Setup Instructions for Recording Data and Plotting

Installing Python and necessary packages

1. Learn how to access your terminal/command line prompt.
   a. On Windows: https://en.wikiversity.org/wiki/Command_Prompt/Open or https://www.wikihow.com/Open-the-Command-Prompt-in-Windows (note: do not use Method 5)
   b. On Mac: https://www.wikihow.com/Get-to-the-Command-Line-on-a-Mac
   c. On Linux: https://ubuntu.com/tutorials/command-line-for-beginners#3-opening-a-terminal
2. In your terminal, check if you have Python (a coding language) pre-installed by typing **python** and pressing Enter. If something like the following appears, Python is already installed on your computer and you can skip to step 5!
   ```
   Python 3.9.6 (tags/v3.9.6:db3ff76, Jun 28 2021, 15:26:21) [MSC
   v.1929 64 bit (AMD64)] on win32
   Type "help", "copyright", "credits" or "license" for more
   information.
   ```
3. If you do not have Python on your computer, you should close your terminal by typing **exit** and pressing enter, or by closing the window with the red X button. You can install Python by following the directions here at this link: https://wiki.python.org/moin/BeginnersGuide/Download
   a. If you're on a Windows computer, make sure to check the box "Add Python 3.11 to PATH" (or whatever version you have) on the first page ("Install Python") of the installer. You can follow the instructions in the video here: https://www.youtube.com/watch?v=8cAEH1i_5s0
4. Once you have installed Python, repeat step 2 to make sure that it has installed properly.
5. Exit your Python interpreter by typing **exit()** in your terminal and pressing Enter. This will exit Python but leave the terminal open.
6. Now, you need to check that you have the Python package installer (pip) working. In your terminal, type **python -m pip --version**. If this returns something like `pip X.Y.Z from ... (python 3.N.N)`, pip is already installed and you can skip to step 9!
7. If the previous step returned an error message, install pip with the steps at: https://pip.pypa.io/en/stable/installation/ for the appropriate operating system.
8. Repeat step 6 to make sure that pip has been installed.
9. Open up your Python interpreter again by typing **python** in your terminal again and pressing Enter.
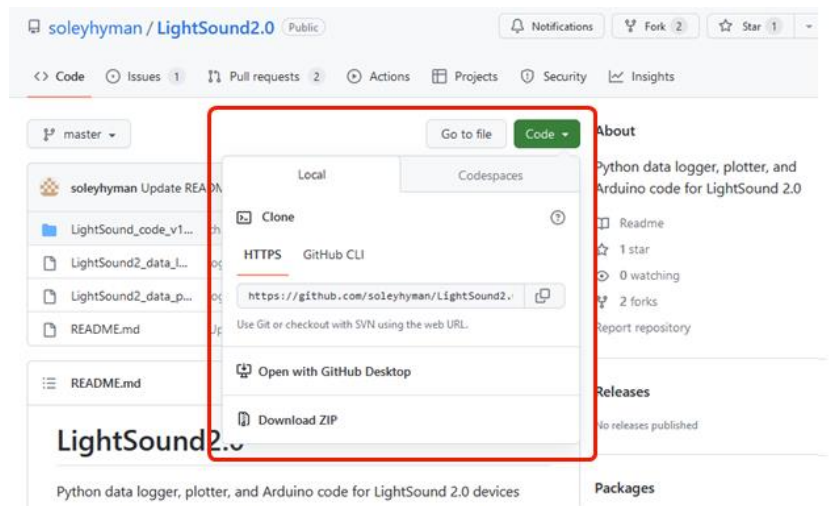
10. Almost there! Now you just need to make sure that you have the appropriate Python packages installed so that you can record LightSound data and plot it. Type the following lines in your Python interpreter, pressing Enter after each one:

        import numpy

        import matplotlib

11. If you get an error from either of those (i.e., ModuleNotFoundError: No module named 'numpy' or ModuleNotFoundError: No module named 'matplotlib'), exit your Python interpreter with the **exit()** + Enter command sequence and install whichever packages don't exist with **pip install numpy** and/or **pip install matplotlib**.

