Internship DNANudge Product Design Specification

Product Design Specification

- We want a live plotting program which records and stores data through the Python console, where the user is able to choose whether to store and/or to plot the data.
- The user should also be able to choose what data is being plotted at any time during operation – no need to choose what to store (if store mode then store everything)
- A restart and calibration sequence should be able to be triggered at any time from the microcontroller reset button, where all current saved data is cleared/a new set of data is stored elsewhere so that the machine does not store 2 sets of data in the same file, causing confusion

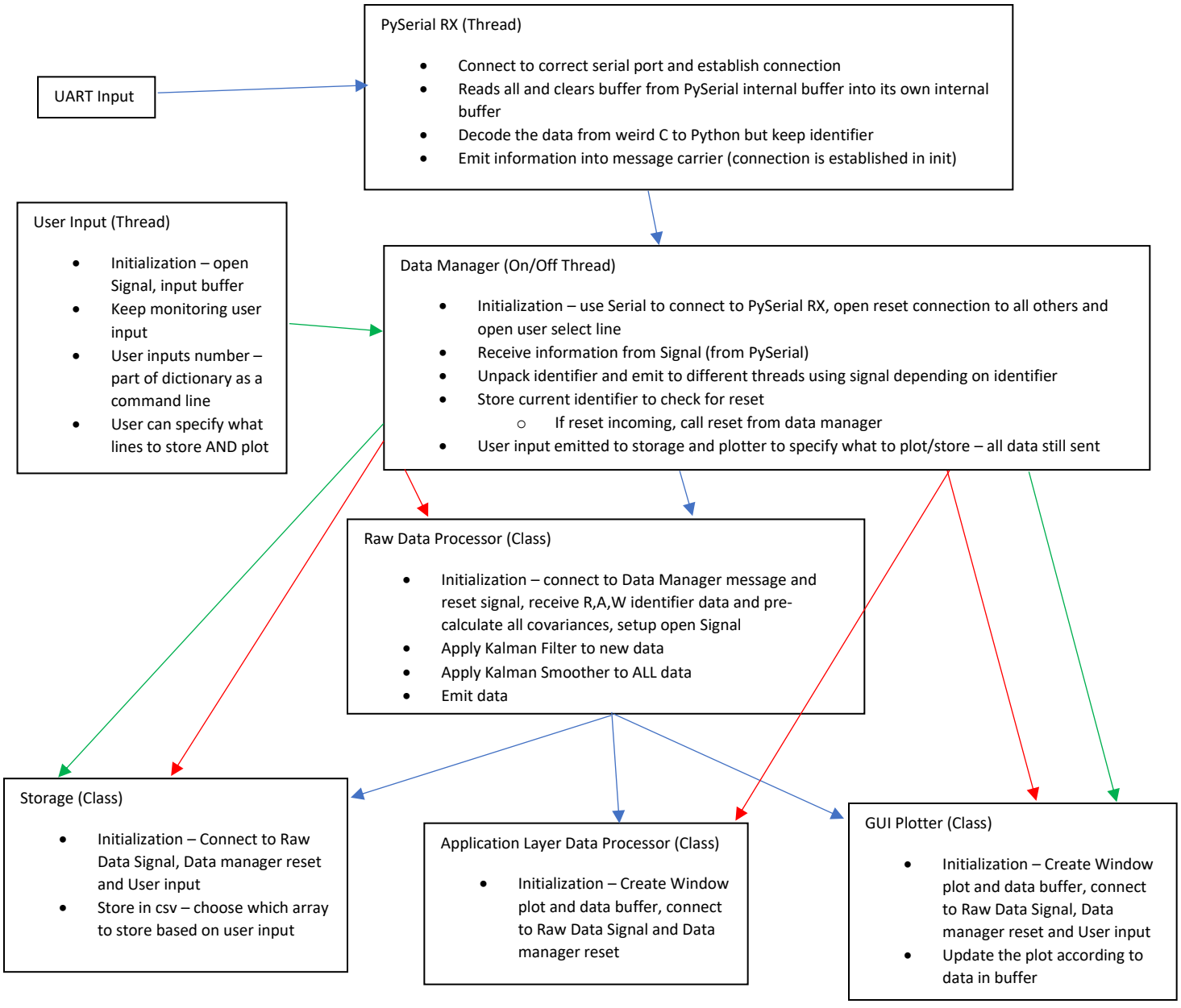
Main components

- A main program which initializes all of the threads and calls the looping functions
- Inputs:
    - A UART connection to transfer data from the microcontroller to the computer, either by serial connection or BLE
    - A constant user input from the Python console
- Outputs:
    - A fast, sensitive live plot of whatever variables the user wants (must support at least 9 live plots without lagging at 20Hz)
    - Data storage for each new reset – Python makes a new text file inside a repository upon startup/reset

Threads/Program Architecture

Main Program

- Initializing variables, call UART and plot functions (NOT loop in thread)
- Initialize User Input
- Initialize UART (sets up signal connect – leave open for Data Manager to pick up)
- Initialize Data Manager (Chooses to connect to UART through Signal into raw message buffer and initialize Signal for each identifier)
- Initialize Raw Data Processor
- Initialize Application Layer Data Processor
- Initialize data storage



User Command Line

Structure:

$$\text{user\_input} = \text{command/option}$$

Command: Store

- store start – starts storing data in a new CSV file – if used again before stop it executes stop and starts new
- store stop – stops data storage

Command: Connection

- connection setport ___ - Sets port to a new port and restarts the whole system
- connection closeport – closes the port and stops all function

Command: Plot (if it already exists don't do anything)

- plot raw – Adds plot of all raw data (including norm)
- plot filter – Adds plot of all filtered data (including norm)
- plot smooth - Adds plot of all smoothed data (including norm)
- plot x
- plot y
- plot z
- plot norm – Adds plot of all norms
- plot acc – Adds all acceleration plots
- plot ang – Adds all angular velocity plots
- plot vel – Adds all velocity plots
- plot jerk – Adds all jerk plots
- plot [index] – e.g. plot 1,2 gives temp and acceleration x

Command: Remove

- remove raw – Removes plot of all raw data (including norm)
- remove filter – Removes plot of all filtered data (including norm)
- remove smooth - Removes plot of all smoothed data (including norm)
- remove norm – Removes plot of all norms
- remove acc – Removes all acceleration plots
- remove ang – Removes all angular velocity plots
- remove vel – Removes all velocity plots
- remove jerk – Removes all jerk plots
- remove [index] – e.g. remove 1,2 removes temp and acceleration x