CSC 209 Review 6 Solution

August 23, 2020

1. I need to create a wrapper function `my_malloc` that does the following:

   - ask `my_malloc` it to allocate `n` bytes
   - call `malloc`
   - test `malloc` doesn't have a null pointer
   - return pointer from `malloc`

   The solution to this problem is:

```c
void *my_malloc(int n) {
    void *p;

    p = malloc(n);

    if (!p) {
        printf("ERROR: Malloc allocation failed");
    }

    return p;
}
```

   Notes

   - Learned that void function can return value
   - **Dynamic Storage Allocation**
     - Allows to allocate storage during program execution
     - Allows to create data structures and shink and grow array as needed
     - e.g. `malloc`, `calloc`, `realloc`
   - **Memory Allocation Functions**
     - `malloc` - Allocates a block of memory but doesn't initialize it
       - doesn't initialize the allocated memory

    - more efficient than `calloc`
    - accessing the content → segmentation fault (accessing value at invalid mem. location) or garbage values
  - `calloc` - Allocates a block of memory and clears it
    - allocates memory and initializes the memory block to zero
    - accessing the content of blocks would return 0
  - `realloc` - Resizes a previously allocated block of memory
- **Null Pointer**
  - is returned when it fails to allocate a block of memory large enough to satisfy the request

Example

```
p = malloc(10000);
if (p == NULL) {
  /* allocation failed; take appropriate action */
}
```

2. I need to write a function named `duplicate` that uses dynamic storage allocation to create a copy of a string.

   The requirements of the function are

   - `duplicate` allocates space for a string of the same length as `str`
   - `duplicate` copies the contents of str into the new string
   - `duplicate` returns a pointer to it
   - `duplicate` returns a null pointer if the memory allocation fails

   The solution to this problem is included in file `question_2.c`

   Note

   - `const` tag in parameter prevetns the function from modifying what it's pointer variable is pointing to.
     - value is modifiable
     - changes the parameter to pass by value