12. Install the pySerial package (for reading in data from a USB port) by typing **python -m pip install pyserial** into your terminal and pressing Enter.

13. Congratulations! You have installed Python on your computer.

Setting up a data folder for the LightSound

1. Now that you've got Python all set up, we want to test the LightSound data recording and plotting. Before we do that, we need to download the code from the LightSound GitHub:https://github.com/soleyhyman/LightSound2.0

2. Once the page has loaded, click the green "Code" button and choose "Download ZIP" from the dropdown menu. That should download in your "Downloads" folder.

3. Navigate to your Downloads folder and unzip or extract your folder. If the unzipping process gives you an option to extract the folder to a new location, choose one that you will be able to find easily (e.g., Desktop or Documents). If it does not give you that option, drag and drop or move the unzipped folder to your desired location.
   a. Windows: https://support.microsoft.com/en-us/windows/zip-and-unzip-files-8d28fa72-f2f9-712f-67df-f80cf89fd4e5
   b. Mac: https://support.apple.com/guide/mac-help/zip-and-unzip-files-and-folders-on-mac-mchlp2528/mac

c. Linux: https://www.howtogeek.com/414082/how-to-zip-or-unzip-files-from-the-linux-terminal/

4. Determine the "address" of your folder.

   a. Windows: In the path bar of the LightSound2.0-main folder window, right click the "LightSound2.0-main" and click "Copy address as text"
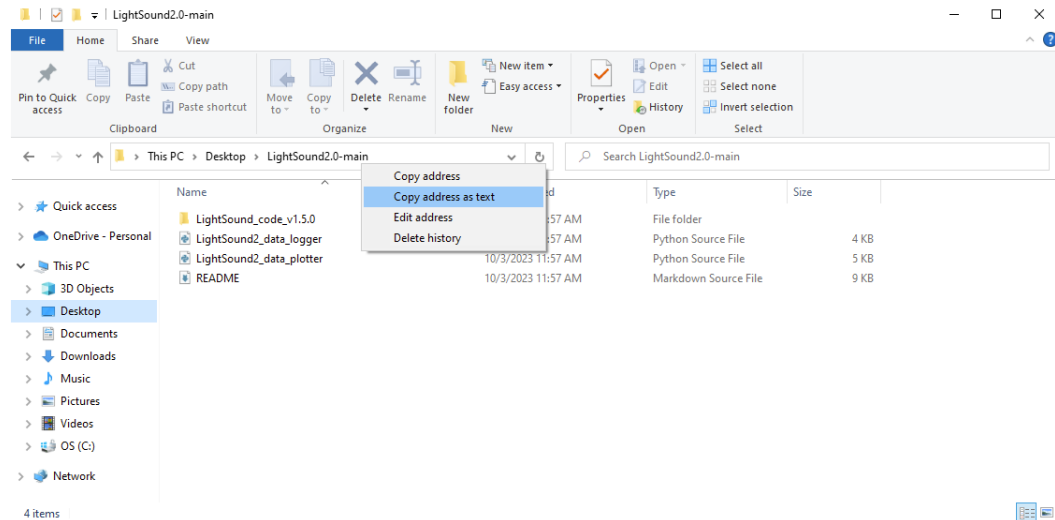
   b. Mac: Control-click the folder in the path bar, then choose Copy *"folder"* as Pathname.

5. Now we need to navigate to the LightSound2.0-main code folder. If you closed your terminal, reopen it again. If you have a Windows computer, go to step 6. If you have an Apple computer, go to step 7.

