Data Structures and Object Oriented Programming using C++

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Pre-requisite

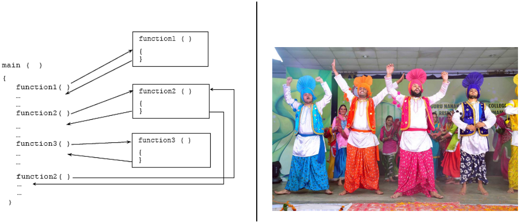
Algorithm and Computing

- Basic familiarity with C/C++ language
- Data types, Variables, Arrays
- Arithmetic/logical operastors
- Loops
- Functions
- Pointers
- Structures

Words to think about

Loops
Functions
Pointers
Structure
Function Overloading
Files

Pointers and Functions



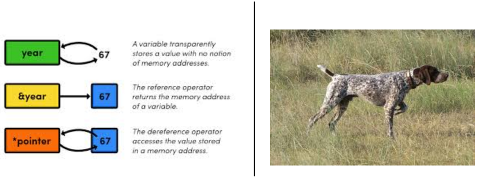
```
main (  )
{
   function1( )
   ...
   ...
   function2( )
   ...
   ...
   function3( )
   ...
   ...
   function2( )
   ...
   ...
 }

function1 ( )
{
}

function2 ( )
{
}

function3 ( )
{
}
```

Figure: Functions



A variable transparently stores a value with no notion of memory addresses.

The reference operator returns the memory address of a variable.

The dereference operator accesses the value stored in a memory address.

Figure: Pointers

Loops and Structures

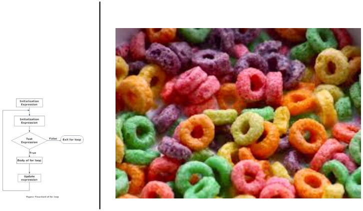
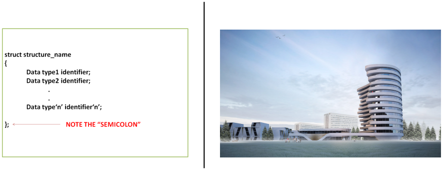

Initialization Expression
Initialization Expression
Test Expression
False
Exit for loop
True
Body of for loop
Update expression
Figure: Flowchart of for loop

Figure: Loops



```
struct structure_name
{
        Data type1 identifier;
        Data type2 identifier;
                .
                .
        Data type'n' identifier'n';
};  <---------------  NOTE THE "SEMICOLON"
```

Figure: Structures

Files

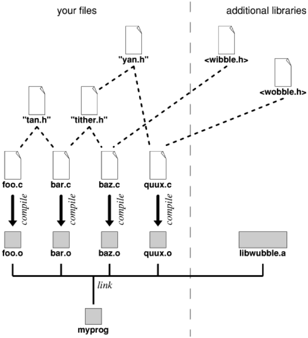
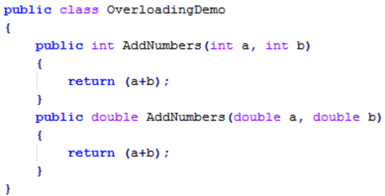


Figure: Filing

Function Overloading



```
public class OverloadingDemo
{
    public int AddNumbers(int a, int b)
    {
        return (a+b);
    }
    public double AddNumbers(double a, double b)
    {
        return (a+b);
    }
}
```

LET'S GET YOU HOME BUDDY
DAMMIT FRANK KEEP IT TOGETHER
constant updates of the best funny pictures on the web LOLSNAPS.com

Figure: Function Overloading

Suggested Reference Material

- Object Oriented Programming in C++, Robert Lafore
- C++ How to Program, Deitel and Deitel
- Electronic resources will be provided

Course Objective

- Concepts of Object oriented programming
- Concepts of Data Structures
- Proficiency in implementing these concepts using C++

Major topics of Course

Object Oriented Programming

- Objects and Classes
- Self-Referential Structures
- Inheritance
- Polymorphism

Data Structures

- Linked Lists
- Stacks and Queues
- Trees
- Sorting Algorithms

General Topics

- Templates
- Exception Handling

Grading (consider tentative)

Class Distribution

- Finals 40%
- Mid terms 25%
- Quizes 15%
- Projects 20%

Languages

Definition

The method of human communication, either spoken or written, consisting of the use of words in a structured and conventional way.

Programming Languages

- Java
- Python
- C and C++
- FORTRAN
- Elisp
- PHP
- Many more

'Objectify' your Friend

A natural way of thinking. Think about representing any of your friend: **Example parameters:**

- Name
- Age
- Height
- Shared Experience
- One word Description
- Emotional state
- Social Profile
- Convincing/reading/writing/speaking skills
- Eye color, hair, cloth $\cdots$
- Sports
- Habits
- Abilities

(Data type: int, string, float??)

Objects

Defining Problems using Objects.

- Characteristics
- Responsibilities

Example

Make a Computer Game of Cricket.

- Teams (Team as Main Class)
- Players (Player as another Class)
- Data defined for each Player tells its characteristics
- Responsibilities and tasks defined as Member functions
- Example Member Functions??

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Basic Idea

- The fundamental idea is to combine into a single unit both data and functions that operate on the data.
- This unit is named as Object.
- The definition of this unit is called a Class.
- An objects functions are called member functions in C++.
- And its data are called members

Procedural vs Object Oriented

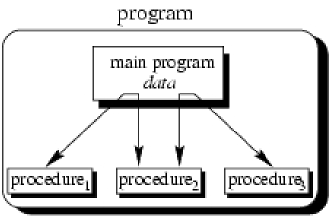

Figure: Procedural Programming

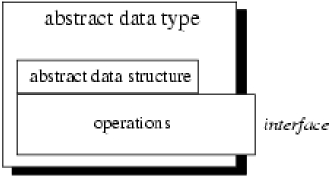

Figure: Abstract Data Types-OOP