CS 201 - Data Structures II

Introduction

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Outline

- Data Structure – What, Why?
- Important Considerations
- Course Overview
- Course Logistics

What is data Structure?

- A **data structure** is a particular way of organizing data in a computer so that it can be used effectively.

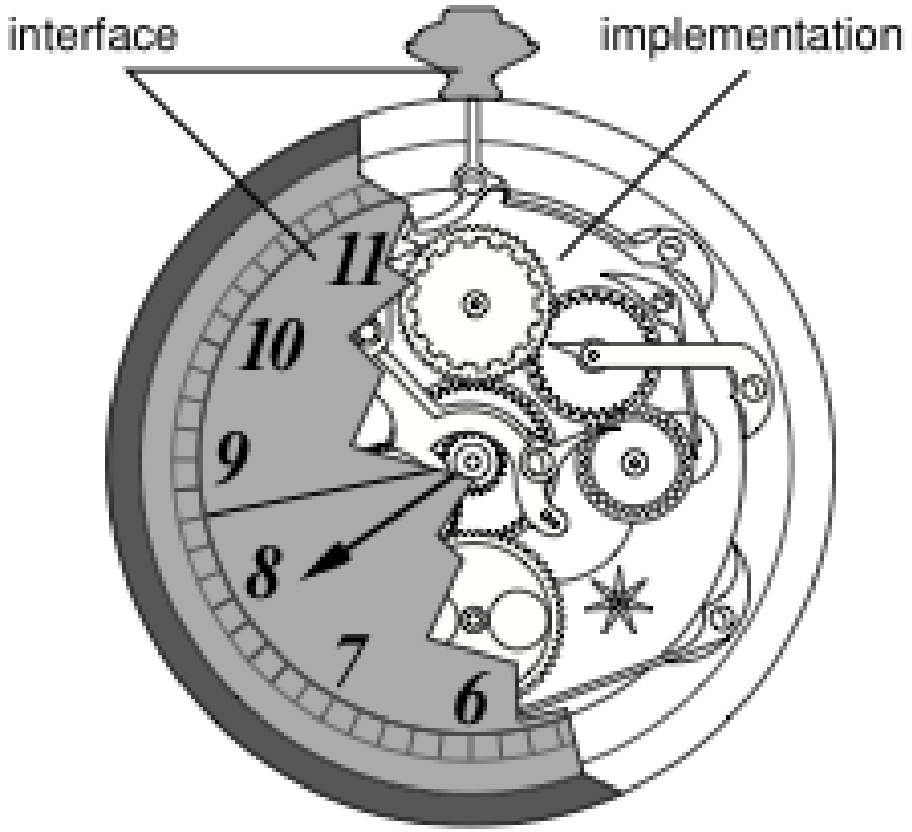
Organization in real-world

Important Considerations

- Linear vs Non-linear
- Sequential vs random access
- Static vs Dynamic
- Homogenous vs heterogeneous
- Time and Space Complexity

