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Foundations of Programming (Python)

Assignment 08

Object Oriented Programming with Python

Introduction

In this document, I will provide an overview of using object oriented programming techniques with Python. This report will include discussion of the CDInventory08.py script and what challenges I came across.

CD Inventory Script

Building upon the last few week's assignments of managing a CD inventory, I integrated object oriented programming (OOP) concepts into the code. I will only describe the changes included to the script, since majority of the pseudocode and functionality stayed the same.

I extended the structure of my code to include classes to define objects, creating attributes for objects, creating methods (functions), and restrict access to an object's attributes.

```
17 class CD:
18     """Stores data about a CD:
19
20     properties:
21         cd_id: (int) with CD ID
22         cd_title: (string) with the title of the CD
23         cd_artist: (string) with the artist of the CD
24
25     methods:
26         user_add: user adds an index to the CD inventory
27         user_del: user selects and deletes an index from the CD inventory
28
29     """
30
31     """--Attributes--"""
32     def __init__(self, cd_id, cd_title, cd_artist):
33         self.__cd_id = cd_id
34         self.__cd_title = cd_title
35         self.__cd_artist = cd_artist
```

Figure 1 CD Class

In line 32, I use the built in double underscored init method to initialize object's state. The constructor initializes (assigns) values to the members of that class. In this case, I wanted to include "cd_id", "cd_title", and "cd_artist".

```
37      """--Properties--"""
38      @property
39      def cd_id(self):
40          return self.__cd_id
41      @property
42      def cd_title(self):
43          return self.__cd_title
44      @property
45      def cd_artist(self):
46          return self.__cd_artist
47
48      @cd_id.setter
49      def cd_id(self, value):
50          self.__cd_id = value
51
52      @cd_title.setter
53      def cd_title(self, value):
54          self.__cd_title = value
55
56      @cd_artist.setter
57      def cd_artist(self, value):
58          self.__cd_artist = value
```

Figure 2 Set and Get Properties

In lines 38-58, I wrote “gets” and “sets” to define the property of the class. The purpose of this is to prevent accidental modification of data. In other words, it helps structure the code to have change or set private attributes. Note, I created individual properties for each of the three user input data (id, title, artist). In this case, I did three pairs of “set” and “get”. I followed the notation of setting private variables in lines 50, 54, and 58 with a double underscore.

The rest of the code followed the previous weeks’ code structure. There was a class for input output presentation, there was a class for data processing, and a class for file operations (reading, writing). The main body of the code included a while loop that presented a menu of choices to the user when the code is run.

Example runs from Spyder and the terminal are included in the Appendix.

Questions

• What is the difference between a class and the objects made from a class?

- Objects are an instantiation from a class.

• What are the components that make up the standard pattern of a class?

- There are fields, constructors, attributes, properties, and methods.

• What is the purpose of a class constructor?

- Constructors are run once during the creation of the object. They pass arguments provided when creating an object.

• When do you use the keyword "self"?

- “Self” is used as convention in the programming community to be the first parameter in every method. This helps the class understand which objects to use in the method.

• When do you use the keyword "@staticmethod"?

- They cannot access properties of the class itself. Thus, when those function properties only belong to the class would warrant staticmethod.

• How are fields and attributes and property functions related?

- Fields are data stores of a class. Attributes are internal fields or variables that hold data. Attributes can then be made private – these special methods are called properties.

• What is the difference between a property and a method?

- Properties control validity of values assigned to attributes in a class. Methods are functions in a class.

• Why do you include a docstring in a class?

- It helps define and describe what the class contains and is supposed to do. Including docstrings will also help readability for other programmers to utilize when reviewing or modifying code.

