Queens College, CUNY, Department of Computer Science

Object Oriented Programming in C++

CSCI 211 / 611

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C++ Classes: Part IV

- This lecture contains a listing of the **automatically generated functions** for a C++ class.
- There are six functions which are automatically generated by the compiler.
- In addition, the `sizeof` operator is built into the C++ language.
- **The material on the "address of" operators is not for examination.**

1 Implicitly generated functions

- When we declare a C++ class, the compiler automatically generates six functions for us.
  1. **Default constructor**
  2. **Destructor**
  3. **Copy constructor**
  4. **Assignment operator**
  5. **"Address of" operator**
  6. **"Address of `const`" operator**
- We have studied the first four and learned how to write our own versions.
- Explicit versions are frequently written by programmers.
- The last two are almost never overloaded.
- They are required for pointers to take the memory address of an object and a `const` object.
  1. The **"address of operator"** "`&`" returns the address of an object.
  2. The **"address of `const` operator"** "`& const`" returns the address of a `const` object.
- The "address of" operators return the **"this"** pointer.
- In addition, the **"`sizeof`"** operator is built into the C++ language, and automatically knows how to compute the memory allocation required for any user-defined class.

2 Class CDCEAC: create, destroy, copy, assign (eq), address, const

- Here is the C++ code for the class CDCEAC = create, destroy, copy, assign (eq), address, const.
- Each function prints a line of output to describe its funtionality.

```
class CDCEAC {
public:

  CDCEAC()
  {
    cout << "create" << endl;
  }

  ~CDCEAC()
  {
    cout << "destroy" << endl;
  }

  CDCEAC(const CDCEAC& orig)
  {
    cout << "copy" << endl;
  }

  CDCEAC& operator= (const CDCEAC& rhs)
  {
    cout << "assign (eq)" << endl;
    return *this;
  }

  CDCEAC* operator& ()
  {
    cout << "address" << endl;
    return this;
  }

  const CDCEAC* operator& () const
  {
    cout << "address const" << endl;
    return this;
  }
};
```

3 Main program

- Here is the C++ code for a main program to use the class `CDCEAC`.
- A line of output is printed when each function is invoked.
- The destructor is invoked twice (two objects go out of scope).
- The `sizeof` operator is also called in the main program.

```
int main()
{
  CDCEAC a;                              // create
  const CDCEAC b(a);                     // copy   (also const object)
  a = b;                                 // assign
  CDCEAC *pa = &a;                       // address
  const CDCEAC *pb = &b;                 // address const

  cout << "sizeof = " << sizeof(CDCEAC) << endl;

  return 0;
}
```