Abstraction

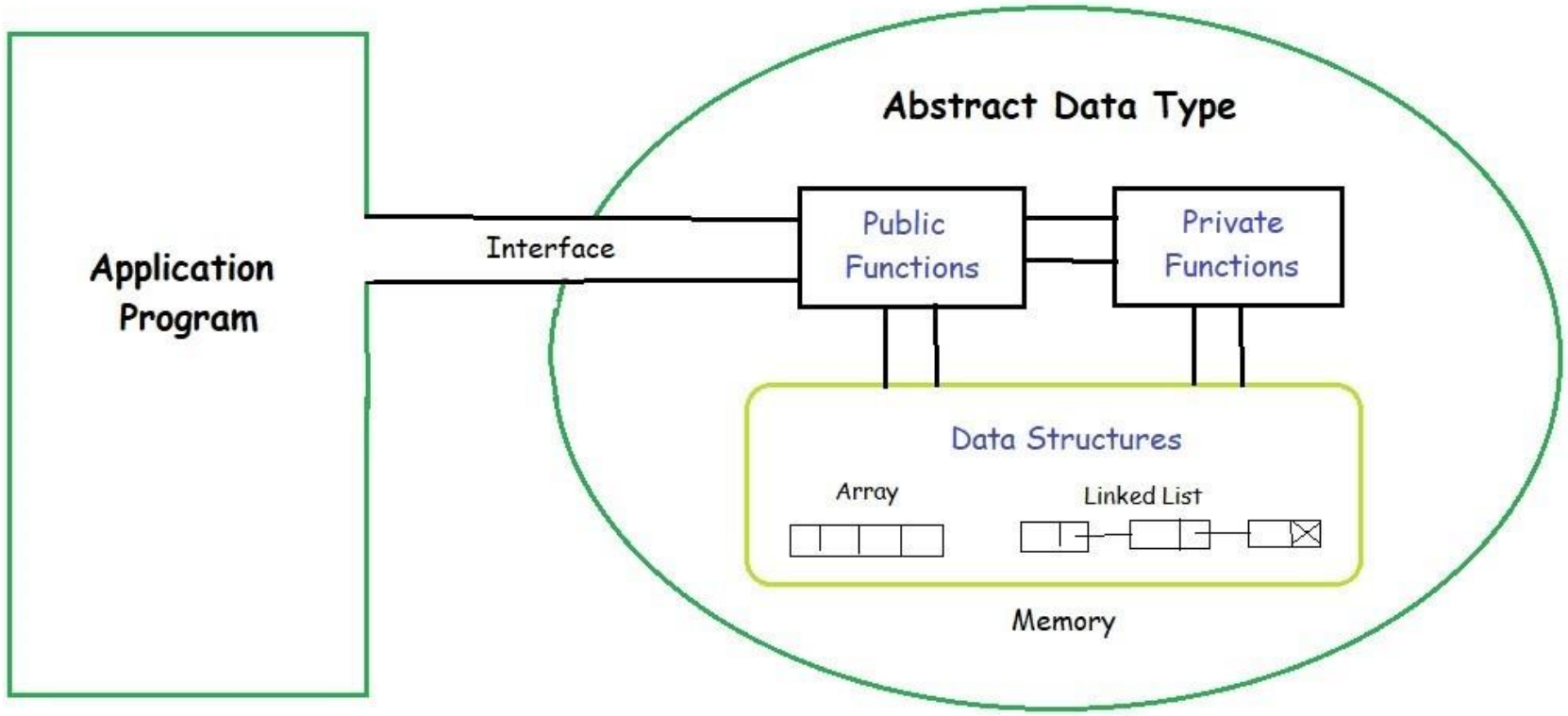
Abstraction



Abstraction

- **Abstraction** is the concept of exposing only the required essential characteristics and behavior with respect to a context.
- Hiding of data is known as **data abstraction**.

Abstract Data Types



https://www.geeksforgeeks.org/abstract-data-types

Three things to consider for a data structure

Correctness: The data structure should correctly implement its interface.

Time complexity: The running times of operations on the data structure should be as small as possible.

Space complexity: The data structure should use as little memory as possible.

Model of Computation

Figure 5.1: A representation of a portion of a computer's memory, with individual bytes labeled with consecutive memory addresses.

Arrays

- Static/Fixed size
- Contiguous memory location
  - Pros and cons of contiguous memory allocation?
  - large chunks of them are loaded into the cache upon first access. This makes it comparatively quick to access future elements of the array.
  - Time complexity: get, search, add, delete
- Direct indexing
  - Why?
- Homogenous
  - Why?

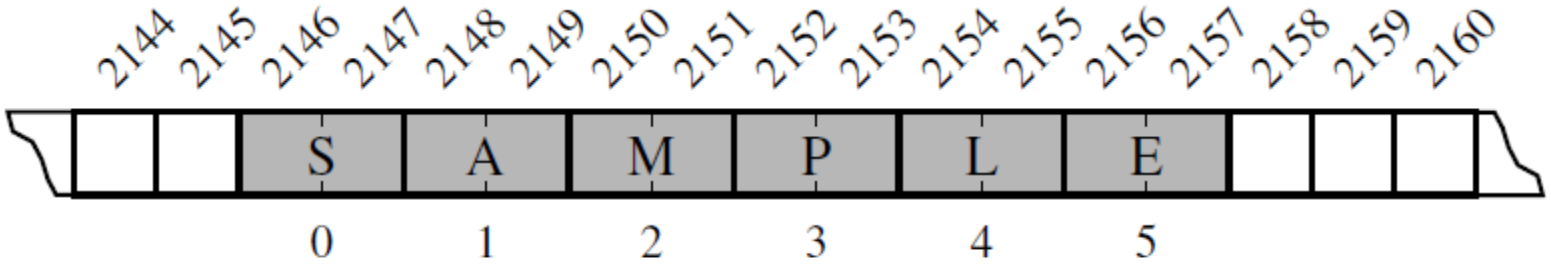


Figure 5.2: A Python string embedded as an array of characters in the computer's

Resources

- Open Data Structures (pseudocode edition), by Pat Morin. Available online at http://opendatastructures.org.
- Data Structures and Algorithms in Python, by Michael T. Goodrich, Roberto Tamassia, and Michael H. Goldwasser. 2013. (1st. ed.). Wiley Publishing.

Thanks