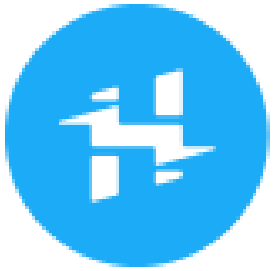

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Twitter Controlled Holiday Lights!

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1 Objective

Create the ability to control holiday lights and inflatables via Twitter mentions and hashtags remotely over the internet.

Figure 1-1 – Completed Twitter Controlled Light Controller

1.1 Requirements

The following table outlines the required computing components.

Qty	Description
1	Raspberry Pi 3
1	SainSmart 4Channel 5v Relay Module
6	Female to Female Jumper wires
1	SanDisk 16GB SD Card
1	CanaKit 5v Raspberry Pi Power Adapter
1	Canakit Raspberry Pi 3 Case

Table 1 – Computing Components

The following table outlines the required Hardware/Electrical components.

Qty	Description
1	12inx12in Junction box with lid
3	Leviton 15 Amp Duplex Outlet
1	1-Gang 8 cu. In. Flanged Shallow Old Work Box
1	Husky 9ft. 14/3 Power Tool Replacement Cord
1	2-Gang 2 Duplex Outlet Wall Plate – Stainless Steel
1	Southwire 50 ft. 14 gauge Stranded wire (Note: All electrical wire used in this project is the same gauge. You can color code the wires to make it easier to follow the wiring diagram but this will increase the cost.)
1	34 Yellow In-Sure 4-Port Connector (10-Pack)
1	Loctite 0.85 fl. oz. Plastic Epoxy
4	1/8th in. wide by ¼ inch long machine screws with nuts and washers
OPTIONAL Ethernet wire, CAT6 Punch down block, CAT6 Ethernet wall mount jack holder	

Table 2 – Hardware/Electrical Components

Required Tools

Qty	Description
1	Philips head screwdriver
1	Razor Knife
1	Wire Strippers
1	Micro Screw Driver Set
1	Power Drill or Benchtop drill
1	Pack of various size drill bits (1/2 Inch Drill bit and 1/8-inch drill bits used in project.)
1	Jigsaw
1	Electrical Tape

Table 3 – Required Tools

Figure 1-2 – Required Tools

2 Building the Enclosure

Gather the following parts…

Figure 2-1 – Enclosure Parts

Step 1: Take your Shallow Single Gang box and remove the outside tabs carefully using a razor knife on either side as pictured below and break out the wire tabs on both sides of the box indicated by the arrows. Removing these tabs will save precious space within the enclosure and still allow us to secure our internal power outlet to the box.

Figure 2-2 – Shallow Gang Box modifications

Step 2: Using the Loctite Epoxy, Glue the gang box into the top right corner of the project enclosure. Be sure to leave a big enough gap to fit the Husky 9 ft. power cable in between the enclosure wall and the gang box. Epoxy the bottom portion of your Raspberry Pi case to the top left side of the enclosure.

Step 3: Where indicated by the red circles, use your ½ inch drill bit to drill out the holes needed to run in power (Red Arrow) and provide some ventilation inside the box (Yellow Arrows). **Note:** Be sure you leave enough room for the lid screw over the power hole to be used without puncturing the power cable!