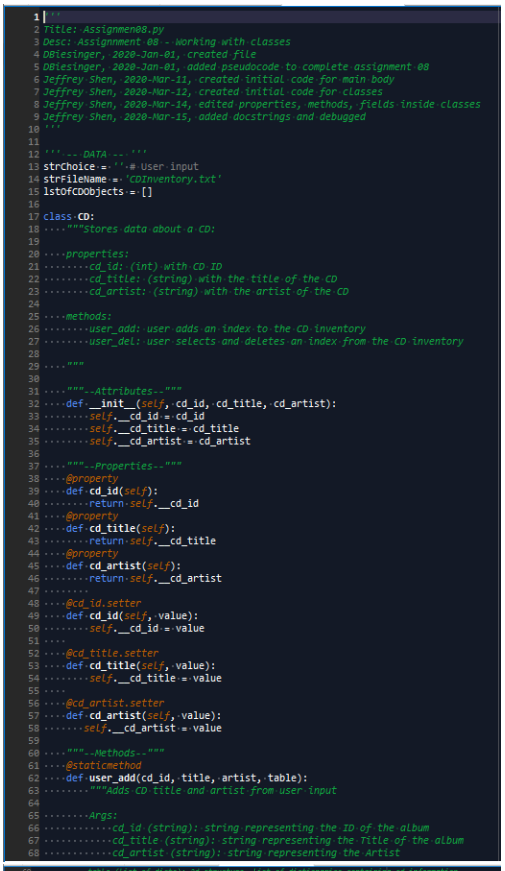
Summary

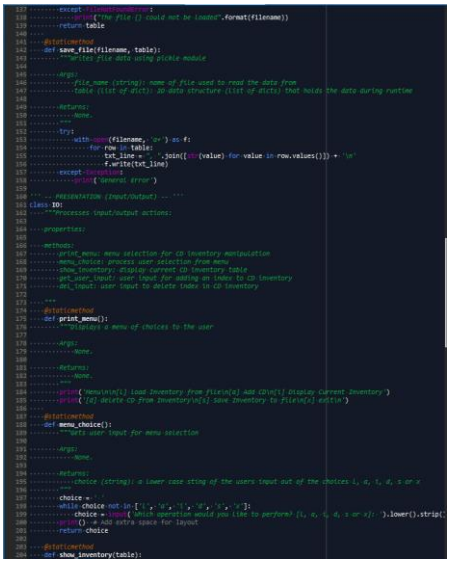
In this lab, I explored using OOP concepts and applied them to my CD inventory script. Using OOP techniques help shape and structure the code to reflect manipulation of classes, objects, and more.[1] I think I struggled with grasping how fields, attributes, properties, and methods all interact with each other.[2] The code still runs, however, it can most likely be made more efficiently using OOP. I'm curious to see what the clean and concise code is supposed to look like. I've also included my GitHub.

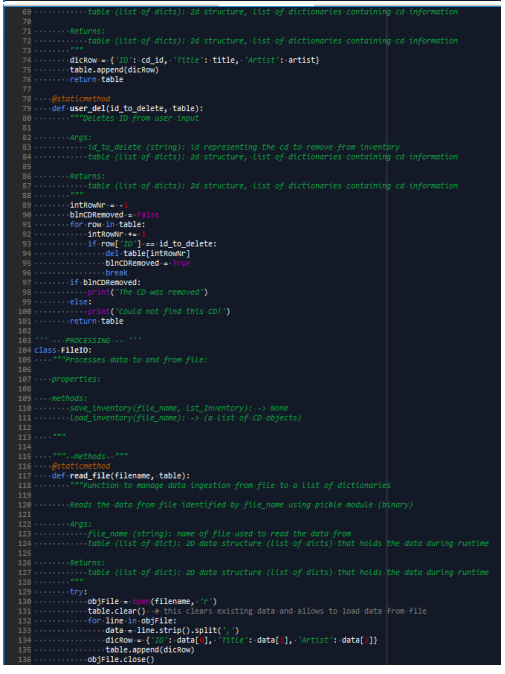
[1] https://www.tutorialspoint.com/getter-and-setter-in-python
[2] https://www.geeksforgeeks.org/__init__-in-python/

