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Introduction

Vision behind NeoSnap

NeoSnap is a device that was created by LSRC Consulting for Enlace as a senior design project at the University of Illinois at Chicago. The goal of this project was to provide Enlace a better and cheaper alternative to a mobile application that simulated a photo booth. At LSRC, we strive for excellence and innovation so we took the idea one step further by including Enlace's mission in our final product.

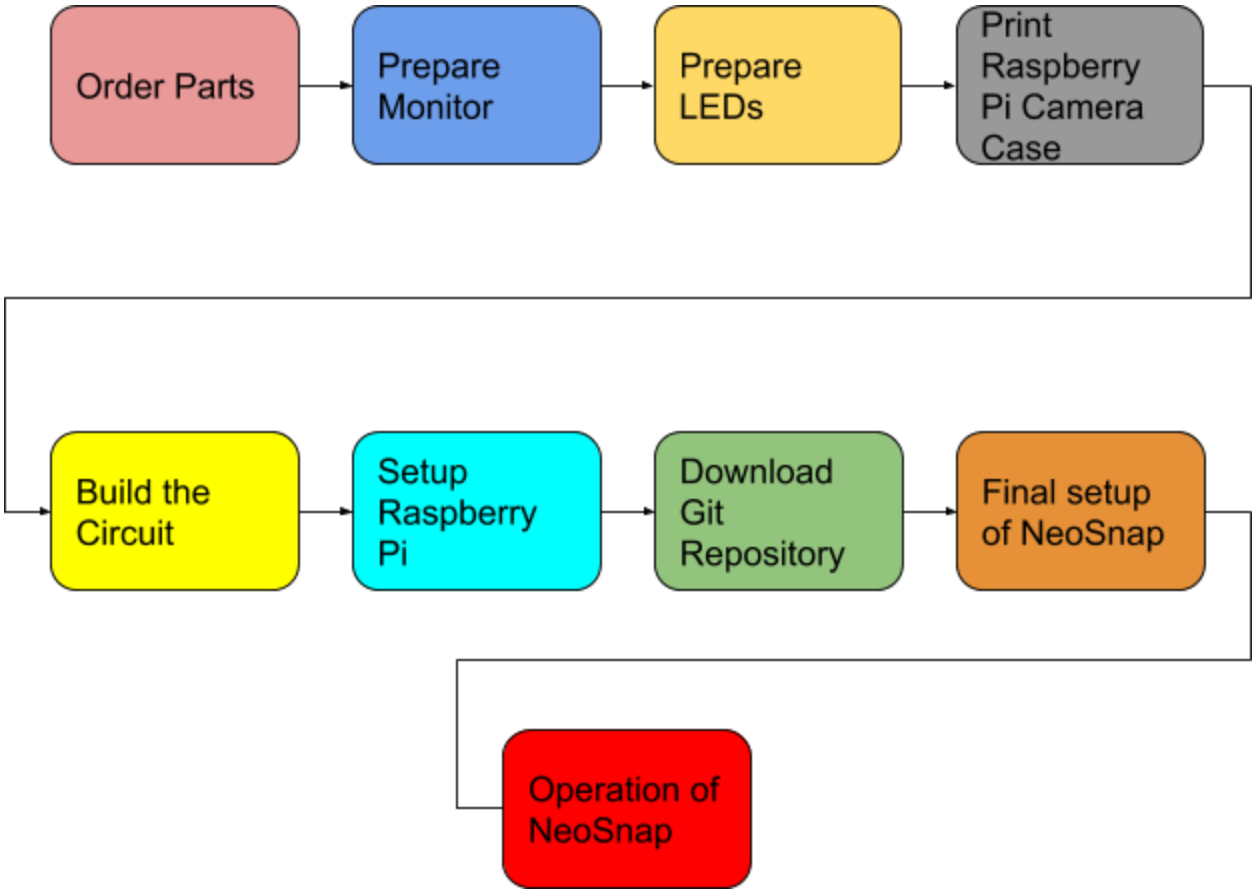
Enlace is dedicated to creating a positive impact on the lives of Little Village residents and we felt one way to positively impact the students of Little Village was to give the community a small peek into the STEM fields (Science, Technology, Engineering, and Mathematics) by showing how fun and interesting it can be to build a new product. Our goal with the NeoSnap was to make a smart product that fulfills all of the requirements of the photo booth product, but also document the process to the point where a high school with little to no experience with programming or electrical engineering can replicate it while learning how to code, make a schematic, and familiarize themselves with Computer Aided Design.