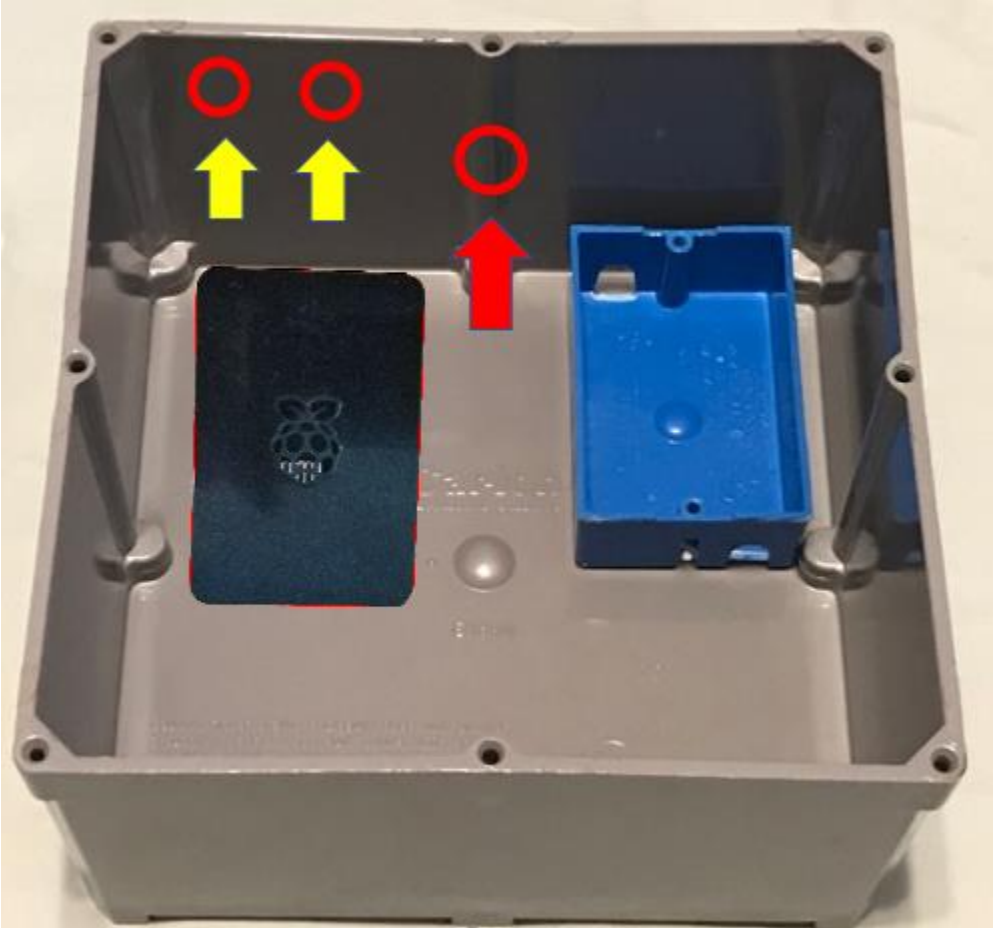

Figure 2-3 – Epoxied Placement of Internal Plastic components

The Epoxy will take 20-30 minutes to become tacky and takes 24 hours to cure completely! I suggest you watch some Netflix and call it a day! Next up is electrical work!

3 Wiring the Electrical Circuits and Modifying the Lid

Whoaaa there! We interrupt this IoT project to let our project team have a word!

Disclaimer

We have taken all reasonable care to ensure that steps published were accurate on the stated date of publication. Chris Poplawski nor Raymond Jones take any responsibility for the consequences of error or for any loss or damage suffered by users of any of the information published in this project post, and such information does not form any basis of a contract with readers or users of it. Electricity can kill you and start fires… Nobody wants that! Be safe and have fun!

Now that we got the Debbie Downers out of the way… Back to the build!

Step 1: Run your power line into the enclosure and route through the back tab of the shallow gang box.

Colored wires are as follows:

Black: Hot Wire (Positive)
White: Neutral Wire (Negative)
Green: Earth Ground

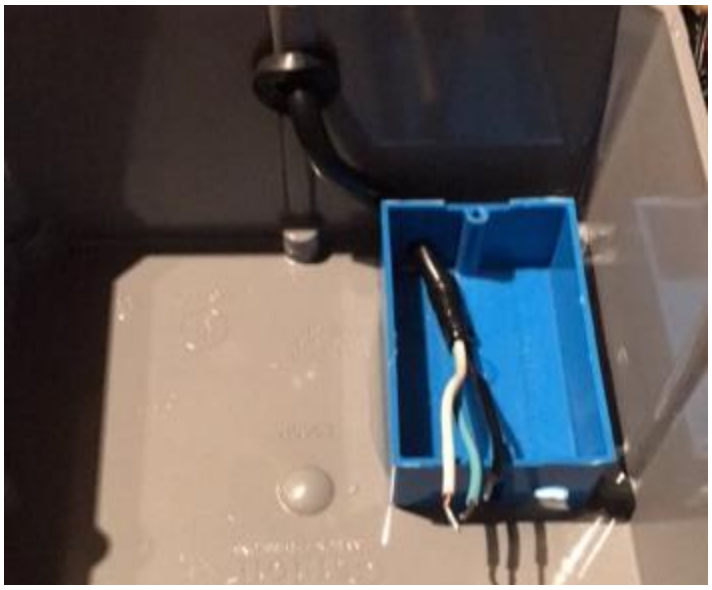

Figure 3-1 – Pull Through the Main Power Supply Cable

Step 2: Wire your first outlet using the diagram below.

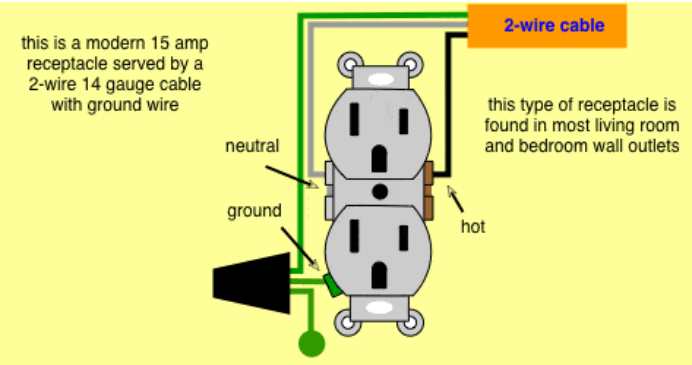

Figure 3-2 – Standard Outlet Wiring Diagram

Please note: On the outlet, the left and right side terminal screws are color coded. Make sure you follow the color coding to ensure you safely wire the outlet.

You should now end up with the below screenshot. Congratulations! You can test the two outlets by plugging in a light and making sure it turns on when you plug in the power chord.

Figure 3-3 – Completed Internal Power Supply Wiring

Step 3: Modifying the Enclosure Lid for mounting the External Outlets

Gather the following items…

Figure 3-4 – Parts and Tools to modify enclosure lid

Take the plastic enclosure lid and measure a 3-¾ in. wide by 2-¾ in. long box and mark it with tape or a pen so you know where to cut. Using the ½ inch drill bit drill the inside corner of the box so you have a space to insert the Jigsaw blade.

Cut out the box you marked so you have an opening just large enough for the back of the external outlets to fit through. We will be using the metal tabs on the outlets to secure the outlets to the plastic lid, as we are not using junction boxes to secure them.

Using one of the Outlets, mark on the back of the metal face plate where the outlet tab holes line up (Orange Arrows) and drill them out with a 1/8th inch drill bit. Do this for both sides of the face cover.

Figure 3-5 – Marking the mounting holes in the stainless-steel faceplate

After you drill out the faceplate cover you can use this as a template over the Lid enclosure outlet hole to drill the screw holes through the plastic. Using 1/8th inch wide, ½ inch long machine screws and nuts you can secure everything together like the below picture.

Figure 3-6 – Outlets mounted to stainless-steel cover and lid enclosure

A quick note on the External facing outlets. There is a small tab (Blue Arrow) that bridges the two terminals together on the hot side (Black Wire) of the outlet. Snap off the bridge connector so we can control the hot sides independently. Leave the bridge tab in place on the neutral side as we can share a common neutral. This step is not needed on the Internal outlet and is required for the external ones.