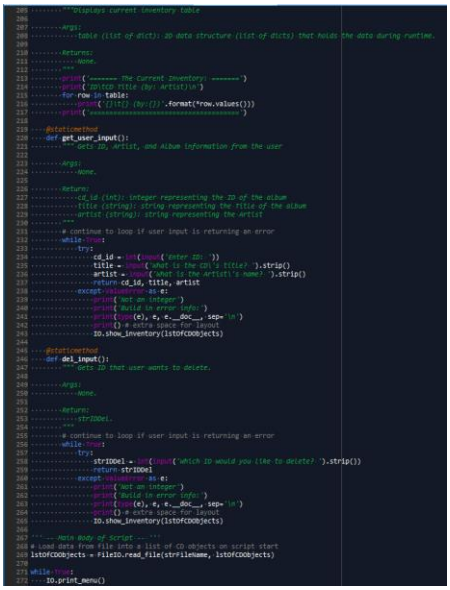
Appendix

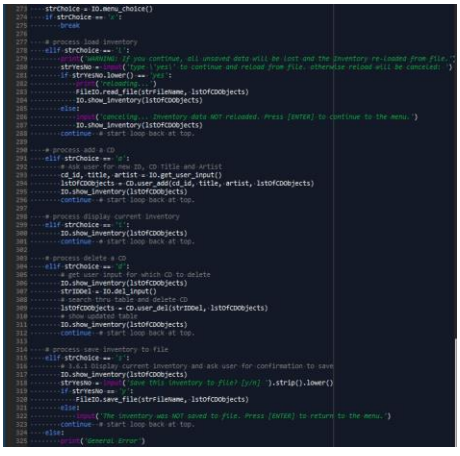
Complete Code for CDInventory08.py











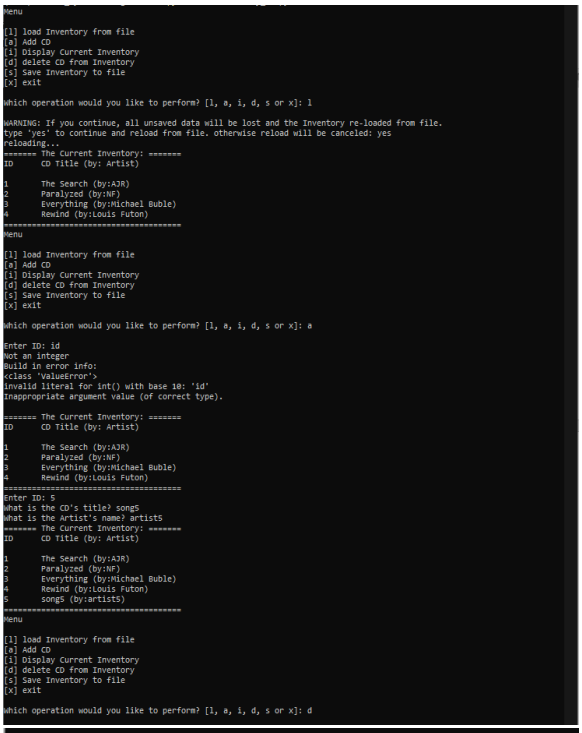
Example Run from Spyder

```
Menu

[l] load Inventory from file
[a] Add CD
[i] Display Current Inventory
[d] delete CD from Inventory
[s] Save Inventory to file
[x] exit


Which operation would you like to perform? [l, a, i, d, s or x]: l

WARNING: If you continue, all unsaved data will be lost and the Inventory re-loaded from file.

type 'yes' to continue and reload from file. otherwise reload will be canceled: yes
reloading...
======= The Current Inventory: =======
ID      CD Title (by: Artist)

1       The Search (by:AJR)
2       Paralyzed (by:NF)
3       Everything (by:Michael Buble)
4       Rewind (by:Louis Futon)
=======================================
Menu

[l] load Inventory from file
[a] Add CD
[i] Display Current Inventory
[d] delete CD from Inventory
[s] Save Inventory to file
[x] exit


Which operation would you like to perform? [l, a, i, d, s or x]: a


Enter ID: song
Not an integer
Build in error info:
<class 'ValueError'>
invalid literal for int() with base 10: 'song'
Inappropriate argument value (of correct type).
```

```
======= The Current Inventory: =======
ID      CD Title (by: Artist)

1       The Search (by:AJR)
2       Paralyzed (by:NF)
3       Everything (by:Michael Buble)
4       Rewind (by:Louis Futon)
=======================================

Enter ID: 5

What is the CD's title? Crashing

What is the Artist's name? Illenium
======= The Current Inventory: =======
ID      CD Title (by: Artist)

1       The Search (by:AJR)
2       Paralyzed (by:NF)
3       Everything (by:Michael Buble)
4       Rewind (by:Louis Futon)
5       Crashing (by:Illenium)
=======================================
Menu

[l] load Inventory from file
[a] Add CD
[i] Display Current Inventory
[d] delete CD from Inventory
[s] Save Inventory to file
[x] exit


Which operation would you like to perform? [l, a, i, d, s or x]: d

======= The Current Inventory: =======
ID      CD Title (by: Artist)

1       The Search (by:AJR)
2       Paralyzed (by:NF)
3       Everything (by:Michael Buble)
4       Rewind (by:Louis Futon)
5       Crashing (by:Illenium)
=======================================
```

```
Which ID would you like to delete? delete
Not an integer
Build in error info:
<class 'ValueError'>
invalid literal for int() with base 10: 'delete'
Inappropriate argument value (of correct type).

======= The Current Inventory: =======
ID      CD Title (by: Artist)

1       The Search (by:AJR)
2       Paralyzed (by:NF)
3       Everything (by:Michael Buble)
4       Rewind (by:Louis Futon)
5       Crashing (by:Illenium)
=======================================

Which ID would you like to delete? 5
The CD was removed
======= The Current Inventory: =======
ID      CD Title (by: Artist)

1       The Search (by:AJR)
2       Paralyzed (by:NF)
3       Everything (by:Michael Buble)
4       Rewind (by:Louis Futon)
=======================================
Menu

[l] load Inventory from file
[a] Add CD
[i] Display Current Inventory
[d] delete CD from Inventory
[s] Save Inventory to file
[x] exit


Which operation would you like to perform? [l, a, i, d, s or x]: x
```