Prerequisites

This instruction manual has been tailored for the average high school student but we do recommend having the following prior to starting the project:

- All required parts from the provided parts list
- Clean work area free of clutter
- Internet (preferably wired – some wireless connections do not work well with the Pi)
- Computer with at least 1 USB port
- Mouse and Keyboard to navigate the Pi
- Access to soldering iron and solder
- Access to a 3D printer to print case for Raspberry Pi Camera
- Basic understanding of
    - Operating Systems (Windows, OSX, Linux, etc.)
    - Python (see References section for tutorials and books)

Getting Started



Step 1: Ordering Parts

Although the code can be worked on prior to ordering the parts, it will not properly function until you have created the circuit first. Refer to the parts lists spreadsheet below. Included are links to the website where we ordered them, but they can be brought from anywhere, even some brick and mortar stores such as American Science and Surplus.

Parts List:

Parts List	Price
Raspberry Pi 3 Model B with Camera Module v2	$64.10
Waveshare Raspberry Pi 10.1 inch HDMI LCD Capacitive Touchscreen with Case	$94.99
NeoPixel Digital RGB Led Strip 60 LED-White	$24.95
Power Supply for Raspberry Pi 5v 2.5A Micro USB Charger Adapter with On Off Switch	$8.59
0.3m HDMI Flat Cable	$6.99
1N4001 Diode - 10 pack	$1.50
3M Scotch Reclosable Fasteners*	$3.49-$7.99
Total	$204.61-$209.11

* = Optional

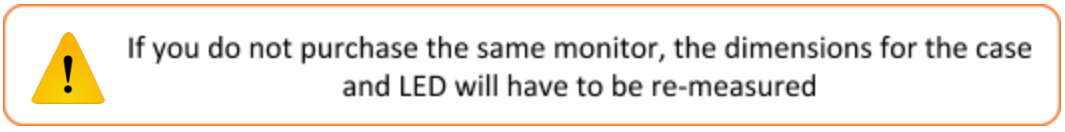
Step 2: Prepare the monitor

The monitor used in the original NeoSnap is the Waveshare 10.1” touchscreen monitor but it can be replaced with a larger or smaller monitor as long as it maintains the touchscreen functionality with the Raspberry Pi.

You can check how the screen should be configured and plugged in Here

If screen is plugged in properly and you continue to get a“NO SIGNAL” message, then follow these instructions:

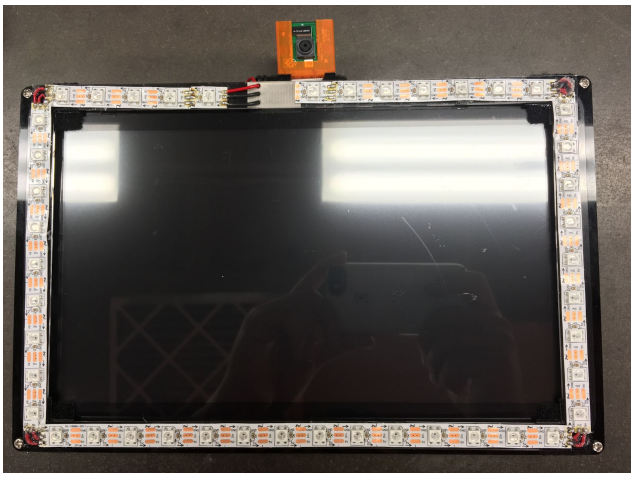
“No matter the configuration, when switching to the HDMI source it would keep saying "no signal". After some back and forth in emails with support, it was suggested that I do a firmware update. After a successful firmware flash from the image provided on their wiki, the screen started to work properly. The screen now powers up in HDMI default mode and does not display "no signal" when the powered off RPI is plugged into the HDMI port. The only difference in the firmware flash instructions, instead of powering off, and then long pressing the power button (this did not work), I instead unplugged the touchscreen from its power source and held the power button down as I plugged the touchscreen power source back in. If your screen does not work, and all the configurations have not helped, talk to support and do a firmware update.”



