1 Introduction

1.1 What is Rasberry Pi?

The Raspberry Pi is an tiny computer, that includes a tiny processor, a bit of memory, a slot for an SD card, and some input/output jacks, e.g. HDMI, USB, headphone, camera, and pin header for various sensors.

1.2 Why use Raspberry Pi?

The Pi has a lot of functionality and flexibility for develop monitoring of environmental parameters.

1.3 Uses in Environmental Science

1.3.1 Weather and Climate Change

1.3.2 Air Pollution Monitoring

1.3.3 Soil Water Monitoring and Irrigation Control

1.3.4 Conservation

Conservation biologists use a wide range of instruments to track and monitor wildlife (camera traps, active (radio) and passive (RIF) transmitters). In addition the use of cameras are used to evaluate plant health and diversity (spectral analysis).

1.4 Resources

1.5 Raspberry Pi

The Raspberry was created to help non-technical youth to learn computer and robotics. The Raspberry Pi was an unexpected success and now the Pi is one of the most important minaturized computers for a wide range of projects.
The

1.5.1 Unpacking the Raspberry Pi

When you recieve your Pi, plan on spending about 1-2 hours setting it up which include the following steps:

1. Unpack Kit Contents

2. Put Pi in case and add heat sinks (video instructions for the case at https://www.canakit.com/pi-case)

3. Connect to keyboard, mouse and monitor. Make sure the HDMI plug is in the correct mini-HDMI socket and the monitor is configured to get a signal from the port being used.

4. Insert pre-loaded SD card

5. Plug-in Pi, you'll see a rainbow screen for a minute and then a installation menu.

6. Install the Rasbian operating system only. This will take 10 minutes. Read the little windows so you know some of the resources associated with the operating system. The installations stalls at the end, where it says 100%. Be patient, it will finish on it's own and reboot.

7. Once the Rasbian OS starts, you'll see four raspberries at the top and then you'd get some prompts to set up the OS.

8. I suggest you keep the password as default for now, select the langauge, keyboard type, and time zone.

9. Next you'll need to get connected to the internet. Select your modem and enter password to connect.

10. Then you'll get a prompt to check for updates. Yes, there will be updates. This will take another 10 minutes. About 1/2 way the screen goes completely blank. I am not sure why, but it's rather disconcerting.

11. Just like with a desktop, you will need to shut down the Raspberry Pi before removing it from power. You can either do this through the raspberry icon in the top left corner of your console under the "shutdown" option, or you can type $"sudoshutdown-hnow"intheconsole.Onceyouhavedonethisyoucanremoveyourpifrompowe$

1.6 Remote Access

It doesn't take too long (10 minutes once you get the hang of it) to be able to work remotely on your microprocessor via a tablet or laptop. More information at

1. Begin by making sure all of your packages are up-to-date (even if you updated while setting up your OS, you will still need to do this). Do this with the code $"sudoapt-getupdate"andthen"$sudo apt-get upgrade". This will take several minutes.

2. Enable the SSH server by typing $"ifconfig"intotheconsole.Thiswillleadyoutoascreenwithseveraloptions$ "sudo apt-get remove xrdp vnc4server tightvncserver", $"sudoapt-getinstalltightvncserver", andfinally"s$ apt-get install xrdp".

3. Type $"ifconfig"intoyourconsoletofindyourRaspberryPi'sinetaddressunderthe"wlan"subcategory.Thi$ $opentheterminalandadd"sshpi@[YOURPI'sINETADDRESS]".[Note:$ $theauthordoesnothaveaMacorLinuxOS, sothishasnotbeentested].$

5. Connecting to Windows OS: this is a bit more involved; you will need to download an SSH client. The Microsoft "Remote Desktop Connection" app is available for free, and is pretty intuitive to use. Download this, and follow the

instructions to set it up. Once it is installed, all you will need to do is enter the inet address you found above into the text box, and it will open a page for you to add your username and password (which at this point should still be "pi" and "raspberry"). Then your console will open.

> If it won't connect: make sure your microprocessor and the computer you are attempting to accesss it from are on the same wifi; make sure your microprocessor is connected and hasn't gone to sleep; make sure you've properly enabled all of the packages (I had to try to run xrdp twice to get it to work the first time).

6. Still working on: remotely accessing w/o HDMI connection, mirroring between microprocessor console and remote access console (more information to come).

1.6.1 Video Tutorials

1.7 Projects General-purpose input-output Examples

1.7.1 Weather and Climate

1.7.2 Air Quality

1.7.3 Sensors

Particulate Matter

NOx

O3

CO

Temperature and Humidity

1.7.4 Software

- Python Script

1.7.5 Soil Moisture

[cheap version](https://tutorials-raspberrypi.com/measuring-soil-moisture-with-raspberry-pi/)

[Raspberry 3 and Capacitance Sensors](https://www.switchdoc.com/2018/11/tutorial-capacitive-moisture-sensor-grove/)

[moisture-sensor-dfrobot](https://tutorials-raspberrypi.com/raspberry-pi-capacitive-spoil-moisture-sensor-dfrobot-gravity/)

1.7.6 Wildlife

Poacher Cam v7, Chris Kline, panthera.org