CH-230-A

Programming in C and C++

C/C++

Tutorial 13

Dr. Kinga Lipskoch

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Moving Within a Stream

- The next byte you will put/get to/from a stream has a position
- `tell` functions return the current absolute position in a stream
- `seek` functions move the specified positions
- Positions can be either absolute or relative:
  - `ios::beg` relative to beginning (absolute)
  - `ios::cur` relative to current position
  - `ios::end` relative to end of file
- `p` (put) suffix for ostreams
- `g` (get) suffix for istreams

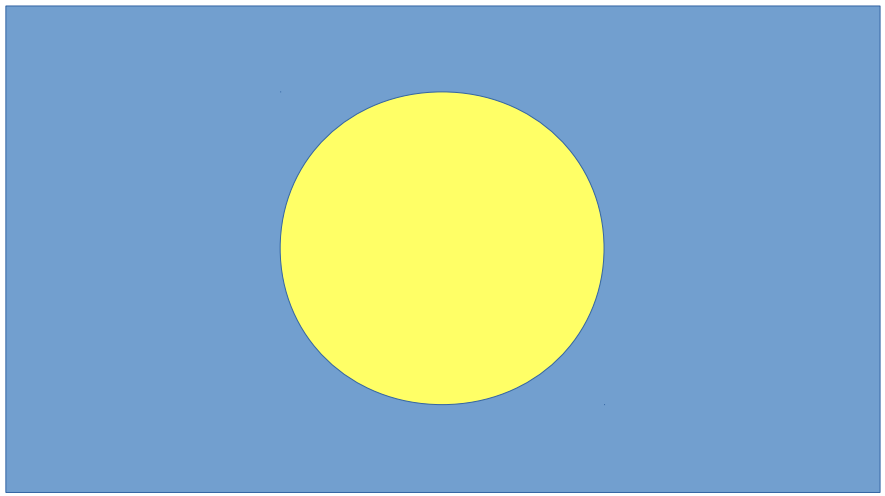
How to Move in a Stream?

- `ios::pos_type tellp()` returns current position
- `ios::pos_type tellg()` returns current position
- `seekp(pos_type)` moves to given absolute position
- `seekg(pos_type)` moves to given absolute position
- `seekp(pos_type, off_type)` moves to relative position, as given by `off_type`
- `seekg(pos_type, off_type)` moves to relative position, as given by `off_type`
- `pos_type` can be converted to `int` or `long`
- `off_type` is either `ios::beg`, `ios::cur` or `ios::end`

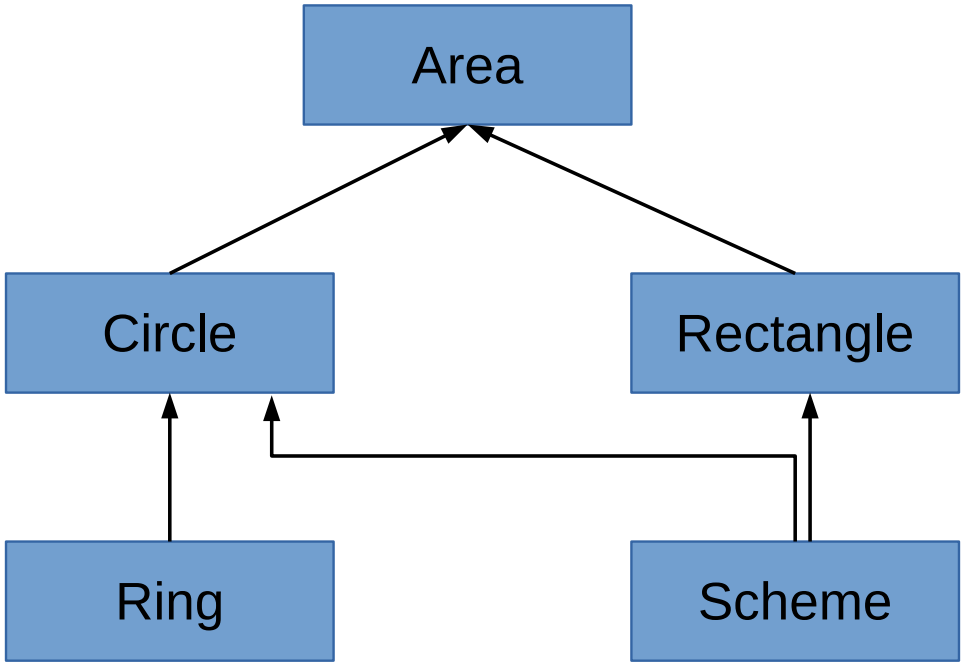
Some Examples

- `seek.cpp`
- The same stream can be used multiple times for reading from different files
- Just close it and reopen it to bind to a different file