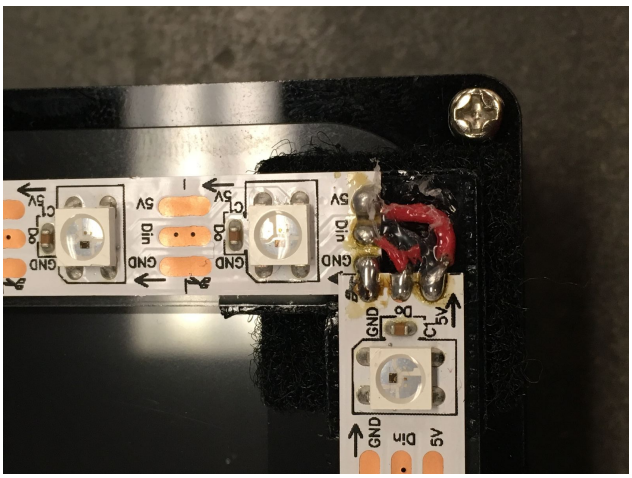
Step 3: Prepare the LEDs

Below we have attached a picture of how the LEDs have been laid out (Photo A). The bottom of the screen should have a 14 LED strip, the sides should have a 9 LED strip, and for the top the left should have a 5 LED strip and the right should have a 7 LED strip. Next, solder the corners of the the LED strips as shown in the photo below being cautious that the solder does not cross in between the 5v, ground, or data pads (Photo B). Once the LEDs are soldered at the corners solder 3 wires to the top left strip so that they can be connected to the pi. The 5V wire should be connected to pin 2, the ground wire should be connected to pin 6, and the data wire should be connected to pin 12. A chart has been linked in the references which includes the pin layout of the GPIO headers pins on the Pi. Finally, it is preferred that the LEDs be reinforced with a laser printed piece of acrylic so that the LEDs can be attached to the screen using velcro.

A



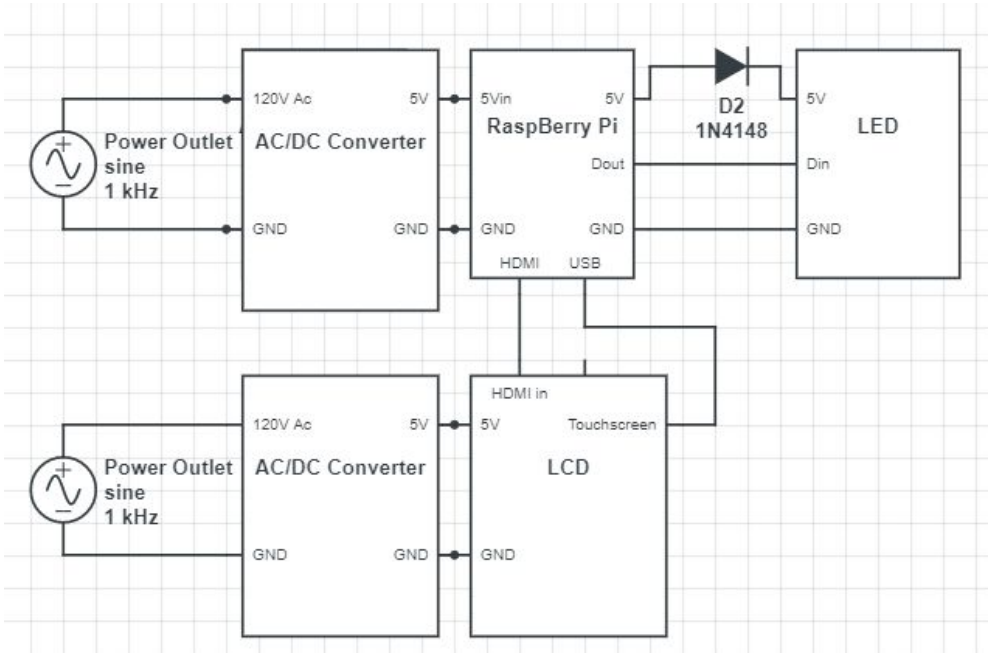
B



Step 4: Print Raspberry Pi Camera Case

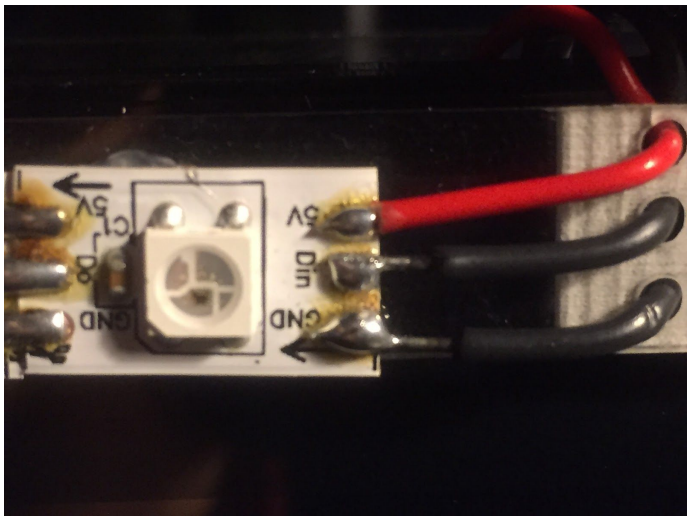
First download the file located in the references tab of this manual. Then upload the file onto a USB drive and insert into the 3D printer. Depending on the 3D printer used this file should take approximately 10-20 minutes printing.

