Multi-paradigm programming

Shop Assignment

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The aim of this assignment is to build on the shop programme provided by the professor and to add additional functionality. I have chosen 2 programming languages C and Python. Procedural programming was done both in C and Python while Object -orientated programming was done only in Python as C is low level language and it doesn’t support OOP. That is also one of the first differences in these 2 programming languages. In this report I will describe 2 approaches, procedural and object-oriented programming and then talk about their differences and similarities.

Procedural Programming

The procedural programming model is derived from structured programming and uses selection, repetition and sequences. Procedural programming uses procedures to instruct the computer what to do in a series of steps.

These procedures can also be referred to as functions, routines, or subroutines. A program or any part of it can call any routine at any time during its execution. Procedural programming is also referred to as "inline programming", and it takes a top-down approach to execute instructions and solve problems. A simple program that calls any number of routines for different operations can be said to use a procedural programming approach. [1]

Object-orientated programming

Object-oriented programming, also known as OOP, is an approach to problem-solving where all computations use objects. An object is a component of a program that knows how to perform certain actions and how to interact with other elements of the program. Objects are the basic units of object-oriented programming. A simple example of an object would be a person. Name of a person would be considered a their property while walking would be considered a method of the person. A method in object-oriented programming is like a procedure in procedural programming. The key difference here is that the method is part of an object. In object-oriented programming, you organize your code by creating objects, and then you can give those objects properties and you can make them do certain things.[3]

A key aspect of object-oriented programming is the use of classes. A class is a blueprint of an object. You can think of a class as a concept and the object as the embodiment of that concept. So, let's say you want to use a person in your program. You want to be able to describe the person and have the person do something. A class called 'person' would provide a blueprint for what a person looks like and what a person can do. Examples of object-oriented languages include C#, Java, Perl and Python.[2]

Briefly about structure of OOP:

1. Classes are user-defined data types that act as the blueprint for individual objects, attributes and methods.
2. Objects are instances of a class created with specifically defined data.
3. **Methods** are functions that are defined inside a class that describe the behaviour of an object.
4. **Attributes** are defined in the class template and represent the state of an object. Objects will have data stored in the attributes field.

Main principles of OOP:

* **Encapsulation.**This principle states that all important information is contained inside an object and only select information is exposed.
* **Abstraction.** Objects only reveal internal mechanisms that are relevant for the use of other objects, hiding any unnecessary implementation code.
* **Inheritance.**Classes can reuse code from other classes. Relationships and subclasses between objects can be assigned
* **Polymorphism.**Objects are designed to share behaviors and they can take on more than one form. The program will determine which meaning or usage is necessary for each execution of that object from a parent class, reducing the need to duplicate code.

Similarities and differences in procedural and object - oriented programming

Firstly, I would like to point out the differences between C and Python language and its use. C programme is less user friendly as it is more complicated, it takes longer to code in C language and is more sensitive than Python. Even all necessary installations for C lasted longer than for other programming languages. When I was finally able to successfully install and run C language, its execution took a lot of time to figure out how to successfully run the programme. From the start it was clear that I have been dealing with low level language when compared to Python. It is easy to read and use as it is considered advanced language. Python was much easier to use as it has simpler syntax and larger built in library. It is more user friendly. In C language we have to create functions ourselves which makes coding more difficult and time consuming. As I mentioned before, procedural programming is a structured, top – down approach programming.

When you compare procedural and object – oriented programming in C the type of the variables must be declared when they are created, and only values of those types must be assigned while in Python there is no need to define the data type of a variable. The same thing is with memory allocation. In C memory needs to be allocated manually while memory in automatically handled in Python. [6]

Furthermore, C uses {} to identify a separate block of code and Python uses indentation. I personally find indentation part tedious and in this case I preferred C language.

On the other hand when you compare Python procedural and Python OOP style you can see some differences although the language is the same. With procedural style we break a problem into function and each function does one task. When we run the programme our main program is a series of calls to the different functions. In shop case in Python procedural style functions or methods are firstly written separately and then called in the main function when needed. For example, display\_menu function. Whereas in OOP programme starts by making a class that contains specific information. In shop case class Product contains information about its name and price. Once classes are defined we need to write what operations need to happen on the data. These are called methods. Once we have everything defined we can create objects. When you create and object they have all of the attributes and methods defined in their class. .\_\_init\_\_ is a reserved function in Python that is invoked when an object of a class is created. We can also pass arguments to the \_\_init\_\_ method to initialize data members of different objects with unique values.[4] In shop example this is \_\_init\_\_ function with parameters:

|  |
| --- |
| def\_\_init\_\_(self,name,price=0): |
| self.name = name |  |
| self.price = price |  |
|  |  |

When we talk about similarities in OOP and procedural programming style it is obvious that Python OOP and procedural is more similar than procedural style in C. The same syntax can be used in OOP and procedural style in Python such as the use of if \_\_name\_\_=”main”:

Indicating the execution of the code. This is expected as we are talking about the same language, but still few adjustments should be made for calling functions. For example in the OOP shop code each class has a def\_\_repr\_\_function that prints the representation of the object. [5]

To conclude, both programming languages have pros and cons. The important thing is to know in which situation to chose which language. Although C wouldn’t be my first choice because of its complexity it is widely used in industry in the development of firmware and mobile systems where high speed and high performance are very important. Python, on the other hand, is more common to be used in Data Science and related disciplines.

References

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[5] <https://www.geeksforgeeks.org/difference-between-c-and-python/>

[6] https://dare2compete.com/blog/difference-between-c-and-python