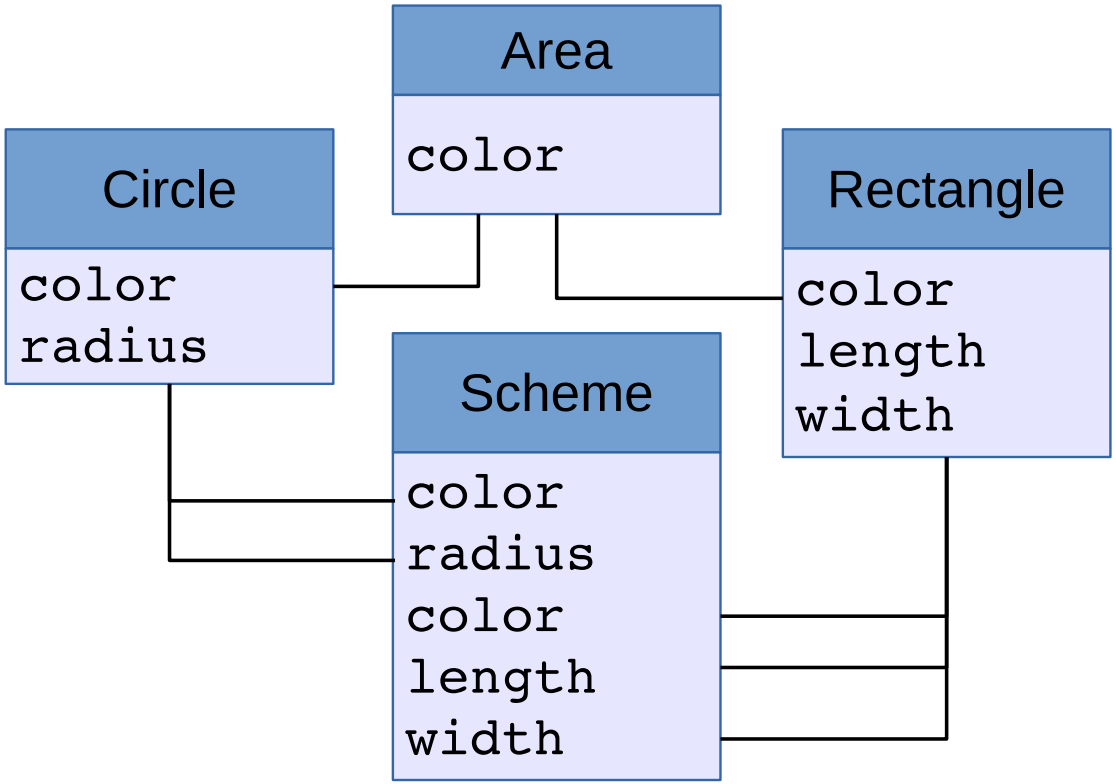
Multiple Inheritance: A Scheme



Class Hierarchy



Class Hierarchy (non-virtual Base Class)



Non-virtual Base Classes

- With polymorphism it is possible that a class can act as indirect base class multiple times
- Here `Scheme` will include members of the indirect base class `Area` multiple times
- One possibility to solve this problem is to use `static_cast<Circle *>` to create unambiguousness

Virtual Base Class

- Create unambiguousness by declaring a base class as `virtual` (i.e., inherit with `: public virtual`)
- Then only one subobject will be created
- In our example we need to explicitly call the `Area` constructor (with parameters) since no default constructor exists
- `nonvirtualinheritance.cpp`
- `virtualinheritance.cpp`
- `nonvirtualinheritance2.cpp`
- `virtualinheritance2.cpp`

Exceptions

Errors happen because of:

- Hardware
- Changed environments
- Wrong usage or operation
- Bugs

Conventional Error Handling

- Already available in C
  - Check whether pointer is `NULL`
  - Check `errno`
- `conventional_error_handling.cpp`

New Keywords (1)

```
1  try
2  {
3    // code, where exception
4    // might occur
5  }
6  catch (char* text)
7  {
8    // statements to be executed if
9    // char* exception  occurs
10 }
```

New Keywords (2)

- Statement that explicitly triggers a `char *` exception
  - `throw "No memory available";`
- Statement that explicitly triggers an `int` exception
  - `throw 12345;`

`try` and `catch` (1)

- No exception in `try`-block
  - No exception handler is called
  - Program continues after `catch`-block
- `throw` within `try` creates exception
  - No further code in `try`-block is executed
  - Destructor for locally defined objects is called, before code in exception handler is run

`try` and `catch` (2)

- Exception in `try`-block
  - First matching `catch`-block is executed
  - All other handlers are ignored
  - At most one handler is being called
- Exception in `try`-block, but no matching handler
  - Default action for uncaught exceptions
  - Usually it ends the program

Exception Handling

- Blocks of code are specially marked
- If error occurs than control goes to special error routines
- `exception_handler.cpp`

`exception` Class

- Class defines error class that receives objects via throw on exception
- Provides methods to give information about the error
- `class_exception.h`
- `class_test.h`
- `class_test.cpp`
- `test_exception.cpp`
- `test_exception2.cpp`

All-round Handler

`terminate.cpp`