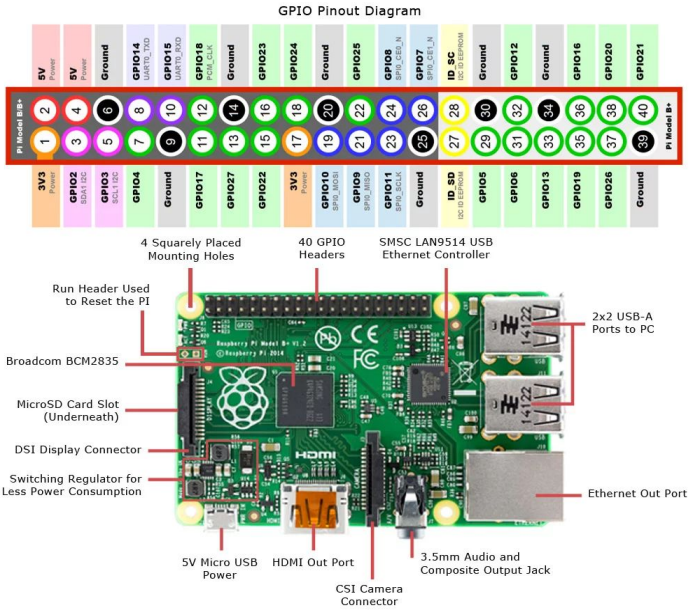
Step 5: Build the Circuit



Hooking up the LED's to the PI

These 3 edges (5v, Din, GND) have to be hooked up to the pi





So For the 5v we want to hook that up to Pin 2 on the GPIO pinout Diagram

For the Din we want to hook that up to Pin 12 on the GPIO pin out Diagram

For the GND we want to hook that up to Pin 5 on the GPIO pin out Diagram

Step 6: Setup Raspberry Pi

*terminal to install libraries

1.Go to Menu > Preferences > Raspberry Pi Configuration > Interfaces then make sure it looks like this:

2.Go to https://github.com/d-shah93/NeoSnap and click on the green Clone Or Download button > Then Click Download Zip

3. Wait for it to download

4. Once Downloaded copy and paste the Folder called NeoSnap onto your Desktop

5. Copy and Paste the NeoSnap.Desktop to your Desktop folder as well.

6. On the toolbar click the terminal button (It's the black box with a >_ sign on it. Hovering over it with a mouse also shows it's the terminal

7.On the terminal Type the following commands (these are case sensitive)

- sudo apt-get update && sudo apt-get upgrade
  - (Note: Every now and then it will ask you to type in Y. All you have to do is hit Y and press enter)
  - (Note: This is a very long process it's updating the pi to all the latest software)
- sudo apt-get install python3 python3-pyqt5
- sudo apt-get install python python-pyqt5
- sudo pip install dropbox
- sudo pip install Pillow
- `sudo apt-get install build-essential python-dev git scons swig`
- `git clone https://github.com/jgarff/rpi_ws281x.git`
- `cd rpi_ws281x`
- `scons`
- `cd python`
- `sudo python setup.py install`
- sudo raspi-config
  - Go to 5. Interfacing Option
    - Click P1 Camera
      - Yes
        - Click Finish
          - Reboot

Now All the proper software has been installed

Step 7: Download Git Repository

Git (abbreviation for GitHub) is a code sharing/version control service available for anyone to use for free. To start, go to https://github.com and create your free account (from your personal computer or the Raspberry Pi). If you need more assistance with Git, there are a number of tutorials available online. Some of the tutorials used by the founders of NeoSnap are:

- https://try.github.io/ (very helpful due to the interactive terminal provided)
- https://www.codecademy.com/learn/learn-git (Codecademy offers many other beneficial programming courses as well)
- http://rogerdudler.github.io/git-guide/ (very simplified, please excuse the language on the site)

