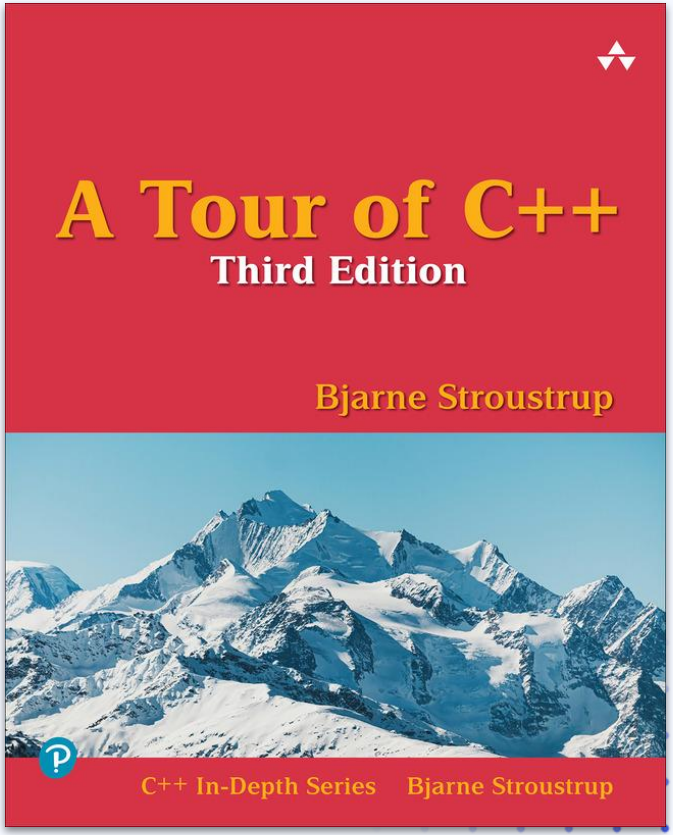
Streams

CSE 232 - Dr. Josh Nahum

Reading:

Section 11.5 and Section 11.7
through Section 11.7.3



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Stream Operators

Types

```
#include <iostream>
using std::ostream, std::istream;
ostream & operator<<(ostream & os, T const &);
istream & operator>>(istream & is, T &);
```

Important notes:

- These operators are written to work on (o/i)streams, so that they can work on the standard streams, file streams, string streams, and others.
- They take a non-const reference because streams can't be copied and the stream needs to be modifiable.
- They return a reference so they can be chained.
- The class, named `T` in this example, is a reference because the operator doesn't need a copy.

01

<fstream>

The Two Sides

ofstream

ofstream supports all the same operations as other ostreams (like cout).

```
ofstream ofs{"output.txt"};
ofs << setw(4);
ofs << "Age: " << 30 << endl;
```

ifstream

ifstream supports all the same operations as other istreams (like cin).

```
ifstream ifs{"input.txt"};
int x;
ifs >> x;
ifs >> noskipws;
while (ifs >> x) // ...
```

RAII!

fstreams follow RAII. They open the file when they are constructed, and they close the file in their destructor. You don't need to explicitly close the file, just let the fstream be destroyed naturally.

Rule of three

fstreams follow Rule of 3! Because an fstream has a user-defined destructor, it also has a user-defined copy constructor and copy assignment operator.

2 Ways To IO With Files

fstreams

Use fstreams to read from and write to files explicitly in the C++ code.

IO Redirection

Use the unix redirections commands to send standard output to a file or read file contents as standard input.

02

<sstream>

String Stream

Like a string

It holds characters like a string (`.str()` gives access to that string).

ostringstream

supports all the operations that ostreams support.

istringstream

supports all the operations that istreams support.

Usage

String streams are used when you want to to stream operations on a string.

ostringstream

```
ostringstream oss;
oss << fixed << setprecision(4) << boolalpha;
oss << 3.14159 << " is great == " << true << endl;
string sentence{oss.str()};
// sentence is "3.1416 is great == true\n"
```

Commonly used to create formatted strings and to convert objects to strings.

istringstream

```
string word;
char ch;
istringstream iss{“hello world”};
iss >> word; // space sep, “hello”
iss.get(ch); // the space
iss.get(ch); // ‘w’
```

Commonly used to extract objects from data in a string.

ToString

Python

Classes in python commonly have a `__str__()` method that returns the object represented as a string.

C++

Classes in C++ commonly have a `operator<<` function to write a object to an ostream. If you want the object as a string, use an ostringstream!

Attribution

Please ask questions via Piazza

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