section in ~/.kivy/config.ini

cursor=1

touchring=1

7. Setup the Touchscreen

* Backup /boot/config.txt
* Edit /boot/config.txt
* Add (or update if these settings already exits):

# uncomment if hdmi display is not detected and composite is being output

hdmi\_force\_hotplug=1

# uncomment to force a specific HDMI mode (here we are forcing 800x480!)

hdmi\_group=2

hdmi\_mode=87

hdmi\_cvt=800 480 60 6 0 0 0

hdmi\_drive=1

max\_usb\_current=1

* Remove:

dtparam=audio=on

* Run "sudo raspi-config”:
  + Advanced Options -> Audio
    - Enable “force 3.5mm headphone jack”

8. Setup the I2C

* Backup /boot/config.txt
* Edit /boot/config.txt
* Add (or update if these settings already exits):

dtparam=i2c\_arm\_baudrate=400000

9. Inverted Touchscreen Solution

* Backup /usr/local/lib/python3.5/dist-packages/kivy/input/providers/hidinput.py
* Edit /usr/local/lib/python3.5/dist-packages/kivy/input/providers/hidinput.py
* Change Line 422 from:

invert\_y = int(bool(drs('invert\_y', 1)))

* To:

invert\_y = int(bool(drs('invert\_y', 0)))

10. Installing a Desktop Environment

The user can exit the software to access the desktop environment (to be able to browse files, etc.) Run the following to install the desktop environment:

sudo apt-get install raspberrypi-ui-mods

sudo apt-get install --no-install-recommends xinit

11. Installing Plant Stalk Measurement Device Software

* Move the software folder “GranuSoft” to ~/
* Install dependencies:

sudo pip3 install numpy matplotlib

garden install graph

garden install matplotlib

* At this point, the software should be able to run using fake data.
* Install sensor dependencies:

sudo pip3 install RPI.GPIO

sudo pip3 install adafruit-blinka

sudo pip3 install pyserial

sudo pip3 install adafruit-circuitpython-gps

sudo pip3 install adafruit-circuitpython-lis3dh

sudo pip3 install adafruit-circuitpython-am2320

sudo pip3 install adafruit-circuitpython-ads1x15

12. Modify the Adafruit ADC Library

* Go to /usr/local/lib/python3.5/dist-package/adafruit\_ads1x15/ads1x15.py
* Comment out lines 101 and 102, in the \_read function
* This will allow you to sample much faster, but note it is only valid if you are in continuous mode. See sensor\_info.docx for more info.

13. Running Software at Boot

* Add the following lines to ~/.bashrc

cd ~/FIELDAQ/Granusoft/src

python3 main.py