

Background

To manage big projects, we must divide them into independent units. You can always split the parts of a program that stores and retrieves data (Data Structures) from the parts that compute the data (Algorithms).

Data Structures are service code that stores and retrieves data.

Software implementation should achieve robustness, adaptability and reusability.

Robustness:

- Software must be correct; program provides the right output for all the anticipated inputs
- Robust: capable of handling unexpected inputs that are not defined for the program and should be able to recover “gracefully” from this error.
 - o Ex: Expecting a positive integer but was given a negative number
 - o Life critical applications where software error can lead to injury or loss of life, software that is not robust could be deadly.

Adaptability:

- Software needs to be able to evolve overtime, in response to changing conditions in its environment
- Portability: the ability of software to run with minimal change on different hardware and operating system platforms
 - o Java is portable by the nature of the language

Reusability:

- Software must be reusable; the same code should be usable as a component of different systems in various applications
 - o Developing software can be expensive and time consuming, one way to offset some cost is through reusable software.
 - o Proceed with caution to reuse code that is right for that system.

OOP Principle

Principles of object oriented approach: Abstraction, Encapsulation, Modularity

Abstraction:

- Distill a complicated system down to its most fundamental parts and describe these parts simply.
- Apply abstraction paradigm to the design of the data structure gives rise to Abstract Data Type (ADT)
- ADT:
 - o Mathematical model of a DS
 - o Specifies the type of data stored, operations supported on them and the types of parameters
 - o Specifies the what not the how
 - o In java, an ADT is expressed as an Interface which are just methods declarations but no implementation
- A data structure is a concrete implementation of an ADT
- In java, a D.S. is represented by a class which can implement an interface or interfaces, if it defines all methods declared in the interface

Encapsulation:

- Different components of a software system should not reveal the internal details of their implementations
- Gives the programmer freedom in implementing the details of a system
- Programmer must follow the abstract interface
- Client uses but does not know how

Modularity:

- Modularity refers to an organizing principle for code in which different components of a software system are divided into separate functional units.