6. If you are on Windows, type `cd` and then a space and then **either** right-click in the terminal window or use the Ctrl+V paste sequence. This should paste the folder address in the terminal. Press Enter. At the bottom of your terminal, you should see something like `C:\Users\yourname\Desktop\LightSound2.0-main`, depending on where you put the folder. Check that the contents are there by typing `dir` and press Enter. You should see a list of files that looks like this:

7. If you are on Mac, type **cd** and then a space and then Copy text in another app, and then in Terminal, choose Edit > Paste**.** This should paste the folder address in the terminal. Press Enter. At the bottom of your terminal, you should see something like `/Users/UserName/Desktop/LightSound2.0-main`. Check that the contents are there by typing **ls** and press Enter. You should see a list of

files that looks like this:

```
(base) HUIT-FAS-MacBook-Pro-16-inch-2021:plottingcode abieryla$ ls
LightSound2_data_logger.py      LightSound2_data_plotter.py    LightSound_code_v1.5.0         README.md
```

8. Congratulations! Now you can practice logging and plotting your data!

[Instructions for logging data](#) (click to for instructions at LightSound GitHub)

Runs on Python 2.7 or 3.x

Package requirements: numpy, matplotlib, and [pySerial](#)

1. Ensure that the serial logger program (LightSound2_data_logger.py) is located in the folder where you will save your data
2. Connect the LightSound 2.0 to the computer with a micro-USB B cord (must be able to transfer data)
3. Determine the appropriate serial port of the LightSound 2.0
   - Windows: type mode into command line, port should have the form COM*
   - Mac: type ls /dev/tty.* into terminal, port should have the form /dev/tty.usbmodem* or /dev/tty.usbserial*
   - Linux: type ls/dev/tty* into terminal, port should have the form /dev/ttyUSB* or /dev/ttyACM*
4. In the terminal (Mac/Linux) or command line (Windows), navigate to data folder and type: python LightSound2_data_logger.py port 9600 timezone file_prefix
   - port is the full port name determined in Step 3 (i.e. including /dev/tty* for Mac or Linux)
   - 9600 is the baud rate for reading the LightSound 2.0 data
   - timezone is the timezone of observations (e.g. CST, EST, ART, CLT, etc.)
   - file_prefix is the prefix of the name of the data files (the script saves the data with the correct extension)
5. A plotting window will pop up once you start the code and will start live-plotting the data that the LightSound is recording. The brightness values that are being recorded by the LightSound will be visible in the terminal.
6. To stop data logging:
   - If you are a Windows/PC user, click back into your terminal and press Ctrl + C in the terminal/command line. Sometimes you need to do this multiple times for it to properly stop. If you do accidentally exit this window via the exit button, don't panic! Just click back into the terminal and press Ctrl +

`C` repeatedly until it exits the code. The .csv file will not be produced, but the raw data will still be saved, which you can later turn into a csv file.
- If you are a Mac user, as of 10/12/2023, there is a bug in the code for exiting the script. Until a long-term solution is found, first exit the plotting window by clicking the red X. This will throw an error in the command that you can ignore. Click into the terminal window with the serial data and end the script via `Ctrl + C`. This will save the data in both _raw.log and _data.csv file formats, but the plot will not save. To plot from the data, use the instructions provided below for the plotter script.

Instructions for plotting data

Runs on Python 2.7 or 3.x

Package requirements: `datetime, matplotlib, numpy, sys`

1. Ensure that the serial logger program (LightSound2_data_plotter.py) is located in the folder where you will save your data
2. In the terminal (Mac/Linux) or command line (Windows), navigate to data folder and type: **python LightSound2_data_plotter.py filename plot_lines savename.png**. You should replace filename, `plot_lines`, and `savename` with the appropriate values/words for you (as described below) and then press Enter.
   - `filename` is the full name of the data file (should end with _raw.log or _data.csv)
   - `plot_lines` determines whether the plot will include whether the gain and integration times
     - To plot the lux (intensity) values only, replace `plot_lines` with 0
     - To plot the lux, gain, and integration times, replace `plot_lines` with 1
   - `savename` is the prefix of the image name the plot will save to; use none if you do not want to save the image (extension typically is .png)