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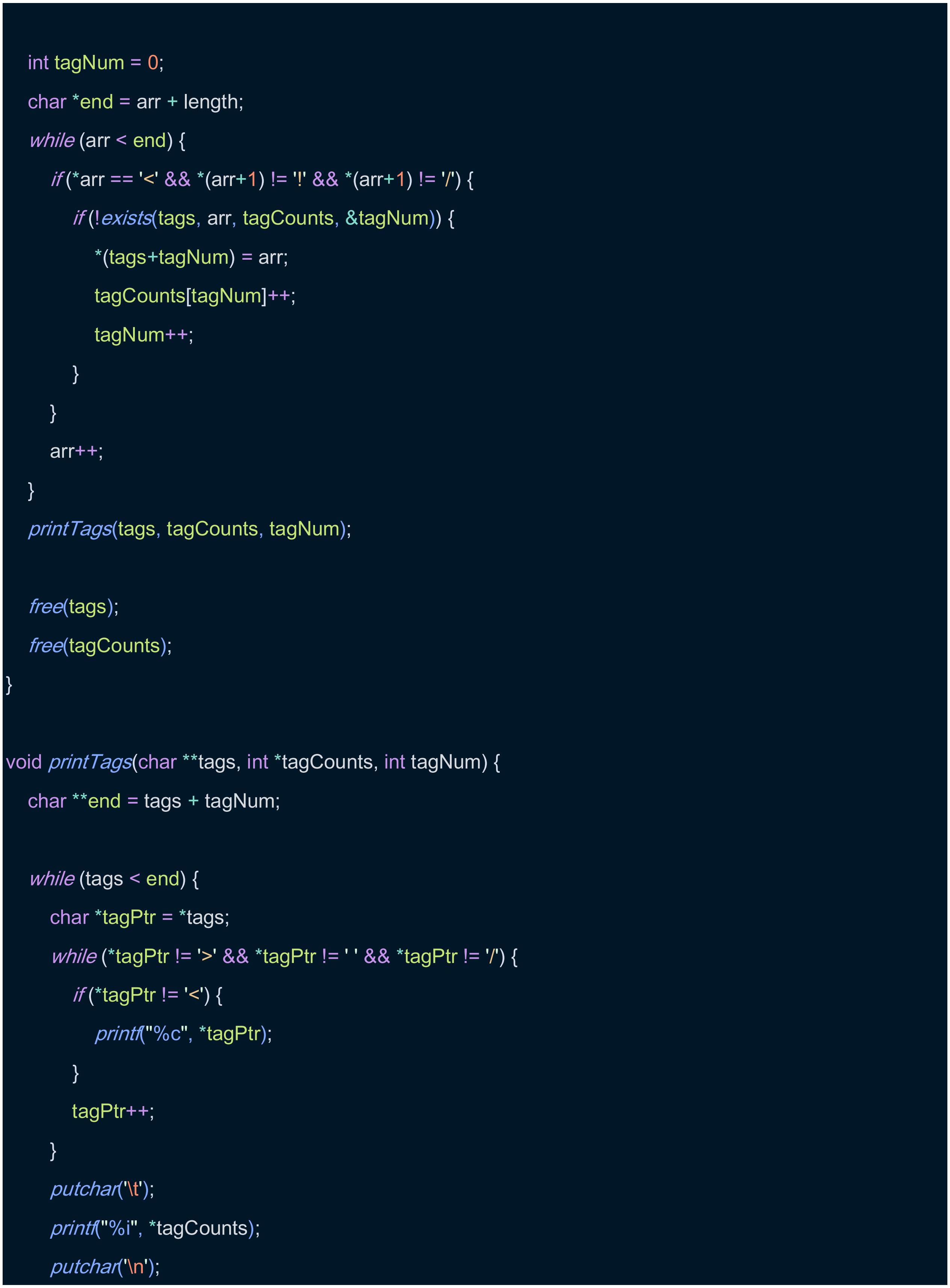
CS-2263

Assignment #3

Source Code:

main.c

```
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include "tags.h"

# define N 100000
# define T 100

void readInput(char *fileName, char *inputArray, int *length);
void countTags(char *arr, int length);
void printTags(char **tags, int *tagCounts, int tagNum);

int main(int argc, char **argv) {
    if (argc < 2) {
        printf("Usage: %s <html_file>\n", argv[0]);
    }
    char *inputArr = malloc(N);
    int inputArrLength = 0;
    readInput(argv[1], inputArr, &inputArrLength);

    countTags(inputArr, inputArrLength);
    putchar('\n');

    free(inputArr);
}

void countTags(char *arr, int length) {
    char **tags = malloc(T * sizeof(char*));
    int *tagCounts = malloc(T * sizeof(int));
    memset(tagCounts, 0, T * sizeof(int));
```



```
    int tagNum = 0;
    char *end = arr + length;
    while (arr < end) {
        if (*arr == '<' && *(arr+1) != '!' && *(arr+1) != '/') {
            if (!exists(tags, arr, tagCounts, &tagNum)) {
                *(tags+tagNum) = arr;
                tagCounts[tagNum]++;
                tagNum++;
            }
        }
        arr++;
    }
    printTags(tags, tagCounts, tagNum);

    free(tags);
    free(tagCounts);
}

void printTags(char **tags, int *tagCounts, int tagNum) {
    char **end = tags + tagNum;

    while (tags < end) {
        char *tagPtr = *tags;
        while (*tagPtr != '>' && *tagPtr != ' ' && *tagPtr != '/') {
            if (*tagPtr != '<') {
                printf("%c", *tagPtr);
            }
            tagPtr++;
        }
        putchar('\t');
        printf("%i", *tagCounts);
        putchar('\n');
        tags++;
        tagCounts++;
    }
}

void readInput(char *fileName, char *inputArr, int *length) {
    FILE *fp = fopen(fileName, "r");
    if (fp != NULL) {
        char ch;
        while ((ch = fgetc(fp)) != EOF && *length < N - 1) {
            *(inputArr + *length) = ch;
            (*length)++;
        }
    }
    fclose(fp);
}
```

tags.h

```
#ifndef TAGS_H
#define TAGS_H

int exists(char **tags, char *arr, int *tagCounts, int *tagNum);

#endif
```

tags.c

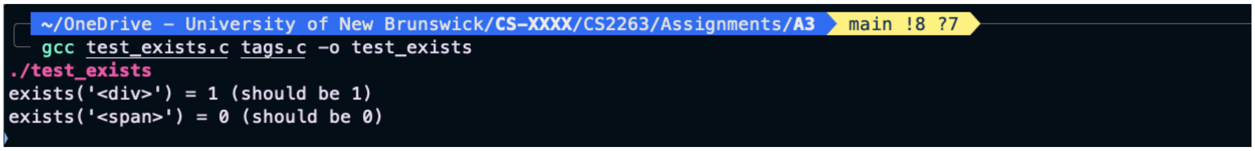
```
#include "tags.h"

int exists(char **tags, char *arr, int *tagCounts, int *tagNum) {
    char **end = tags + (*tagNum);

    while (tags < end) {
        char *tagPtr = *tags;
        char *arrPtr = arr;
        while (*tagPtr && *arrPtr &&
               *tagPtr != '>' && *tagPtr != ' ' && *tagPtr != '/' &&
               *arrPtr != '>' && *arrPtr != ' ' && *arrPtr != '/' &&
               *tagPtr == *arrPtr) {
            tagPtr++;
            arrPtr++;
        }
        if ((*tagPtr == '>' || *tagPtr == ' ' || *tagPtr == '/' ) &&
            (*arrPtr == '>' || *arrPtr == ' ' || *arrPtr == '/' ))
        {
            (*tagCounts)++;
            return 1;
        }

        tags++;
        tagCounts++;
    }
    return 0;
}
```

Separately testing “exists” function:

```
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include "tags.h"

#define T 100
```

```c
int main() {
   char **tags = malloc(T * sizeof(char *));
   int *tagCounts = calloc(T, sizeof(int));
   int tagNum = 0;

   // Create a fake tag in memory
   tags[0] = "<div>";
   tagCounts[0] = 1;
   tagNum++;

   // Test tag that already exists
   char *testTag1 = "<div>";
   int result1 = exists(tags, testTag1, tagCounts, &tagNum);
   printf("exists('<div>') = %d (should be 1)\n", result1);

   // Test tag that doesn't exist
   char *testTag2 = "<span>";
   int result2 = exists(tags, testTag2, tagCounts, &tagNum);
   printf("exists('<span>') = %d (should be 0)\n", result2);

   free(tags);
   free(tagCounts);
   return 0;
}
```

Test output:

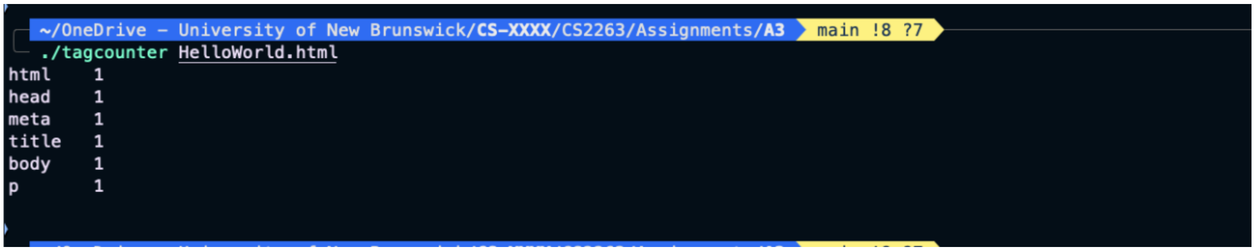


```
 ~/OneDrive - University of New Brunswick/CS-XXXX/CS2263/Assignments/A3  main !8 ?7
 gcc test_exists.c tags.c -o test_exists
./test_exists
exists('<div>') = 1 (should be 1)
exists('<span>') = 0 (should be 0)
```

