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DAP299

CS214

Asst 1: Making a Better Malloc

This assignment was to create our own malloc and free calls in C using a static character array to simulate the dynamic memory. Myblock size for this project was 5000 but it can easily be changed as well. The beginning of the array, I had a short * that kept track of the available free space in the memory. Every time mymalloc was called it would return a pointer to point to an address in the array myblock simulating memory. One index prior to the returned index of the array pointer is that respective memory's metadata. The metadata will consist of one single character, ~, or |. ~ will represent that the memory to the right is used until the next ~, | or the end of memory is found. | will represent that the memory to the right is free until the next ~ or the end of memory is found. I did not initialize an int, double, short etc with the values 174 or 176 in my code as they are decimal representations of ~ and | and may cause an issue.

The program will use the first fit method when trying to find memory. It will look for an | and when it is found it will move to the next ~ or to the end of memory until it finds the required chunk of memory that will be the size that mymalloc was calling for. Once the memory is found, it will switch | with ~ and the memory is now labeled taken. If the memory called for is smaller than the free chunk then the memory will be split with the required memory and the rest of the free memory.

Now, when free() is called on a pointer, I made sure that it is a pointer that was created by my pointer, and that the metadata correlated to the memory was taken. If it already free, then it won't free it again. Now, after all the checks are done, the memory is freed. It replaces the ~ with | to symbolize the free memory.

The example runs for all of my error checks and test cases from A to F are shown below with the average run time and the total time for all of the test cases.

```
ilab1.cs.rutgers.edu
mymalloc.c -- ~/Downloads/214/Assign... mymalloc.c (/ilab/users/dap299/Downl... asst1 - Dolphin
Assignment1 - Google Drive - Google C... asst1 : bash - Konsole

File Edit View Bookmarks Settings Help
[dap299@ilab1 asst1]$ make
gcc -g -Wall -c mymalloc.c
gcc -g -Wall -o memgrind memgrind.c mymalloc.o
[dap299@ilab1 asst1]$ ./memgrind

error check one
Error: Memory was not allocated pointer in memgrind.c on line: 37, so not freed
error check one time: 0.0000120000000000

error check two
Error: Memory was not allocated pointer in memgrind.c on line: 49, so not freed
error check two time: 0.0000020000000000

error check three
Can't allocate 5000 bytes in FILE: 'memgrind.c' on LINE: '60'
Can't allocate 4999 bytes in FILE: 'memgrind.c' on LINE: '62'
error check three time: 0.0000040000000000

All test cases are done
Average time for A: 0.0000027900 sec
Average time for B : 0.0016025000 sec
Average time for E : 0.0004704700 sec
Average time for D : 0.0005355000 sec
Average time for E : 0.0023030800 sec
Average time for F : 0.0049263200 sec

The total time for all the test cases was: 0.9930660000 sec

[dap299@ilab1 asst1]$
```