stringstream

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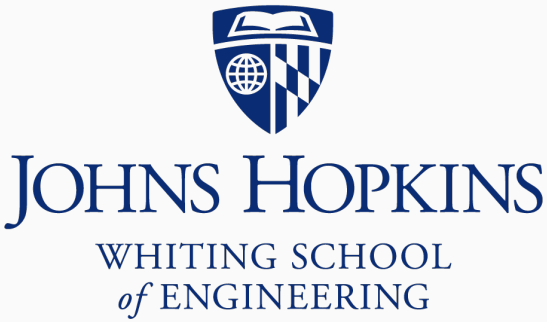

Source markdown available at github.com/BenLangmead/c-cpp-notes

stringstream

`std::stringstream` and its specialized cousins `std::istringstream` and `std::ostringstream` help you get data into and out of strings

First, let's see an example of overloading the extraction (>>) operator

stringstream

```
std::istream& operator>>(std::istream& is, Complex& c) {
    // Assume format "3.0 + 4.0 i"
    string tmp;
    is >> c.real;       // parse real coefficient
    is >> tmp;          // skip the +
    is >> c.imaginary;  // parse imaginary coefficient
    is >> tmp;          // parse the i
    assert(tmp == "i"); // sanity check
    return is;
}
```

Similar to operator<< but with `istream` instead of `ostream` and >> instead of <<

Second argument must be non-const reference so we can modify

stringstream

`std::stringstream` is a stream, like `std::cout` or `std::cin`

Instead of reading or writing to console, it reads and writes to a temporary string ("buffer") stored inside

The string buffer can be accessed with `.str()`

```
#include <string>
#include <iostream>
#include <sstream>  // for std::stringstream

using std::cout;    using std::endl;
using std::string;  using std::stringstream;

int main() {
    stringstream ss;                // buffer is empty
    ss << "Hello, world!" << endl; // write message to buffer
    cout << ss.str();               // retrieve buffer with .str()
    return 0;
}
```

stringstream

```
$ g++ -c ss1.cpp -std=c++11 -pedantic -Wall -Wextra
$ g++ -o ss1 ss1.o
$ ./ss1
Hello, world!
```

Why not use `std::string` and `+` operator instead?

`+` operator overload for `std::string` only handles `std::string` or `char` arguments; often we want other types too

`stringstream` works with `operator<<` and `operator>>`; an operator overload for either will work with `stringstream` just as well as with `cin`/`cout`

stringstream

```
#include <string>
#include <iostream>
#include <sstream>

using std::cout;    using std::endl;
using std::string;  using std::stringstream;

int main() {
    stringstream ss;
    ss << "Hello" << ' ' << 35 << " world"; // mix string, char, int

    string word1, word2;
    int num;
    ss >> word1 >> num >> word2;            // read them back out
    cout << word1 << ", " << word2 << '!';
    return 0;
}
```

stringstream

```
$ g++ -c ss2.cpp -std=c++11 -pedantic -Wall -Wextra
$ g++ -o ss2 ss2.o
$ ./ss2
Hello, world!
```

stringstream

```
#include <string>
#include <iostream>
#include <sstream>
#include <vector>

using std::ostream; using std::istream;
using std::cout;    using std::endl;
using std::vector;  using std::stringstream;

ostream& operator<<(ostream& os, const vector<int>& vec) {
    for(int i : vec) { os << i << ' '; }
    return os;
}

istream& operator>>(istream& is, vector<int>& vec) {
    int i;
    while(is >> i) {
        vec.push_back(i);
    }
    return is;
}
```

stringstream

```
int main() {
    stringstream ss("1 2 3 4 5");
    vector<int> vec;
    ss >> vec;
    cout << vec << endl;
    return 0;
}
```

```
$ g++ -c ss2.cpp -std=c++11 -pedantic -Wall -Wextra
$ g++ -o ss2 ss2.o
$ ./ss2
1 2 3 4 5
```

stringstream

Whoa! What was that `for(int i : vec)` business?

```
for(int i : vec) { os << i << ' '; }
```

That's a "ranged `for`", a convenience added in C++11 that we will discuss more later

stringstream

`stringstream` is an example of *multiple inheritance*

Inherits from:

- `istringstream`, which handles input and overloads extraction operator
- `ostringstream`, which handles output and overloads insertion operator

If you only need one or the other, you can use `istringstream` or `ostringstream`

stringstream

`stringstream` can be especially useful for testing, especially if you have designed your code to handle input and output as streams

Example like today's exercise:

```
// Only using for input
istringstream ss("Eight of Hearts "
                 "Ten of Hearts "
                 "Jack of Hearts "
                 "Nine of Hearts "
                 "Queen of Hearts");
assert(straight_flush(ss));
```