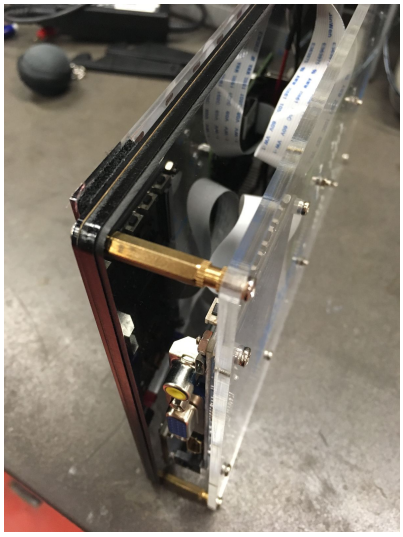
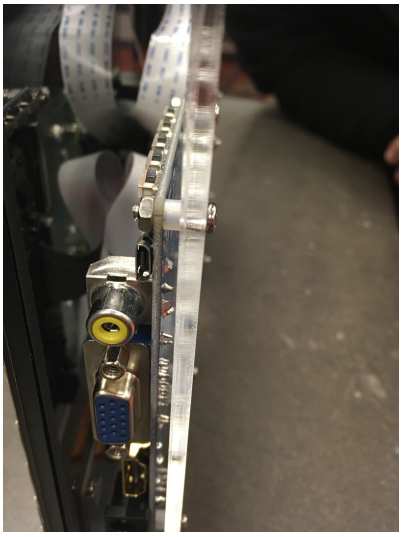
In the terminal of the Raspberry Pi, enter:

```
sudo apt-get install git
cd Documents/
mkdir NeoSnap
git clone https://github.com/d-shah93/NeoSnap.git
```

The first command is to install Git onto your Raspberry Pi. `cd Documents/` will change the working directory from the home directory of the Raspberry Pi to the Documents folder. mkdir is a command to create a subfolder inside the working directory. This is the same as right clicking inside of a folder and selecting 'Create New Folder', but another approach. From now on, commands entered in this terminal window will affect the NeoSnap folder. The final command is a Git command to clone (copy) all the files from our NeoSnap project stored on GitHub to your Raspberry Pi.

Step 8: Final setup on Raspberry Pi

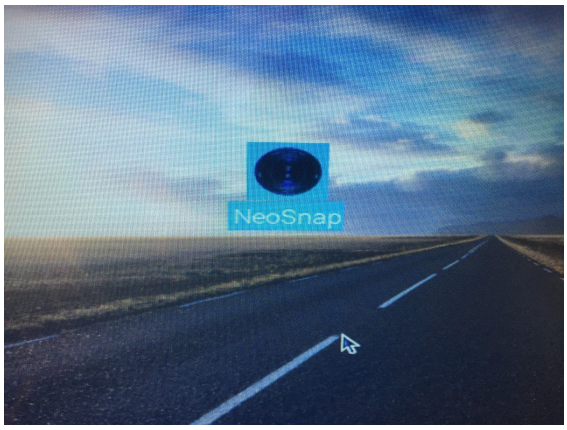
Once you have the NeoPixel property lighting up and taking photos it is time to put everything together in the case. The case included with the Waveshare touchscreen includes a variety of nuts and bolts that have specific purposes. Below we have attached pictures of how the different screws should go onto the case. After the case has been assembled you can now put the LEDs on the front of the screen. Attach a piece of velcro on all for sides of the screen adjected to the screws. Then attach a piece of velcro on all four corner sides of the piece of acrylic holding the LEDs. Now attach the piece of acrylic to the screen via the velcro. Similarly a piece of velcro will also be used to attach the Pi camera (with the case) to the top of the screen.

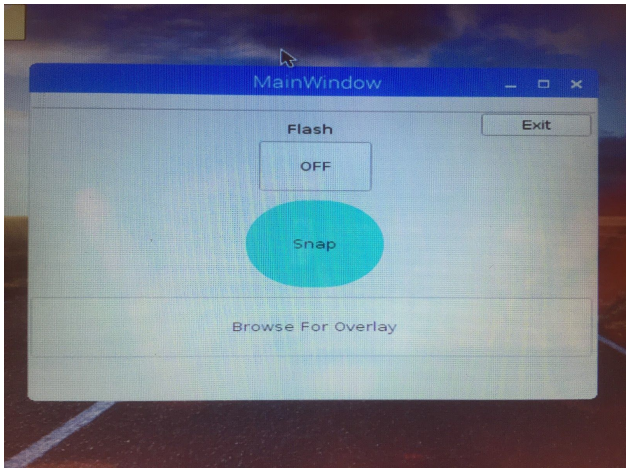

Step 9: Operate the NeoSnap

Operating The NeoSnap GUI: *Note: When Clicking buttons on the GUI, make sure you wait a second or two before pressing another.

