



ADVANCED PROGRAMMING

SIR FAHAD AHMED SATTI

ASSIGNMENT 2

SMART STRINGS

DOCUMENTATION



INTRODUCTION

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.CPP

Files

- Copied_Pointers
- Owned_Pointers
- COW_with_Reference_Counting
- COW_with_Reference_Linking

HOW TO RUN

Separate .CPP file for each implementation.

Classes String{} and String_Buffer{} and the main() function are in the same file for each implementation.

In every file, main() function demonstrates the implementation.

Run each file separately with a C++ compiler OR include 1 file at a time in Visual Studio project and run the project.

APPROACH

Copied Pointers

When the copy constructor is called, it deep copies the contents of the passed object to the new one. The two different strings have the same contents, stored in separate memory locations.

Owned Pointers

The `String{}` class has a `StringBuffer*` member that points to the object in which a `char*` points to the actual string. The `String{}` class has a 'bool' variable that tracks ownership. Copied strings contain pointers to the same `StringBuffer`. When a `String` copies another `String`'s contents, the former one gains ownership of the `StringBuffer` and it becomes its responsibility to release the memory when it goes out of scope.

Copy-on-Write with Reference Counting

The `StringBuffer{}` class has an 'int' variable that keeps track of the reference count. Functions are provided to increment or decrement the reference count. When a `String` gains or loses the pointer to a `StringBuffer` object, it modifies the count. When reference count becomes 0, the object is deleted.

Copy-on-Write is implemented by creating a new `StringBuffer` if the reference count is greater than 1, and removing 1 from the previous one's reference count.

Copy-on-Write with Reference Linking

A circular doubly linked list of Strings is maintained instead of a reference count. The String{} class has 'next' and 'previous' pointers. When a String is copied, it is added to the circular doubly linked list. When a string loses the StringBuffer object, it is removed from the list. If only one node is left, the StringBuffer is deleted.