WalkingStickPrompter

A walking stick tele-prompter.

Usage

SD Card

The SD card has several "gotcha's":

- Must be formatted as `FAT` (preferably `FAT16`, but `FAT32` should work as well)
- Directories currently not supported
- Keep the SD relatively clean, not too many files. For file selection need all the file names read in and there isn't a ton or RAM to go around!
    - One shouldn't have more than 13 `.txt` files available, as the menu system doesn't currently support scrolling

Resources:

- https://www.arduino.cc/en/Reference/SDCardNotes

Files

These are guidelines for files that are on the sd card. For the device to operate properly, you must keep these things in mind.

- File names:
    - Case insensitive; `hello.txt` will be seen the same as `Hello.txt` and the board will get confused.
    - can only be 8 characters long, or will be shortened artificially in the display. Unfortunately, with the tech used there isn't a way around this.
    - sometimes a file can get weird, and fail to read. try renaming it.
- File Formats:
    - Currently, only `.txt` files are accepted.
    - The files must be pre-formatted before they will display correctly
        - Essentially, newlines will mess up how the text is displayed on the screen, moving all text under the newline down (and out of view)
        - There is a tool though for formatting the files appropriately: Formatter
- The device will save the options set by the user to the SD card using the `OPS.DAT` file. This is not meant to be edited manually, but can be deleted to reset the options to default.

Resources:

- https://www.arduino.cc/en/Reference/SDCardNotes

Battery

On preliminary measurements, will full brightness and smallest text size, the device lasted on a 1200mAh battery.

To charge the battery, simply plug the main board into the computer or phone charger, with the battery plugged in and on (if a switch was added between the battery and the board). The main board will handle charging the battery.

The Orange light on the board is an indicator for charging status:

- Off = Not charging, fully charged
- On = Charging
- Flashing = No battery connected

More information here: https://learn.adafruit.com/adafruit-feather-328p-atmega328-atmega328p/power-management

How to Use

The board uses a simple menu system to navigate. When the device is powered on, it first displays a splash screen. After that, it will go into the file select menu.

File Selection

This menu shows all valid and available text files for reading.

Use `Up` or `Down` to highlight a file, `Right` to select it (moving into file reading).

Pressing `Left` will send you to the Options Menu

File Reading

When reading a file, it will simply display one page of file content at a time.

- `Down` will load the next page
- `Up` will load the previous page
- `Left` will send you back to File Selection

Options Menu

The Options menu will let you change the presentation of text when reading files in.

Use `Up` or `Down` to highlight an option to change, `Right` to select it (moving to that option's specific menu).

Pressing `Left` will send you back to File Select.

Text Size

The text size menu will change the size of the text when file reading.

Use `Up` or `Down` to cycle through the available sizes, `Right` to set the size to the current one shown.

Pressing `Left` will send you back to the Options menu without saving changes.

Text Color

The text size menu will change the color of the text when file reading.

Use `Up` or `Down` to hilight the available colors, `Right` to set the color to the current one selected.

Pressing `Left` will send you back to the Options menu without saving changes.

Backlight

The text size menu will change the backlight level of the screen.

Use `Up` or `Down` to cycle through the available brightnesses, `Right` to set the brightness to the current one shown.

Pressing `Left` will send you back to the Options menu without saving changes.

Build Documentation

Bill of Materials

- Adafruit Feather 328P
- 2.2" 18-bit color TFT LCD display with microSD card breakout
- 4 momentary switches, or a d-pad
- 1 snap switch for battery (optional)

Resources

- Adafruit Feather 328P Pinouts
- Adafruit 2.2" TFT Display with SD Card Reader
  - https://learn.adafruit.com/2-2-tft-display/adafruit-gfx-library
  -
- Adafruit ILI9341 Arduino Library
  - https://github.com/adafruit/Adafruit_ILI9341/blob/master/Adafruit_ILI9341.h
  -
  - https://learn.adafruit.com/adafruit-gfx-graphics-library/overview
  - https://learn.adafruit.com/adafruit-gfx-graphics-library?view=all
  - https://www.arduino.cc/en/Reference/TFTSetTextSize
- Arduino SD Library
  - https://github.com/arduino-libraries/SD/blob/master/src/utility/SdFile.cpp
  - https://github.com/arduino-libraries/SD/blob/master/src/File.cpp
  - https://github.com/adafruit/SD/blob/master/examples/Files/Files.ino
  - https://www.arduino.cc/en/Reference/SD
    - https://www.arduino.cc/en/Reference/FileRead
    - https://www.arduino.cc/en/Reference/FileSeek
- Arduino Data Types
- Adafruit TFT Display Example
- Adafruit Graphics Primitives
- Adafruit SD examples in the IDE
- https://learn.adafruit.com/adafruit-micro-sd-breakout-board-card-tutorial/arduino-library

