파이썬으로 배우는 데이터 구조

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학습 목표

소프트웨어의 설계 원리에 대해 알고 적용할 수 있다

Data Structures in Python
Chapter 2 - 1

- JavaScript Object Notation(JSON)
- **Software Design Principles**
- Abstract Data Type(ADT)

나는 인애를 원하고 제사를 원하지 아니하며 번제보다 하나님을 아는 것을 원하노라 (호6:6)
하나님은 모든 사람이 구원을 받으며 진리를 아는데에 이르기를 원하시느니라 (딤전2:4)

그런즉 너희가 먹든지 마시든지 무엇을 하든지 다 하나님의 영광을 위하여 하라 (고전10:31)

Agenda & Readings

- **Some Software Design Principles**
- Abstract Data Type (ADT)
  - What is an ADT?
  - What is a Data Structure?
- Examples on ADT:
  - Integer, Set, and List

- Resources:
  - Textbook: Problem Solving with Algorithms and Data Structures
    - Chapter 1.5 Why Study Data Structures and Abstract Data Types?
  - Textbook: www.github.com/idebtor/DSpy:
    - Ch1-1: Introduction

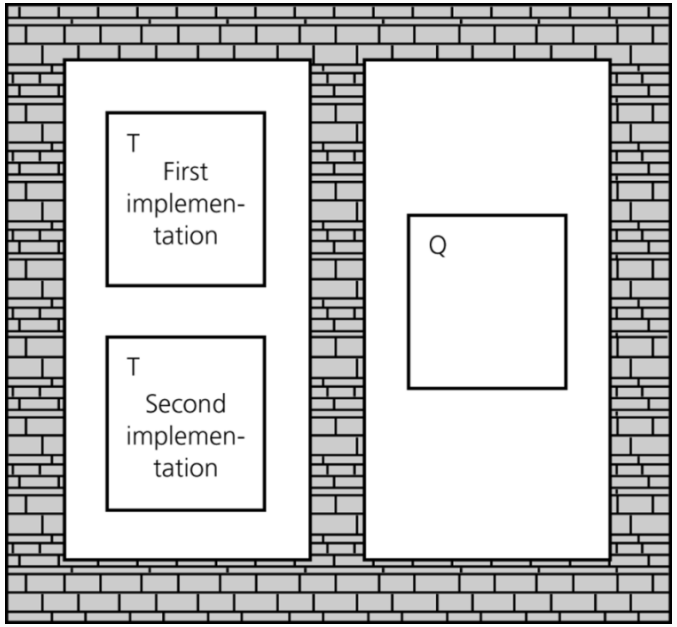
Software Design Principles - Modularity

- Modularity divides a program into manageable parts.
  - Keeps the complexity of a large program manageable.
  - Isolates errors.
  - Eliminates redundancies.
  - Encourages reuse (write libraries).

- A modular program is
    - Easier to write.
    - Easier to read.
    - Easier to modify (or maintain).

Software Design Principles - Information Hiding

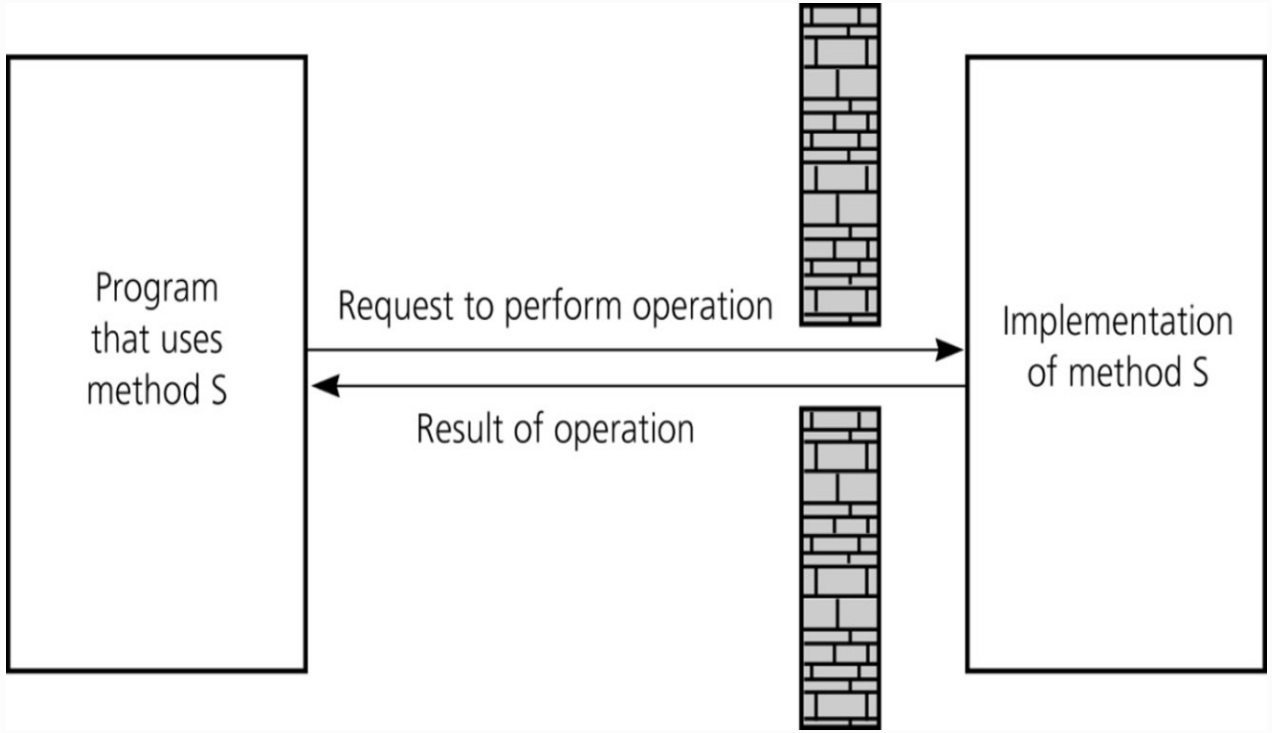
- Hides certain implementation details within a module.
- Makes these details inaccessible from outside the module.
- Isolates the implementation details of a module from other modules.



