IT206 Data Structures Lab with OOP

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DA-IICT

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Operator Overloading

int a
a++;

- Giving Additional meaning to an operator

Michael Goodrich

Operator overloading

Function Overloading

compile time → run time

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- One of the ways in C++ to implement polymorphism

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Operator Overloading

- Giving Additional meaning to an operator
- One of the ways in C++ to implement polymorphism
- Semantics of operator can be extended but syntax cannot be changed.
- Original meaning of operator is preserved.
- Some operators cannot be overloaded.

sizeof(int)

- Class member access operators (., .*).
- Scope resolution operator (::).
- Size operator (**sizeof**).
- Conditional operator (?:).

___ ? ___ : ___

Defining Operator Overloading

add
add(2,3)
add(a1,a2)
a1.add(a2)

```
return type classname :: operator op(arglist)
{
        Function body              // task defined
}
```

- Operator functions - either member functions or Friend functions

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Defining Operator Overloading

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- Operator functions - either member functions or Friend functions
- Friend function- 1 argument for unary operator, two for binary operator.
- Member function - no argument for unary operator and one for binary operator.

Steps for Operator Overloading

1. Create class for data type to be used in operator overloading.

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2. Declare operator function in public section of class.
3. Define the operator function

Unary Operator Overloading

-a;

c = -a;

```
// C++ program to show unary operator overloading
#include <iostream>

using namespace std;

class Distance {
public:

    // Member Object
    int feet, inch;

    // Constructor to initialize the object's value
    Distance(int f, int i)
    {
        feet = f;
        inch = i;
    }
```

```
// Overloading(-) operator to perform decrement
// operation of Distance object
void operator-()
{
    feet--;
    inch--;
    cout << "\nFeet & Inches(Decrement): " << feet
    << "'" << inch;
}
};

// Driver Code
int main()
{
    Distance d1(8, 9);
    -d1;
    return 0;
}
```

Operator function

decrement()

d1.feet

d1.feet = 8

d1.inch = 9

≈ d1.decrement();

-d1

Unary Operator Overloading using Friend Function

```
#include <iostream>
using namespace std;
class UnaryFriend
{
    int a=10;
    int b=20;
    int c=30;
    public:
        void getvalues()
        {
            cout<<"Values of A, B & C\n";
            cout<<a<<"\n"<<b<<"\n"<<c<<"\n"<<endl;
        }
        void show()
        {
            cout<<a<<"\n"<<b<<"\n"<<c<<"\n"<<endl;
        }
        void friend operator-(UnaryFriend &x);
```

```
void operator-(UnaryFriend &x)
{
      x.a = -x.a;
      x.b = -x.b;
      x.c = -x.c;
}
int main()
{
      UnaryFriend x1;
      x1.getvalues();
      cout<<"Before Overloading\n";
      x1.show();
      cout<<"After Overloading \n";
      -x1;
       x1.show();
       return 0;
}
```

10 => -10
20 => -20
30 => -30

-x1

x1.decrement( ) - 30

- 10
- 20

Binary Operator Overloading

```
#include <iostream>
using namespace std;

class Complex {
   private:
    float real;
    float imag;

   public:
    // Constructor to initialize real and imag to 0
    Complex() : real(0), imag(0) {}

    void input() {
        cout << "Enter real and imaginary parts: ";
        cin >> real;
        cin >> imag;
    }
```

complex Friend operator
+ (complex &a,
complex &b);

add

complex &obj

```
    // Overload the + operator
    Complex operator + (const Complex& obj) {
        Complex temp;
        temp.real = real + obj.real;
        temp.imag = imag + obj.imag;
        return temp;
    }

void output() {
    if (imag < 0)
     cout << " Complex number: " << real << imag << "i";
    else
    cout << " Complex number: " << real << "+" << imag << "
    }
};
```

```
int main() {
Complex complex1, complex2, result;

cout << "Enter first complex number:\n";
complex1.input();

cout << "Enter second complex number:\n";
complex2.input();

// complex1 calls the operator function
// complex2 is passed as an argument to the function
result = complex1 + complex2;
result.output();

return 0;
}
```

=> result = add (complex1, complex2)

overloaded

How to do using Friend Function?

Rules For Operator Overloading

- Only existing operators overloaded.

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- Only existing operators overloaded.
- One operand must be of user defined type ← you need a class

Rules For Operator Overloading

Type conversion

Type cast

- Only existing operators overloaded.
- One operand must be of user defined type
- Some operators can not be overloaded and some cannot use friend function (= ,[ ],(), ->)

assignment

a = float(b) + c;

float a;
int b = 5;
float c = 7.3;

a = b + c;

12.3
12.0

a, c ← int
b ← float

Type Conversions

Basic to Class type

Type Conversions

Basic to Class type

```
class time
{
    int hrs;
     int mins;
  public:
     ....
     ....
     time(int t)                    // constructor
     {
          hours = t/60;             // t in minutes
          mins  = t%60;
     }
};
```

Class time
{ int hrs;
mins

using constructor

time(int t)
{
hours = t/60;
mins = t%60
}

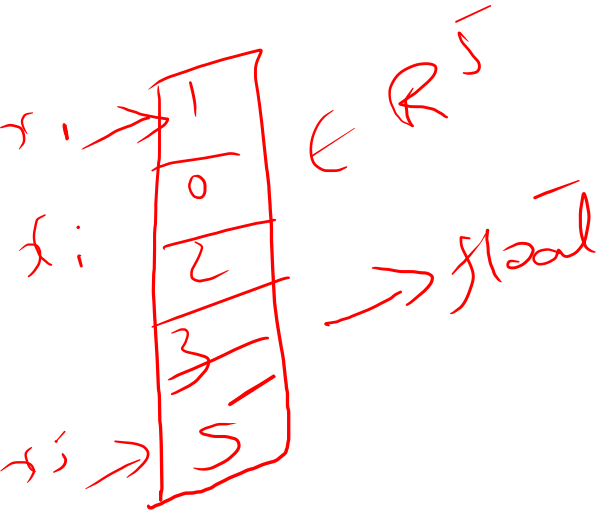
The following conversion statements can be used in a function:

```
time T1;                            // object T1 created
int duration = 85;
T1 = duration;                      // int to class type
```

Class to Basic

```
operator typename()
{
        .....
        ..... (Function statements)
        .....
}
```

Class to Basic



$$\sqrt{\sum_{i=1}^{n} x_i^2}$$

```
operator typename()
{
        .....
        ..... (Function statements)
        .....
}
```

```
vector :: operator double()
{
  double sum = 0;
  for(int i=0; i<size; i++)
        sum = sum + v[i] * v[i];
  return sqrt(sum);
}
```

Class to Basic

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operator typename()
{
        .....
        ..... (Function statements)
        .....
}
```

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vector :: operator double()
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   double sum = 0;
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          sum = sum + v[i] * v[i];
   return sqrt(sum);
}
```

Casting Operator Function must be: class member, no return type, no arguments