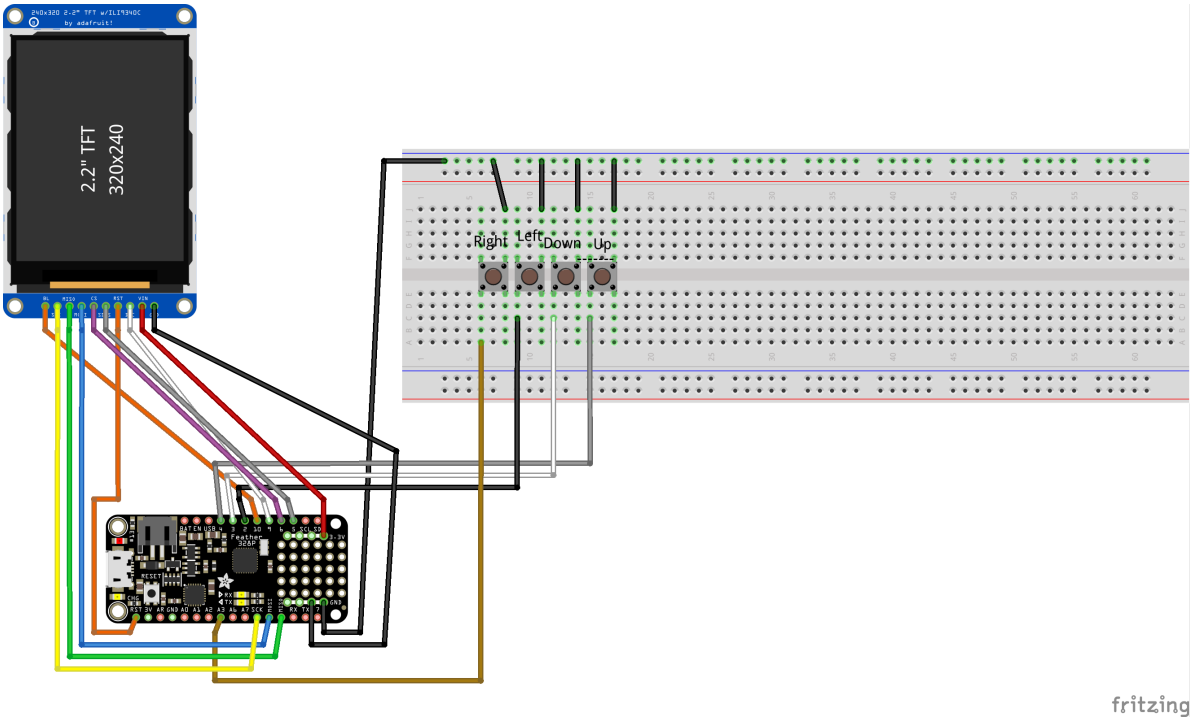
- https://www.arduino.cc/reference/en/language/functions/communication/serial/print/
- https://create.arduino.cc/projecthub/muhammad-aqib/arduino-button-tutorial-using-arduino-digitalread-function-08adb5
- https://forum.arduino.cc/t/passingpassing-f-string-as-a-parameter/108984
- https://cpp4arduino.com/2020/02/07/how-to-format-strings-without-the-string-class.html
- https://www.geeksforgeeks.org/readwrite-class-objects-fromto-file-c/
- https://www.arduino.cc/reference/en/language/variables/data-types/stringobject/
- My Forum posts:
    - https://forum.arduino.cc/t/f-macro-garbled-c-string/896971
    - https://forums.adafruit.com/viewtopic.php?f=57&t=182150&p=885279#p885279
    - https://forums.adafruit.com/viewtopic.php?f=47&t=182033&p=885513#p885513
    - https://electronics.stackexchange.com/questions/580450/correct-wiring-for-adafruit-2-2-tft-display-w-sd-card?noredirect=1#comment1519294_580450

