Assignment title	Assignment 1: Data Structures and Algorithm Design
Discussion	Meal Prep Application
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Introduction

Nowadays meal prepping is a common practice for many people, everyone has to eat, and that task comes in with many hurdles. It is time consuming, and meals require of different ingredients.

Proposed outline

This application offers efficient recipe management. Users can add, sort recipes alphabetically, and create shopping lists with ascending ingredient quantities, saving time and money during grocery shopping. According to Robson et al. (2020), people on average spend 40 minutes food shopping. Menu:

1. Enter a meal: it will ask for the meal name and ingredients with their respective quantities.
2. Delete a meal: the meal and ingredients will be erased and removed from the shopping list.
3. Search a meal: enter the meal name or a portion of string contained in the meal name, and it will show the meal and ingredients list.
4. Sort meals: this function will order the meals in alphabetical order with their respective ingredients.
5. Display mode: to display all the added meals and ingredients.
6. Shopping list: all the ingredients will be displayed in a list fashion.
7. Quit: the application closes.

Design, data structure and algorithm

Design

The program main structure revolves around several lists, all of which provide different levels of depth within the execution, yet these are all as important. All these lists come together after some data indexing, string manipulation and simple arithmetical operations.

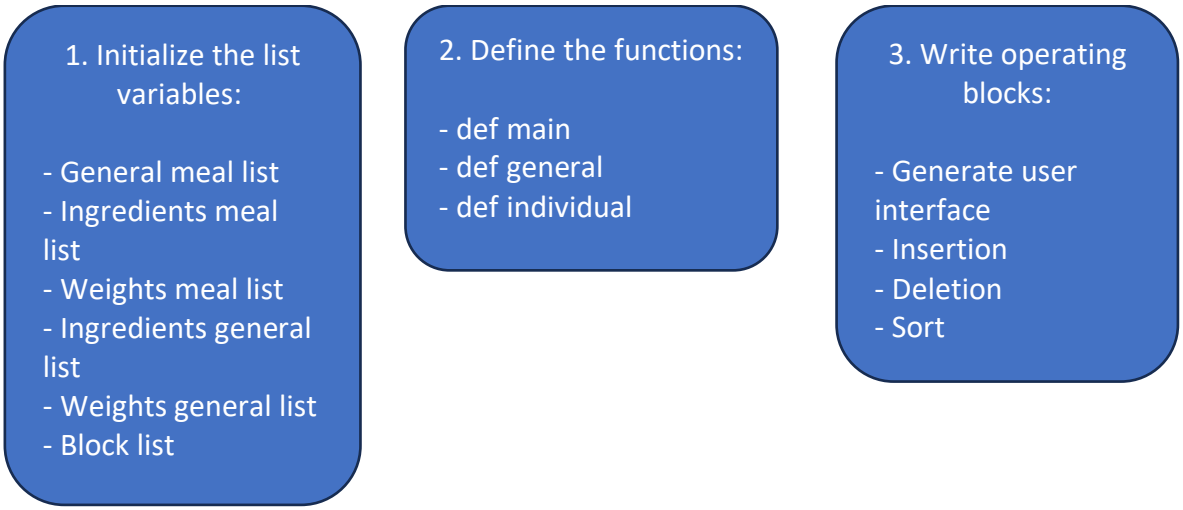
Data structure

Polya (2014) outlines in simple steps how to solve a problem. This also applies to algorithm design as its aim is to also converge to an outcome.

The program will encapsulate different data types, including functions with their respective parameters, variables and the most important data type, lists. The program will not explicitly define a dictionary-type of structure, however the lists “Ingredients general” and “Weights general” work together in the same fashion. Here, ingredients act like keys and weights act like their associated values (Powell, 2015).

Algorithm

The algorithm is split in 3 parts:



Step 1

- General meal: where the dish/menu titles are stored.
- Ingredients meal: where the individual ingredients for the dish are stored.
- Weights meal: where the individual weights are stored.
- Ingredients general: used to compute a shopping list where ingredients are not repeated.
- Weights general: computes all the weights for their respective ingredients. If an ingredient is detected to already be in the list, the weight is added on top.
- Block list: used mainly for the search and sort operations. This is the structure of the list (example with 2 meals):

Meal name	Ingredient and weight 1	Ingredient and weight 2	Meal name 2	Ingredient and weight 1	Ingredient and weight 2

Array containing lists as rows	Nested lists

Step 2

- def main (meal_name, number_of_ingredients): runs through all the lists except "Block list".
- def general (ingredient, weight): as a helper function of main(), it prepares the general lists "Ingredients general" and "Weights general" adding weights on repeated ingredients.
- def individual (meal_name, ingredients_meal, weights_meal): generates the "Block list" appending these 3 attributes into a nested list.

Step 3

These are to be run indefinitely in a loop until the user opts to quit the program. Data manipulation will be working on the generated lists and making updates to them accordingly.

Test plan

Operation involved	Requirement
Sort/Delete/Search	List must not be empty before performing the operation.
Delete	After the operation, the list length_before > length_after. Ingredients and weights of removed meal subtracted from shopping list.

To meet the requirements, a separate testing.py file will perform these checks without cluttering the main script.
For this, the testing.py file will work with defined and undefined variables, as these may or may not be created in main when performing the data manipulation operations. In other words, if the program does not enter the sorting block, the sorting check variable will not be declared.

In pseudocode concepts:

1. Define variables in main.py to adopt length parameters.
2. Import these testing variables along with lists for checking voids and functions for checking exceptions (data range) to the testing.py file.
3. Check the different imported inputs by firstly ensuring these were declared in the main.py file after its execution finished.

4. Perform tests on the declared variables. Throw exceptions when input values go beyond the desired range. For instance, a weight of <= 0 for an ingredient would not make sense.
5. Retrofit findings (add implementations) into the main.py script, to notify the user if the inputs chosen were invalid.

Conclusions

To wrap up, the algorithm proposed solves an everyday task by saving the user some time when shopping and creating meals, displaying their ingredients and quantities in an orderly manner. Despite the algorithm being capable of accomplishing the task, it uses many variants of dynamic lists. Moreover, it is written linearly, a practice called procedural programming. This practice is not as efficient as using classes with Object Oriented Programming (OOP), this work could still be done as future implementation.

References

G Polya (2014). *How to Solve It A New Aspect of Mathematical Method*. Princeton University Press.

Powell, J. (2015). *Python Data Structures*. *Infinite Skills*. Available at: https://learning.oreilly.com/videos/python-data-structures/9781771373517/ [Accessed 2 Oct. 2023].

Robson, S.M., DeLuccia, R., Baker, S., Bodt, B. and Trabulsi, J. (2020). Qualitative Research on the Real-Time Decision Making of WIC Participants While Food Shopping: Use of Think-Aloud Methodology. *Journal of the Academy of Nutrition and Dietetics*, 120(1), pp.111–119. doi:https://doi.org/10.1016/j.jand.2019.05.009.

Bibliography

J Glenn Brookshear and Brylow, D. (2020). *Computer Science: an overview*. Harlow Pearson.