Example Run from Terminal



```
Menu

[l] load Inventory from file
[a] Add CD
[i] Display Current Inventory
[d] delete CD from Inventory
[s] Save Inventory to file
[x] exit

which operation would you like to perform? [l, a, i, d, s or x]: l

WARNING: If you continue, all unsaved data will be lost and the Inventory re-loaded from file.
type 'yes' to continue and reload from file. otherwise reload will be canceled: yes
reloading...
======= The Current Inventory: =======
ID      CD Title (by: Artist)

1       The Search (by:AJR)
2       Paralyzed (by:NF)
3       Everything (by:Michael Buble)
4       Rewind (by:Louis Futon)
=======================================
Menu

[l] load Inventory from file
[a] Add CD
[i] Display Current Inventory
[d] delete CD from Inventory
[s] Save Inventory to file
[x] exit

which operation would you like to perform? [l, a, i, d, s or x]: a

Enter ID: id
Not an integer
Build in error info:
<class 'ValueError'>
invalid literal for int() with base 10: 'id'
Inappropriate argument value (of correct type).

======= The Current Inventory: =======
ID      CD Title (by: Artist)

1       The Search (by:AJR)
2       Paralyzed (by:NF)
3       Everything (by:Michael Buble)
4       Rewind (by:Louis Futon)
=======================================
Enter ID: 5
What is the CD's title? song5
What is the Artist's name? artist5
======= The Current Inventory: =======
ID      CD Title (by: Artist)

1       The Search (by:AJR)
2       Paralyzed (by:NF)
3       Everything (by:Michael Buble)
4       Rewind (by:Louis Futon)
5       song5 (by:artist5)
=======================================
Menu

[l] load Inventory from file
[a] Add CD
[i] Display Current Inventory
[d] delete CD from Inventory
[s] Save Inventory to file
[x] exit

which operation would you like to perform? [l, a, i, d, s or x]: d
```

```
======= The Current Inventory: =======
ID      CD Title (by: Artist)

1       The Search (by:AJR)
2       Paralyzed (by:NF)
3       Everything (by:Michael Buble)
4       Rewind (by:Louis Futon)
5       song5 (by:artist5)
=======================================
Which ID would you like to delete? 5
The CD was removed
======= The Current Inventory: =======
ID      CD Title (by: Artist)

1       The Search (by:AJR)
2       Paralyzed (by:NF)
3       Everything (by:Michael Buble)
4       Rewind (by:Louis Futon)
=======================================
Menu

[l] load Inventory from file
[a] Add CD
[i] Display Current Inventory
[d] delete CD from Inventory
[s] Save Inventory to file
[x] exit

Which operation would you like to perform? [l, a, i, d, s or x]: x
```