Environment Setup

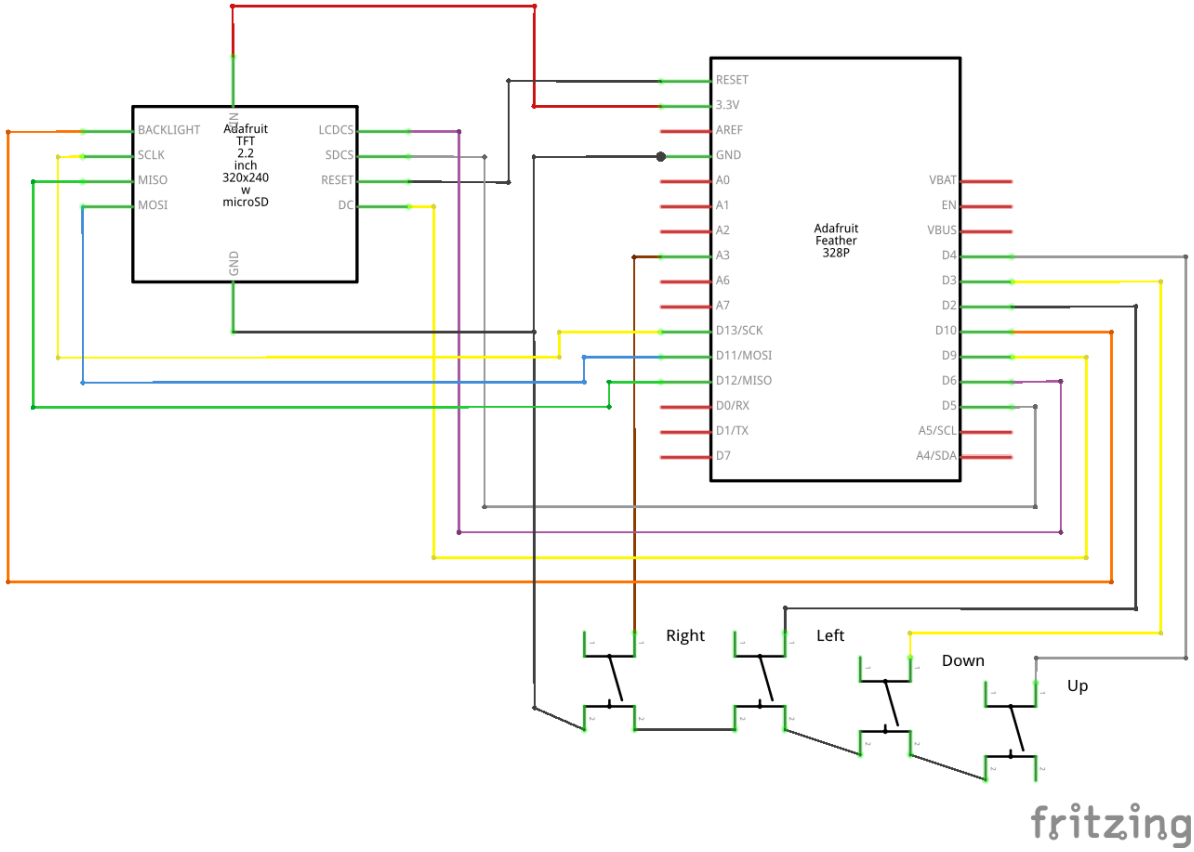
1. Arduino IDE Setup
    1. Board Selection
        - Board: `Arduino Pro or Arduino Pro Mini`
        - Processor: `ATMega328P (3.3V, 8 MHz)`
    2. Required Libs
        - Adafruit BusIO Library
        - AdaFruit GFX Library
        - Adafruit ILI9341 Library
        - LinkedList
            - I needed to delete the `test.cpp` file in the library's directory for it to work.

Circuitry

Realistic circuit diagram:



Schematic view:



Additional

Fritzing

Requires the addition of the Adafruit resource pack:

https://learn.adafruit.com/using-the-adafruit-library-with-fritzing/import-the-library-into-fritzing

Future TODOs:

- Support directories

- Show images on the TFT (requires different microcontroller board with more program space/ RAM!)
- Menu code support scrolling
- Support measuring battery: https://learn.adafruit.com/adafruit-feather-328p-atmega328-atmega328p/power-management
- Have a status screen during reading mode, show battery and progress stats. Navigation aides?