Isolated tasks: the implementation of task T does **not** affect task Q

Software Design Principles - Isolation of Modules

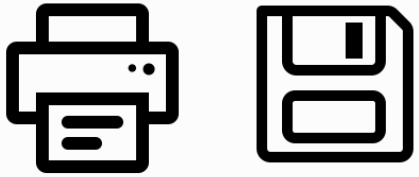
- The isolation of modules is not the end. (otherwise module would be useless)
- Methods' specifications, or contracts, govern how they interact with each other.
- Similar to having a wall hiding details, but being able to access through "hole in the wall"



Software Design Principles - Abstraction

- What does ‘abstract’ mean?
  - From Latin: to ‘pull out’—the essentials
  - To defer or hide the details
  - Abstraction emphasizes **essentials** and defers the details, making engineering artifacts easier to use.

- Example:
  - I don’t need a mechanic’s understanding of what’s under a car’s hood in order to drive it.
    - What’s the car’s interface?
    - What’s the implementation?



Software Design Principles - Abstraction

- Abstraction
  - The principle of ignoring those aspects of a subject that are not relevant to the current purpose in order to concentrate solely on those aspects which are **relevant.**

- How do we achieve:
  - Modularity
  - Information hiding
  - Isolation of modules
    - i.e. The abstraction of **what** from the **how**

Software Design Principles - Abstraction

- Abstraction separates the purpose and use of a module **from its implementation**.

- A module's specifications should
  - Detail how the module behaves.
  - Identify details that can be hidden within the module.

- Advantage:
  - Hides details (easier to use).
  - Allows us to think about the general framework overall solution) & postpone details for later.
  - Can easily replace implementations by better ones and it **does not affect the users of the modules (or library).**

Software Design Principles - Data and Operations

- What do we need in order to achieve the above Software Design principles?

- **For example,** what are the typical operations on data? (example: database)
  - Add data to the database
  - Remove data from the database
  - Find data (or determine that it is not in the data base)
  - Ask questions about the data in a data collection
    (e.g. how many CS50 students take Linear Algebra course?)

- **Question:** Do we need to know what data structures used?
  - No, better make implementation independent of it!

Abstraction - Example

- Programming Language
  - Programming:
    - For instructing a computer to perform a computing task
    - But more than just a means of computing …
      - a framework within which we **organize our ideas**
      - a means of communicating ideas in the community
  - Language:
    - Provides for combining simple ideas to form more complex ideas.

- Example

[sheep] [hand] [spear head] [righteousness]

손(손 수手)으로 양(羊)를 쳐서(창 과戈) 드림. 손의 창으로 양을 잡아 그 피로 나를 덮는 것이 옳을 의
손의 창으로 나를 쳐서 어린 양 예수님께 복종하는 것이 옳은 의

Abstraction - Example

- Programming Language
  - Programming:
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    - But more than just a means of computing …
      - a framework within which we **organize our ideas**
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  - Language:
    - Provides for combining simple ideas to form more complex ideas.

- Example

[ox] [sheep] [excellent] [spear head] [sacrifice]

흠 없는(秀) 양(羊)과 소(牛)를 창(칼)로 잡아(戈) **희생**시킴으로써(犧) 하나님께 제물로 드렸다 (레1:2-4)

Software Design Principles - Data and Operations

- Asks you to think what you can do to a collection of data independently of how you do it.
- Allows you to develop each data structure in relative isolation from the rest of the solution.
- A natural extension of procedural abstraction.

```
CAR:
Start()
Stop()
TurnLeft()
TurnRight()
```

```
CAR:
Start(){
  Select first gear
  Release parking brake
  Bring clutch up to the friction point
  Press gas pedal
  Release clutch
}
```

NOTE: Implementation can be different for different cars, e.g. automatic transmission.

학습 정리

1) 모듈화(Modularity)를 통해 프로그램을 모듈로 나누고,
각 모듈의 상세 내역은 모듈 바깥으로 드러나지 않게 한다

2) 추상화(Abstraction)는 복잡한 자료, 함수, 모듈들을
단순화 시켜 핵심적인 개념 또는 기능을 간추려 내는 것이다

3) 클래스, 메소드, 모듈, 함수 등등을 기본적인 추상화 방법으로
사용할 수 있다

파이썬으로 배우는 데이터 구조

수고했습니다
곧 다음 시간에
다시 뵙겠습니
다