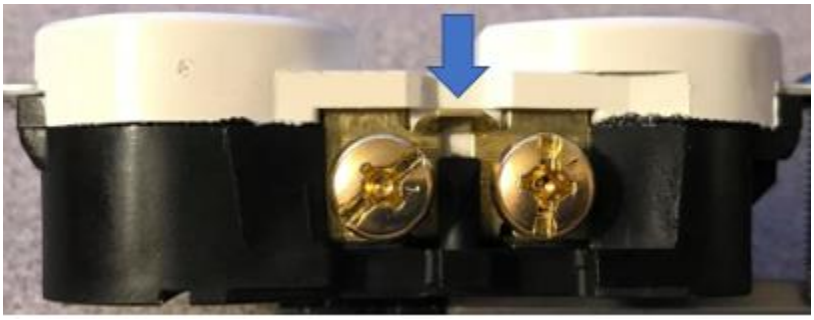

Figure 3-7 – External Outlet -Hot Side Terminal Bridge Connector

Step 4: Now that you can follow the color coding of a wiring diagram as in Step 2, use the diagram on the next page to wire the rest of the components into the box. You may need to save the picture and zoom in real close to see the details! Leave yourself extra length of cable while you are wiring. Cable can always be trimmed down to better fit the box. Be sure to leave enough wire so you can open the lid of the enclosure should you ever need too!

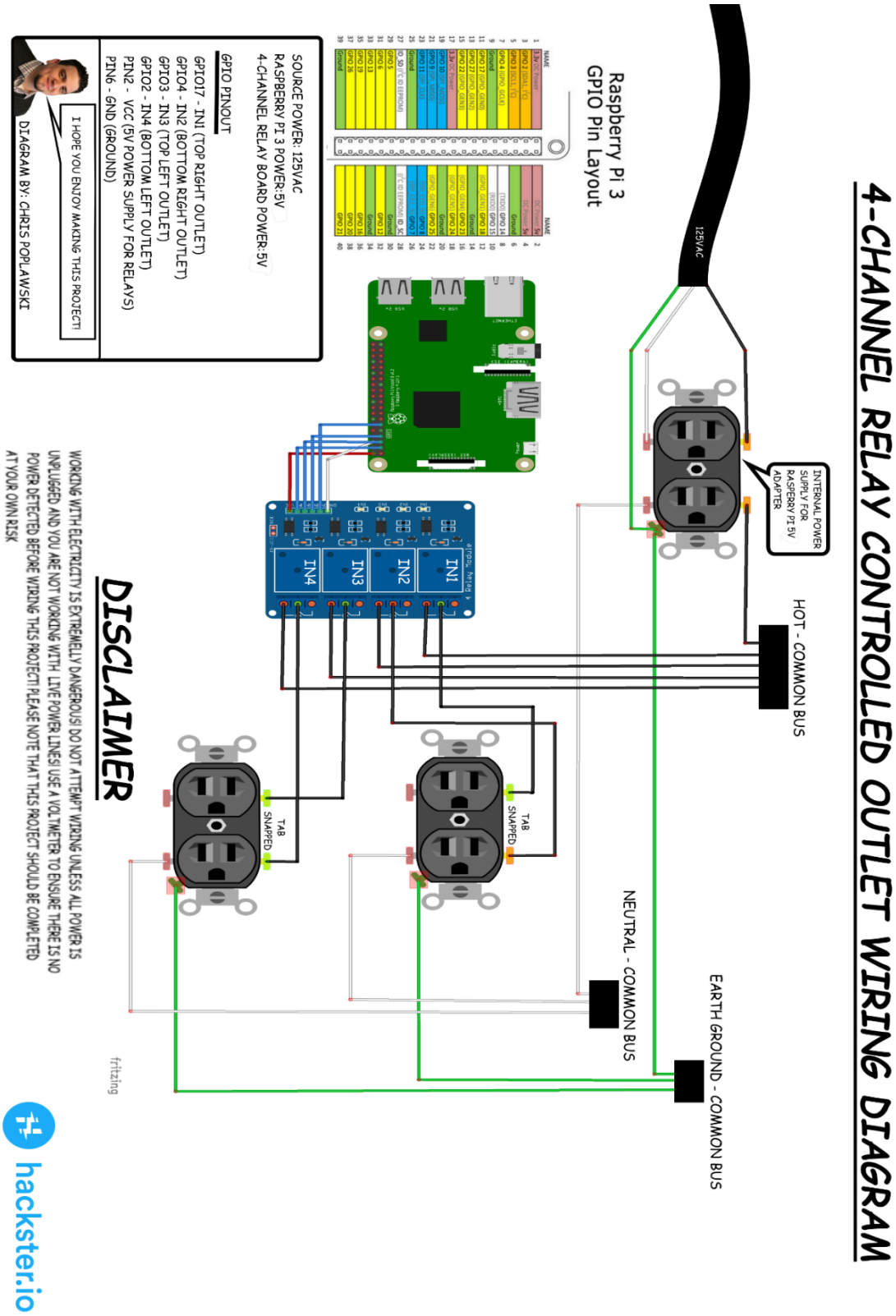

Figure 3-8 – Complete Wiring Map for Project

Once complete you will end up with a box looking like this! Next up is the code!!