Design of the program:

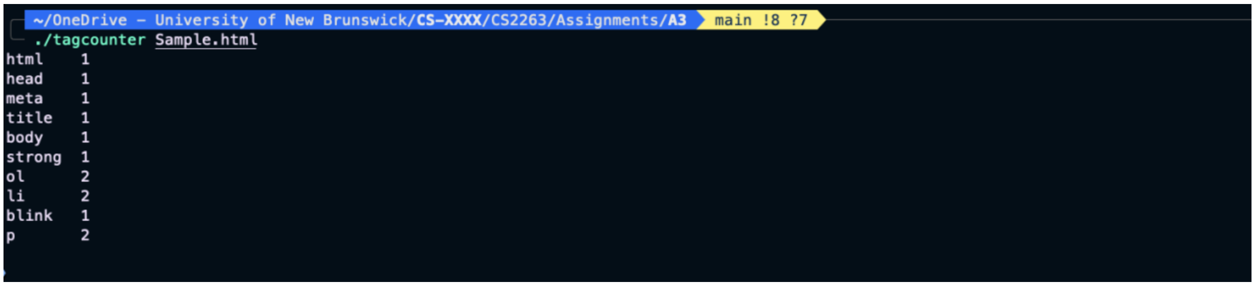
The program reads an HTML file into a dynamically allocated character array using readInput(). It then parses the input using countTags(), which identifies opening tags and stores pointers to each unique tag in a heap allocated array of strings (tags). Alongside an integer array (tagCounts) tracks how many times each tag appears. The function exists() checks whether a tag has already been seen and updates its count if so. Finally, printTags() prints each tag and its count by iterating through the arrays.

Output of HelloWorld.html:



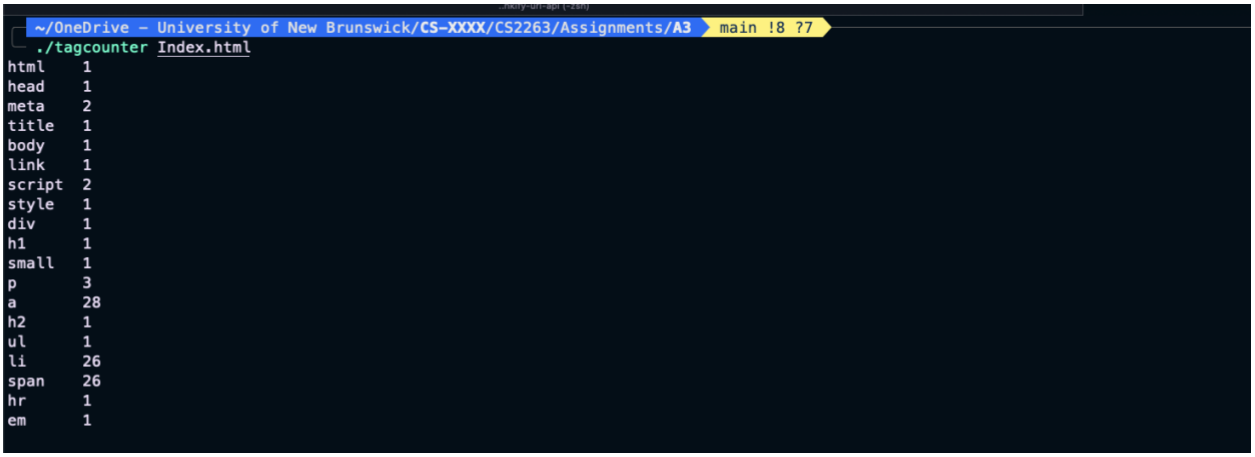
```
~/OneDrive - University of New Brunswick/CS-XXXX/CS2263/Assignments/A3  main !8 ?7
./tagcounter HelloWorld.html
html    1
head    1
meta    1
title   1
body    1
p       1
```

Output of Sample.html:



```
~/OneDrive - University of New Brunswick/CS-XXXX/CS2263/Assignments/A3  main !8 ?7
./tagcounter Sample.html
html    1
head    1
meta    1
title   1
body    1
strong  1
ol      2
li      2
blink   1
p       2
```

Output of Index.html:



```
~/OneDrive - University of New Brunswick/CS-XXXX/CS2263/Assignments/A3  main !8 ?7
./tagcounter Index.html
html    1
head    1
meta    2
title   1
body    1
link    1
script  2
style   1
div     1
h1      1
small   1
p       3
a       28
h2      1
ul      1
li      26
span    26
hr      1
em      1
```