Click On the NeoSnap.exe to start up the GUI



Main Window:



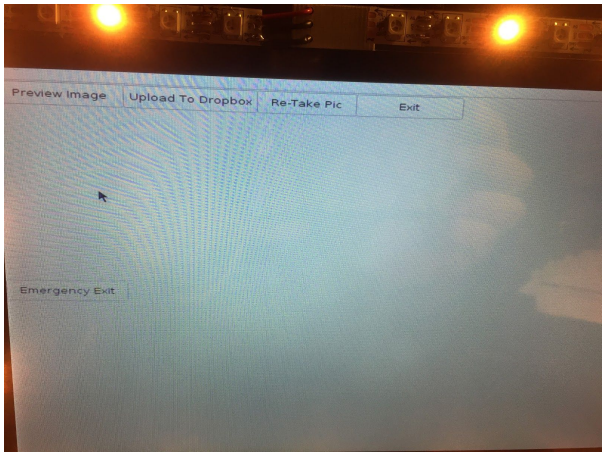
Flash: Turns Flash ON/OFF

Snap: Takes Picture. First picture takes about 4-5 seconds after pressing the button. This is to make sure you have time to pose. The second picture will take 3 seconds after the first picture. And the last picture will take 3 seconds after the second picture

Exit: Quits the program

Browse for Overlay: If you want to have a logo in the bottom right corner of your picture. You can browse for a .png or .jpeg to put in there

PreviewWindow:



Preview Image: Will display your image to you

Upload to Dropbox: Uploads it to the internet. Make sure you have internet connection too.

Re-Take Picture: Re-takes picture and deletes last taken picture

Exit: Once you're done click this to go back to the main window

Emergency Exit: In case something hangs or the GUI isn't working properly. Clicking this will automatically kill it.

Step 10: Messing With the Code

If you want to change certain aspects of the NeoSnap. Here are some things you can change easily.
Go to the NeoSnap folder. Click on the file named “Main.py”

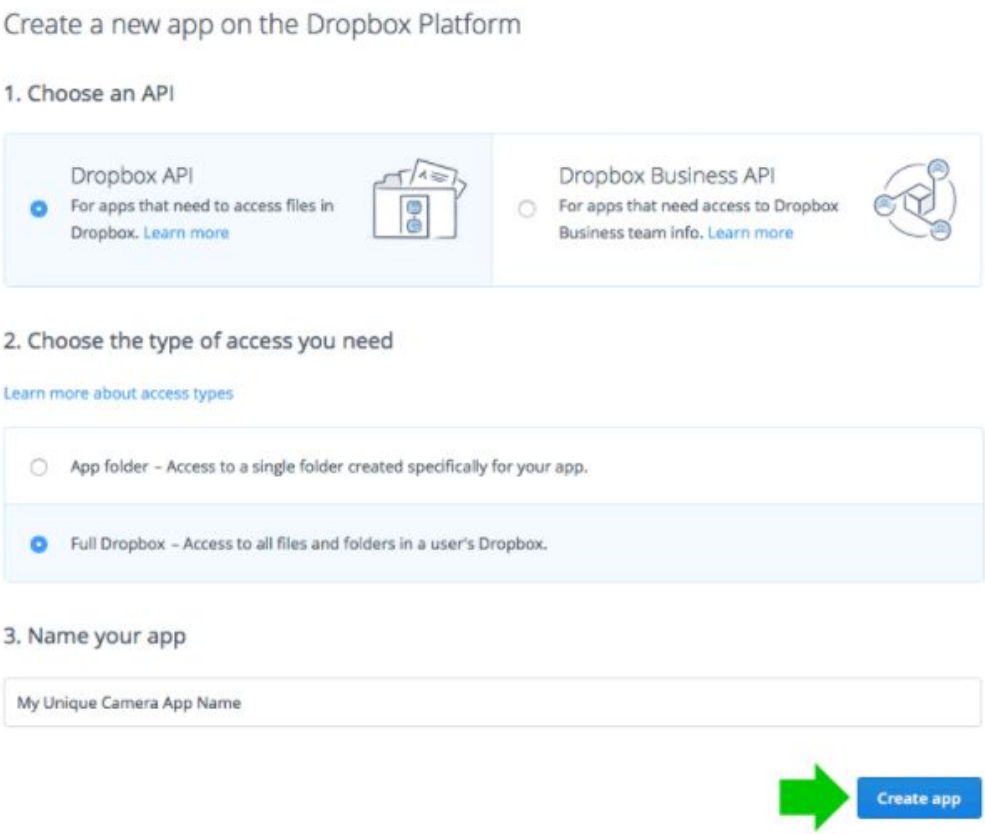
Changing DropBox Accounts:

If you want to change the dropbox account to upload it to follow these instructions:

Visit https://www.dropbox.com/developers/apps and log in with your Dropbox account credentials.

