Advanced Programming

Classes

Topics

- The need for classes (Motivation)
- Class Definition
- Classes and Objects
- Class Member Functions
- Constructor and Destructor Functions
- Class Access Types
  - Public vis-à-vis Private
- Friend Functions
- Class Member Pointer

Shortcomings in C structs

- A field in a C struct is accessible from outside of the struct using its name (No protection)
- C struct are fixed in their structure (No flexibility)
- C structs are not re-usable
- C structs are a group of variables, not an abstract data type with the permitted operations.

Class

- Class is a collection of data items with the operations on these data items.
- The operations are defined as member functions.
- For data item and member function the level of access is defined.
- Classes may use other classes either by including them as member elements, or by modifying parts of their definitions.

Class Definition

- class *ClassName*

  {

  Data Members;

  Member Functions;

  }

Classes and Objects

- A definition of a class creates a class type.
- To create an instance of the class type, it should be declared as a variable.
- The variables of the type of a class are called ***objects***.

Class Member Functions

- Functions can be members of a class
- The member functions are called by

  objectName.FunctionName(parameters);

- Member functions are used as the interface of the class. They provide access to the other members of the class.

Constructor/Destructor

- Constructor is a member function which is called automatically when an instance of the class is created.
- Constructors may have parameters.
- Destructor is called when an object is deleted.
- Constructor has the same name as the class
- Destructor’s name should ~ClassName

Class Access Types

- Public :

  Some member data items and functions are accessible from outside of the object. These data items/functions are placed at the public part of the class

- Private :

  private part is accessible by other member functions only

Class Access Type (cont.)

- By default the class members are put in the private part.
- Public and private sections can be repeated
- Syntax: ***class*** ClassName

```
{
    Private Section
    public:
    public section
}
```

Example

- Define a class to store a complex number. Write all necessary functions to access and process data items
- Write a class to define the screen of a display. What function it may need?

Default Values of Function Parameters

- A parameter passed to a function may have default value.
- If a parameter has a default value then the function can be called with less arguments
- The default parameters should the rightmost parameters in the function protoype

Friend Functions

- A function which is not a member of a class however, has access to the private section of a class is called a friend function
- Friend functions are defined in the definition of the class

Class Member Pointer

- Pointers can be used to access objects.
- Each class has a pointer by default named ***this***
- ***this*** pointer refers to the current object. Hence a function can access the data items of the objects it is called from.

Example

- Define a class to represent a circle. Consider all data items and member functions
- Add a function to check if two circles intersect or not.
- Define a class for a cylinder. Is there any similarity between this class and Circle class?