

Abstract Data Types

page 79

CS300 Data Structures

- VOCABULARY
 - data – factual information
 - structure – arrangement or relationship of elements
- The New Merriam-Webster Pocket Dictionary

Abstract Data Type

- An allowed set of values called the **domain**
- A specified set of **operations (API)**
- *Abstract:*
 - Users don't know how the data is stored
 - encapsulation
 - Only access the data through the operations

Primitive (Atomic) C Data Types

- char

- int

Defined by the C
language specification.

- float

- double

sizeof(int)

C has qualifiers that can precede a data type such as:

- short int

- unsigned char

Data Structures

Data structure

- Can be broken up into a set of component elements
- Include a set of relationships (structure) involving the component elements
- *Has operations*
- *Has a domain*

Goal

- Build a useful data structure
- Test the data structure
- Hand that data structure off to a customer
 - future you
 - teammate
 - paying customer
 - your professor

Array Data Structure

`datatype name[SIZE];`

String ADT

Integer is an atomic ADT.

How might we specify a structured data type such as a String?

Before specifying the String ADT, we need to answer certain questions.

String ADT Questions

- What are the domain of possible values
- What operations exist?

Language independent

Language specific

- What type are the component elements?
- What structure does the type have?

String ADT Specification

- **Elements:** Character set: all printable chars
- **Structure:** Characters are arranged linearly
- **Domain:** All combinations of strings of length 0 to the max string length that can be formed from the character set

String ADT Specification

- Operations

String ADT Specification

- Operations Continued

String ADT Specification

- Operations Continued

ADT Implementation

Now that the String ADT has been specified, we can focus on the best implementation choice.

Code defensively! Your Data Structure should never crash the user's program.

Problem

- For each String representation, implement each of the following functions in C:
 - strlen
 - strcpy
 - strcat