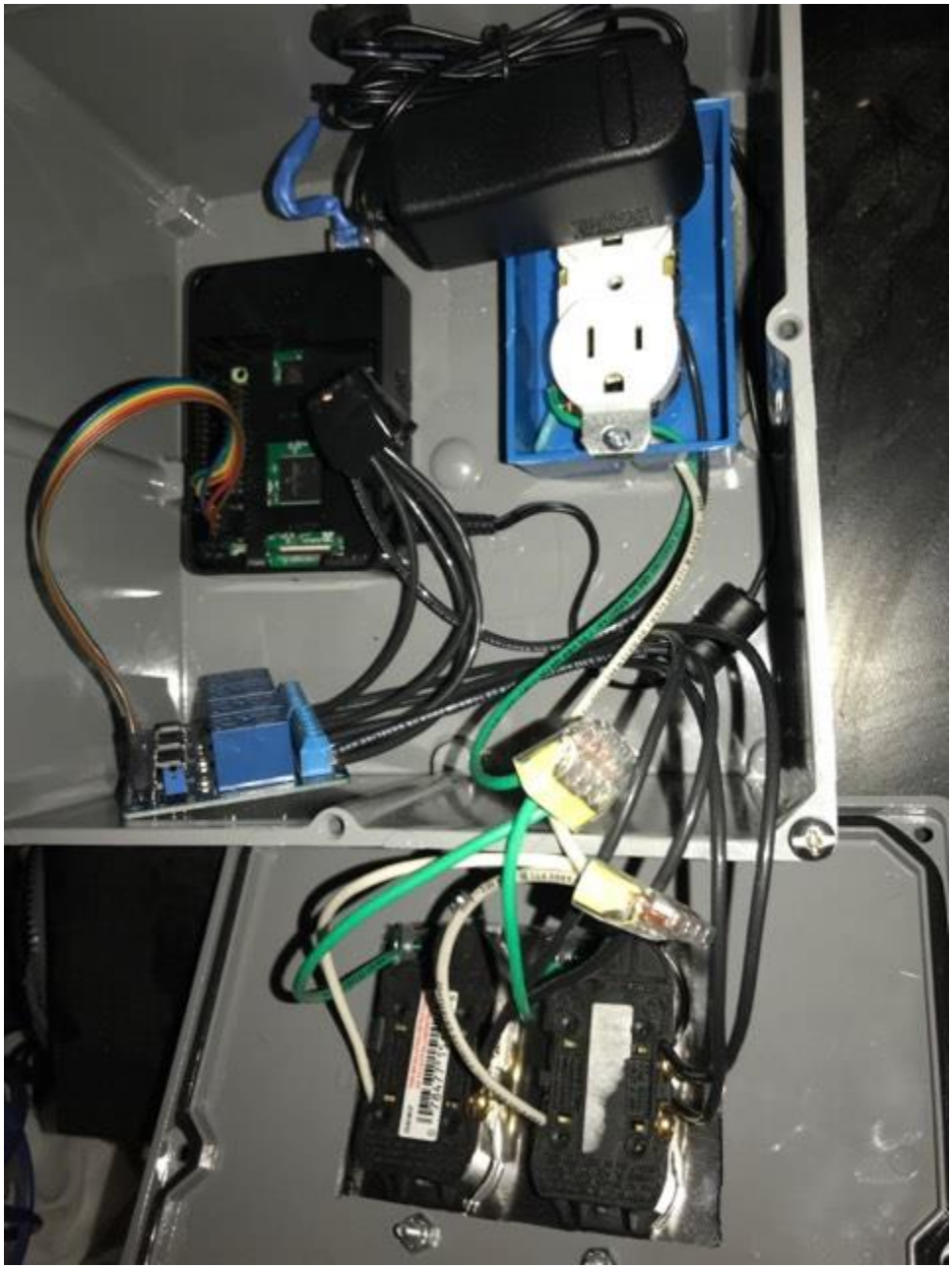

Figure 3-9 – Example of Complete internal wiring

4 Setting up the Operating System on the Raspberry Pi

Step 1: Download Raspbian from the Raspberry Pi foundation website.

