Circular weighing code

# Versions

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"wx": Version 2.8.10

"visa": 1.8

wx is needed in order to run the GUI. Without it, it is difficult but both the circular weghing least squares and the final mass calculations have the ability to read a csv file, and operate on that.

visa is needed to communicate with the instruments, for the automatic gathering of data. PyVisa 1.8 is not compatible with 1.5 or earlier, but hopefully it maintains backwards compatibility with 1.8 for a while. To run visa, the national instruments visa needs to be downloaded (NIVISA541full\_doaloader.exe) as well as the python wrapper "pyvisa", can be downloaded using "pip install pyvisa" in the command prompt.

# The code

There are three windows used, main, circ(ular) and collect. Main is the main frame, circ is the window for the circular weighing algorithm and analysis, and collect is for data collection.

A “gui” prefix such as “gui\_main.py” is for files generated by wxBuilder, they should not be edited.

A “main” prefix, such as “main\_circ.py” is the editable file, where the actual content of the functions is written. Each “main\_” file is a subclass of its corresponding “gui\_” file, overriding the blank event driven buttons actions.

“calc\_” prefixes are for calculations, they are kept separate form the rest of the program. These are imported by “main\_” files and made use of for analysis. The calcualtions make use of numpy for accurate calculations and for speed.

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| Weighing.py | Weighing sequence to collect data from balance |
| Visa2.py | Simulated visa for testing |
| Stuff.py | Extra functions, not edited. |
| Pywxgrideditmixin.py | Mixing for the grid, allows user to copy and paste info. |
| Main\_collect.py | The control window for communicating with balances and collecting info |
| Main\_circ.py | Window for circular weighing tables, allows to analyse a set of circular weighing results. Can open a main\_collect window to collect results. |
| MAIN.py | The main window and tables, can be used to load a main\_circ window to update a weighing difference/collect data. |
| Calc\_mass.py | The larger and more complex final mass calculation. Does a least squares on the differences to find the actual masses given sufficiently many constraints. Works for python 3 and 2. |
| Calc\_circ.py | Least squares for a single circular weighing. Works in python 3 and 2. |

# Further development

The code needs to be able to communicate with all the balances, perhaps what is currently written in weighing.py is not easily generalised.

It is currently very ‘functional’ code, the data gets repeatedly saved to a wx table object, analysed and passed around between functions. This is because initially I didn’t know how the project would end up, so more functionalities needed to be added producing something rather patchy. To improve, perhaps consider a class of mass object, that has various builtin methods for returning its name, name with identifier, nominal valu etc.

Move away from wx 2.8, its old, and use python 3? The calculations would not need to be updated when moving to python 3 (I think), I wrote them to work for both.

The results could return a simple ‘result’ object which has attributes ‘mass’, difference etc. At the moment it is an array, [mass1,mass2,difference,uncertainty].