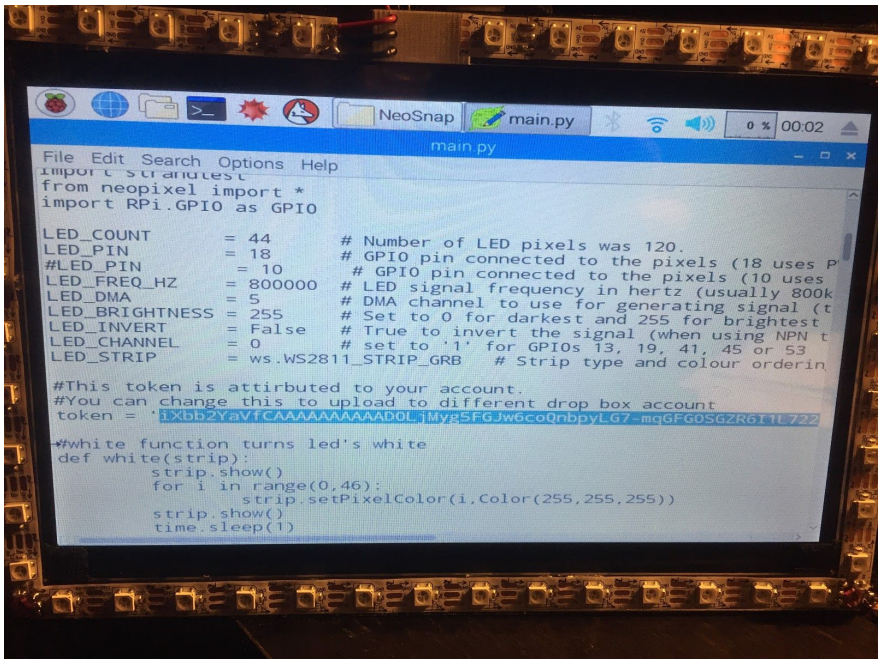
Use the “Create app” button to begin the process...

Select “Dropbox API” and “Full Dropbox,” then assign your app a unique name (e.g. “Bob’s Raspberry Pi Camera”), then click “Create App.”



In the Settings tab for your new app, there's a section with the heading "OAuth 2." Look for the button "Generate access token." This will give a long string of seemingly random letters — a unique identifier for tying your camera to your Dropbox account.

Once you get your token copy and paste it in here:



Note This is Important

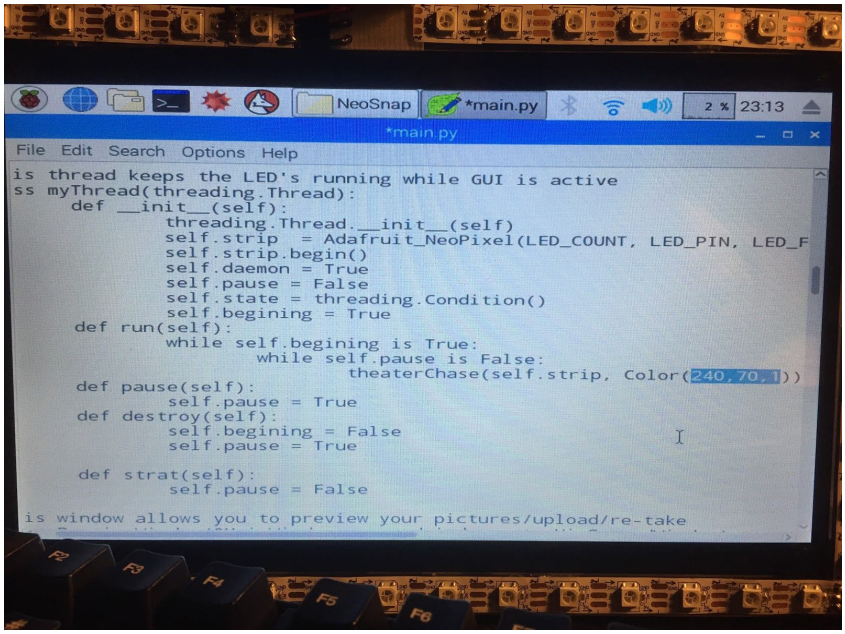
So if you want to change accounts it should look something like this

token = 'token value'

not having it in this format will *break* the code

Changing Colors:

In this line of the Code:

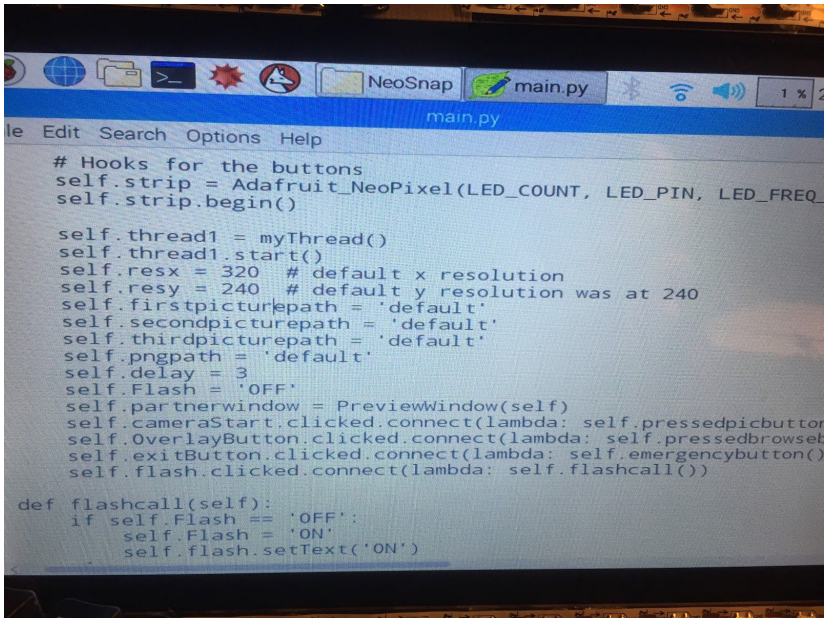


We've Highligted 240,70,1. These are the orange colors you see the LED's lighting up with.

Changing it to any combination of x,y,z where x and y and z are numbers between 0-255. Will change the color of the LED's try experimenting with it to see some different results

Change Resolution of pictures:

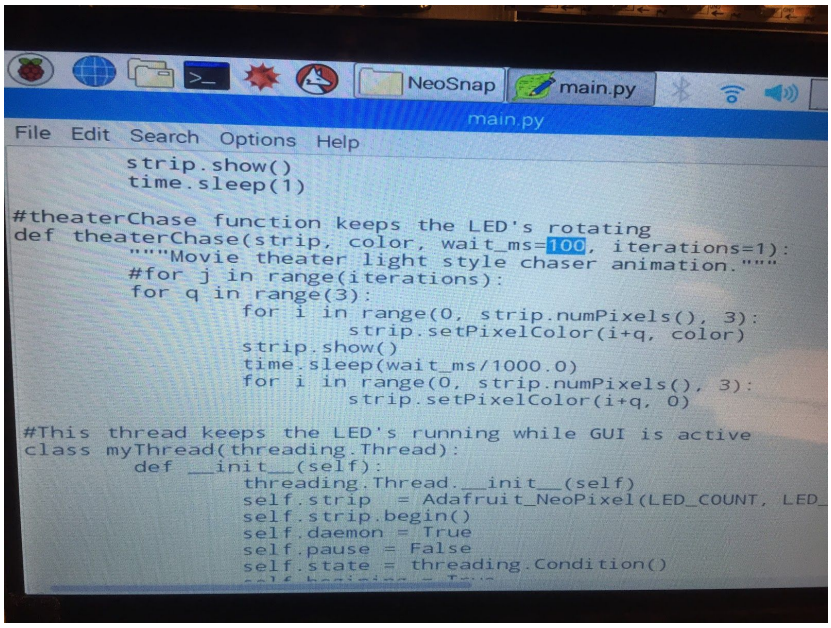
If you need to get a different resolution picture you can look at:



You see 2 things called: self.resx = 320 and self.resy = 240.
Every time it takes a picture it takes a picture with a resolution of 320x240.

Changing these values will change their respective resolution (i.e. wanting a 720x240 picture you change the value of 320 to 720 and you keep 240 at 240)

Decreasing the Speed of the LED's:



Changing the highlighted number value will affect the speed. Increasing the number will decrease the speed

References

Free Python tutorial on Codecademy

Learn Python The Hard Way

Raspberry Pi 3 GPIO Header

Raspberry Pi Camera Case