Aims

The main aim of this program is to provide a way to visually analyse cattle accelerometer data in terms of position, through an easy-to-use graphical user interface.

Use Cases

- Import .csv files, containing cattle sensor data
- View a table representation of the imported data
- Save the current workspace, containing imported data for later usage, as a .cdf file
- Load a saved workspace
- Remove specific cattle from the workspace
- Select specific cattle from the workspace and plot an animated visual representation of their movement over time
- Save the graph in multiple file formats, such as PDF, JPG, PNG, SVG, etc.

Design

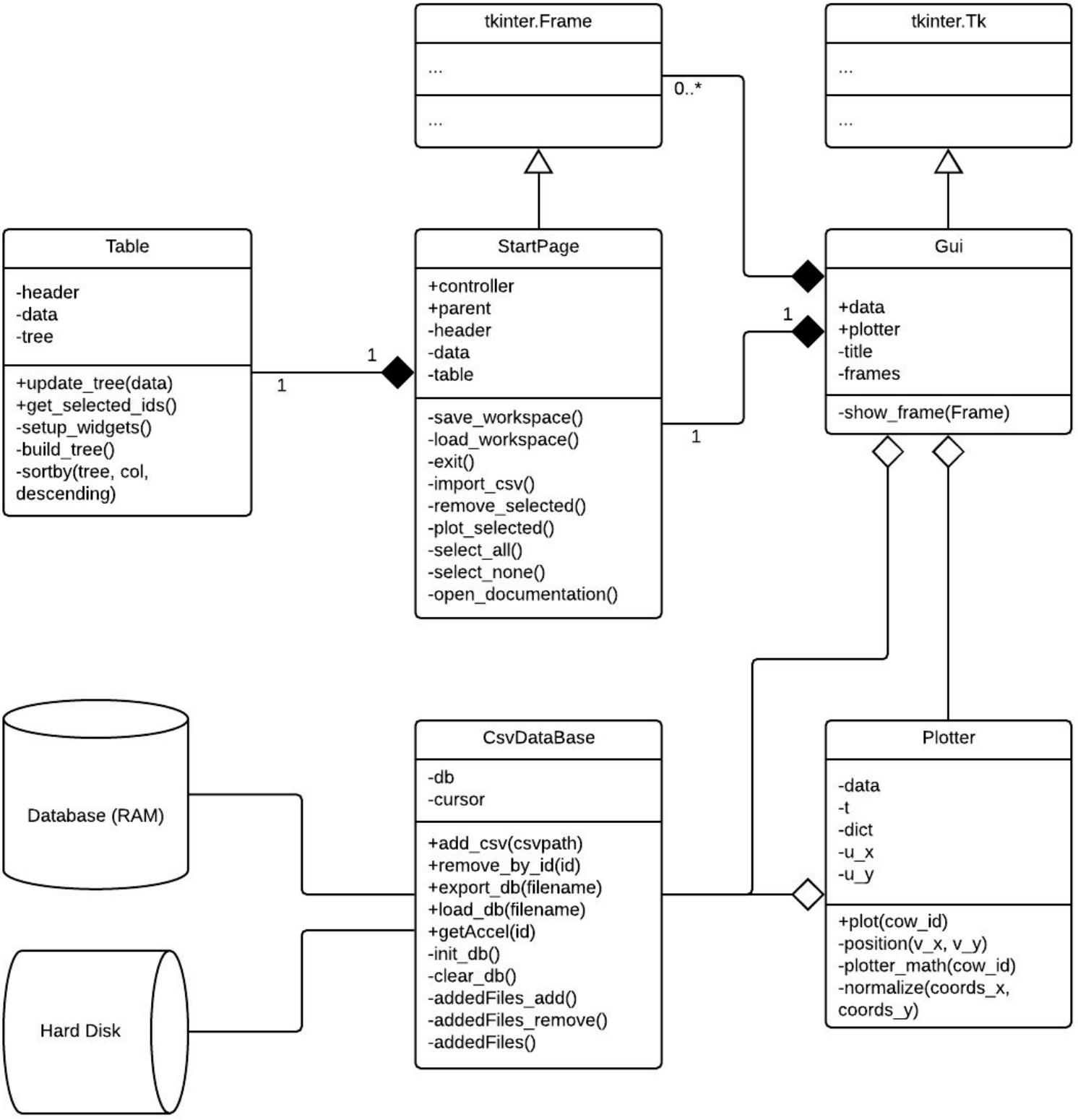
Logic is split into three main classes: Gui, Plotter and CsvDataBase.