https://www.raspberrypi.org/downloads/raspbian/

Step 2: Install the downloaded image onto the SD Card using the following guide and etcher software.

https://www.raspberrypi.org/documentation/installation/installing-images/README.md

Step 3: Insert the SD card into the Raspberry Pi and boot it up. You should have enough room in the project enclosure to insert an HDMI chord and a wireless keyboard and mouse dongle to perform the next part of the programming. If not, you can remove the Raspberry Pi from the project enclosure and rewire the jumpers after this step is complete. Login with Username: "pi" and Password: "raspberry". Setup your WIFI or Ethernet connection to get it on the Internet and move onto the configuration tasks.

Figure 4-1 – Raspberry Pi desktop environment

5 Configuring the Twitter-Pi application

1. The application code repository can be found at https://github.com/raymondljones/twitter-pi. Download this to your Raspberry Pi, Save and Unzip the file. (Write down the Path for this unzipped directory as you will need it later in Step 5. below)

This NodeJS application connects to the Twitter API and filters tweets.

2. For some specifics (path names) run the following commands (as root) in a Terminal window on the Raspberry Pi and write down the path's that are returned.

`"sudo bash" – will log you in as root on your pi`

`"which node"`

`"which php"`

3. If those commands do not return anything, then you will need to install the php and node dependencies. You can install them by running (on the command line as root):

`"apt-get install npm"` (This will install npm, and all its dependencies)

`"apt-get install php7.0"` (This will install the base php packages)

4. Once those are installed, you will need to cd to the directory and install the npm packages required for the project.

`"cd /path/to/repo/project/src"`

`"npm install"`

5. Once installed, re-run the "which" commands to find the 2 paths and write them down. Next, we will configure the Cron job to run our NodeJS program at boot.

The software utility Cron is a time-based job scheduler in Unix-like computer operating systems. People who set up and maintain software environments use "cron" to schedule jobs to run periodically at fixed times, dates, or intervals.

6. run "`crontab -e`" in the Terminal Window and add the following line.

`"* * * * * /path/to/php -q /path/to/repo/project/src/cron.php &"`

Path to PHP is returned by the "which php" command, Path to cron.php is in the directory you unzipped the application to in Step 1.

This will trigger the service every minute. The “cron.php” file checks to see if the service is already running and will avoid launching multiple instances.

7. Edit the following files using Nano text editor on the Raspberry Pi. (How to use Nano)

GNU Nano is a text editor for Unix-like computing systems or operating environments using a command line interface.

data/twitter.json - replace the keys with the ones provided from your twitter application. (How to - twitter app)

data/system.json - replace the path to node with the one returned from "which node" command from earlier.

data/pins.json - replace the hashtags you wish to listen for on the specific pins (do not include the "#" character).

data/listen.json - replace the mention field with the twitter handle you want to listen to.

Basic Logic

- The twitter stream only listens for tweets that contain a mention (configured on the “listen.json” file)
- Each tweet that comes through the stream is checked to see if it contains a hashtag (defined in the “pins.json” file)
- When a match is found, it will turn the corresponding gpio pin on and turn the relay switch on (for 60 seconds)
- After 60 seconds, the gpio pin is turned off, and the corresponding relay will shut off.
- Keep in mind, that this is a self-healing application. If an error occurs at any point that shuts the application down (network disruption, twitter stream error, etc), the application will attempt to start up again when the Raspberry Pi clock turns over to the next minute.

The Project is now complete! You can start using your new Twitter controlled lights right away! We hope you had fun building this project! Have a happy Holidays!!

Appendix A. References

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