CsvDataBase is an interface layer with the sqlite3 database in RAM, which handles import/export of CSV files, saving/loading of the database to disk and queries. It's a standalone class, which doesn't depend on the other two.

Plotter is a business logic class, which is passed a reference to the database class when instantiated. It deals with integrating acceleration data to position, calculating average movement per 10 second increment, conversion of measuring units and randomization / normalization of starting positions.

Gui is the user interface layer, which is passed references to the database and plotter classes when instantiated. Built with tkinter, it serves as a tool for the user to communicate with the database and visualize positional data, created by the plotter. It also allows generated graphs to be saved in multiple formats (.png, .pdf, .jpg, .svg ...)

These are the class relationships:



Testing

Test Scenario	Test Steps	Test Data	Expected Results	Actual Results	Pass /Fail
Import single .csv file	1. Click Data 2. Click Import CSV 3. Select a .csv file	File Name: DATA_01_05_ Cow_42.csv	Cow 42 is imported into the DB and is visualized on the table	Cow 42 is imported into the DB and is visualized on the table	Pass
Import multiple .csv files	1. Click Data 2. Click Import CSV 3. Ctrl + Select multiple .csv files	Files: DATA_01_05_ Cow_42.csv and DATA_01_05_ Cow_195.csv	Cows 42 and 195 are imported and visualised in the table	Cows 42 and 195 are imported and visualised in the table	Pass
Select a cow from the data	1. Click a cow in the table		The row in the table turns blue	The row in the table turns blue	Pass
Deselect a cow from the data	1. Click a cow in the table 2. Click a cow in the table		The row turns back to white	The row turns back to white	Pass
Select all cattle	1. Click Select 2. Click Select All		All rows turn blue	All rows turn blue	Pass
Deselect all cattle	1. Click Select 2. Click Select All 3. Click Select 4. Click Select None		All rows turn back to white	All rows turn back to white	Pass
Remove cow from data	1. Click a cow from the table 2. Click Data 3. Click Remove Selected		Cow is removed from the table and database	Cow is removed from the table and database	Pass
Save current workspace	1. Click File 2. Click Save Workspace 3. Choose a name for the save file 4. Click Save	File Name: test.cdf	Current workspace is saved as test.cdf in the specified path	Current workspace is saved as test.cdf in the specified path	Pass
Load a saved workspace	1. Click File 2. Click Load Workspace 3. Pick a .cdf file 4. Click Open	File Name: test.cdf	The previously saved workspace is loaded and the table is populated accordingly	The previously saved workspace is loaded and the table is populated accordingly	Pass
Plot a single cow	1. Click a cow in the table 2. Click Data 3. Click Plot Selected	Cow ID: 42	A movement graph window is opened, which animates a plot of the cow movement data	A movement graph window is opened, which animates a plot of the cow movement data	Pass
Plot multiple cows	1. Ctrl + Click multiple cows in the table 2. Click Data 3. Click Plot Selected	Cow IDs: 42, 345, 19	A movement graph window is opened, which animates a plot of the cattle movement data	A movement graph window is opened, which animates a plot of the cattle movement data	Pass
Create multiple simultaneous plots	1. Ctrl + Click multiple cows in the table 2. Click Data 3. Click Plot Selected 4. Select a different set of cows 5. Click Data 6. Click Plot Selected		Two movement graph windows are simultaneously opened and animated.	Two movement graph windows are simultaneously opened and animated.	Pass

Save graph as .png	1. Ctrl + Click multiple cows in the table 2. Click Data 3. Click Plot Selected 4. In the graph window, click Save Figure 5. Choose a name and click Save	Cow IDs: 42, 345, 19	The movement graph is saved as .png	The movement graph is saved as .png	Pass
Open documentation	1. Click Help 2. Click Open Documentation		This documentation is opened in the default .pdf program	This documentation is opened in the default .pdf program	Pass
Exit program	1. Click File 2. Click Exit		The program is closed	The program is closed	Pass

Potential Improvements

- Further control over the graphs plotted, such as selecting specific time slices
- The ability to pause, roll back and change the speed of the animation
- Better UI design of the main window
- The ability to double-click specific cattle in the table and receive further information
- The ability to edit data
- Validation of imported .csv and .cdf files
- Further testing on different platforms (Most of these tests have been done on Linux, some on Windows)
- Compilation of the program into an executable file to allow for installation without dependency on Python and the external libraries
- Filtering out unnecessary information from the database to reduce RAM usage and improve loading times