ECE 175: Computer Programming for Engineering Applications

Homework Assignment 8

Due Date: Tuesday October 31, 2017 by 11:59 PM, via D2L Dropbox and Zylab

Conventions: Name your C programs as *hw**x**p**y**.c* where *x* corresponds to the homework number and *y* corresponds to the problem number such as hw8p1.c for problem 1 of homework 8.

Write comments to your programs. Three points deduction for each *program with no comment.*
For each program that you turn in, at least the following information should be included at the top of the C file:

- Author:
- Date created:
- Brief description of the program:
  - input(s):
  - output(s):
  - brief description or relationship between inputs and outputs

Submission Instructions: Submit your .c files (hw8p1.c, …) in D2L Dropbox and Zylabs

Problem 1 (35 points): **grep**

We wish to create a utility that will search a text file for a specified string. Unix has a command line utility that does this called *grep*, which is a funny acronym that stands for *globally search a regular expression and print*.

Write a C program that will search a text file for a specified string.

Your program should

a) Prompt the user for the name of the file to be searched.

b) Prompt the user for the string to be found in the file.

c) Print the name of the file searched.

d) If the string is found then print the entire line of text where the string was found and the line number.

e) Print the number of times the string was found.

Assumptions for this assignment

- Assume that all strings have a maximum length of 200 characters.
- Assume that each line of the file being searched is no more than 200 characters long.
- Assume case sensitivity.
  For example, if the file being searched contains OK and the string to find is ok then a match is not found; i.e. you do not need to worry about changing uppercase characters to lowercase or vice versa.

Here is some help to get you started.

A reminder that fopen can take a variable argument:

```
printf(" Enter a file name: \n");
gets(fname);
fp = fopen(fname, "r");
```

A function that you might find useful is:

```
void my_strcpy(char In[], char Out[], int L){
        int i;
        for(i = 0; i < L; i++)
                Out[i] = In[i];

        Out[L] = '\0';
        return;
}
```

The function above copies one string to another, however, it can be used to copy a portion of a string. For example, if you were working with a *find_string* of length 7, and a string *str* that contains **012345 Here is an example string** and you want to compare only the 5th through the 11th elements to the *find_string*, then you would call

my_strcpy(&str[4], outstr, 7);

Then *outstr* contains
45 Here
and is of length 7. Now *outstr* is ready to be compared to the *find_string*. Now you can make use of *strcmp* which will compare two strings of the same length.

Sample Text

As an example of some text to search; assume that we are searching the file *Gettysburg.txt* (give on D2L) which contains the text of the Gettysburg Address.

Four score and seven years ago our fathers brought forth on this continent a new nation, conceived in liberty, and dedicated to the proposition that all men are created equal.

Now we are engaged in a great civil war, testing whether that nation, or any nation so conceived and so dedicated, can long endure. We are met on a great battlefield of that war. We have come to dedicate a portion of that field, as a final resting place for those who here gave their lives that that nation might live. It is altogether fitting and proper that we should do this.

But, in a larger sense, we can not dedicate, we can not consecrate, we can not hallow this ground. The brave men, living and dead, who struggled here, have consecrated it, far above our poor power to add or detract. The world will little note, nor long remember what we say here, but it can never forget what they did

here. It is for us the living, rather, to be dedicated here to the
unfinished work which they who fought here have thus far so nobly
advanced. It is rather for us to be here dedicated to the great
task remaining before us-that from these honored dead we take
increased devotion to that cause for which they gave the last full
measure of devotion-that we here highly resolve that these dead
shall not have died in vain-that this nation, under God, shall have
a new birth of freedom-and that government of the people, by the
people, for the people, shall not perish from the earth.

Make sure you understand the sample code execution thoroughly before writing the code.

Sample Execution 1: **red entered by a user**

Enter a file name:
Gettysburg.txt
Enter in the search string:
Four

Found Four on line 1: Four score and seven years ago our fathers brought forth on this

The string: "Four" was found a total of 1 times in the file: Gettysburg.txt

Sample Execution 2: **red entered by a user**

Enter a file name:
Gettysburg.txt
Enter in the search string:
four
The string: "four" was found a total of 0 times in the file: Gettysburg.txt

Sample Execution 3: **red entered by a user**

Enter a file name:
Gettysburg.txt
Enter in the search string:
we

Found we on line 5: Now we are engaged in a great civil war, testing whether that
Found we on line 10: live. It is altogether fitting and proper that we should do this.
Found we on line 12: But, in a larger sense, we can not dedicate, we can not
Found we on line 13: consecrate, we can not hallow this ground. The brave men, living
Found we on line 15: poor power to add or detract. The world will little note, nor long
Found we on line 16: remember what we say here, but it can never forget what they did
Found we on line 20: task remaining before us-that from these honored dead we take
Found we on line 22: measure of devotion-that we here highly resolve that these dead

The string: "we" was found a total of 9 times in the file: Gettysburg.txt

Sample Execution 4: **red entered by a user**

Enter a file name:
Gettysburg.txt
Enter in the search string:
a

Found a on line 1: Four score and seven years ago our fathers brought forth on this
Found a on line 2: continent a new nation, conceived in liberty, and dedicated to
Found a on line 3: the proposition that all men are created equal.
Found a on line 5: Now we are engaged in a great civil war, testing whether that
Found a on line 6: nation, or any nation so conceived and so dedicated, can long
Found a on line 7: endure. We are met on a great battlefield of that war. We have
Found a on line 8: come to dedicate a portion of that field, as a final resting
Found a on line 9: place for those who here gave their lives that that nation might
Found a on line 10: live. It is altogether fitting and proper that we should do this.
Found a on line 12: But, in a larger sense, we can not dedicate, we can not
Found a on line 13: consecrate, we can not hallow this ground. The brave men, living
Found a on line 14: and dead, who struggled here, have consecrated it, far above our
Found a on line 15: poor power to add or detract. The world will little note, nor long
Found a on line 16: remember what we say here, but it can never forget what they did
Found a on line 17: here. It is for us the living, rather, to be dedicated here to the
Found a on line 18: unfinished work which they who fought here have thus far so nobly
Found a on line 19: advanced. It is rather for us to be here dedicated to the great
Found a on line 20: task remaining before us-that from these honored dead we take
Found a on line 21: increased devotion to that cause for which they gave the last full
Found a on line 22: measure of devotion-that we here highly resolve that these dead
Found a on line 23: shall not have died in vain-that this nation, under God, shall have
Found a on line 24: a new birth of freedom-and that government of the people, by the
Found a on line 25: people, for the people, shall not perish from the earth.

The string: "a" was found a total of 102 times in the file: Gettysburg.txt

Problem 2 (35 points): The file *placelist.txt* contains the place information (name, country, latitude and longitude). Write a C program that

a) Reads places from a file called placelist.txt and stores it in **an array of type** `place`

b) Prints, on screen, places in the database that are NOT in USA.

c) Sorts the array of places in distance from Tucson city center and print the sorted array on screen. To do so, you will modify the void selection(int x[], int size) function that sorts ints given on the next page.

If you hard-code the list of cities sorted by distance in your code, 0 point for this problem.

1) Your program MUST use the following structure:

```
typedef struct place_s {
        char name[100];
        char country[30];
        double latitude;
        double longitude;
}place;
```

Note: the above structure can be modified (i.e., to include distance) so that it can be used with sorting.

2) The function below should be used to find the distance in miles between 2 locations: (lat1, long1) and (lat2, long2). Note: (lat, long) = (latitude, longitude)

```
double dist(double lat1, double long1, double lat2, double long2)
{
   double R = 6371;
   double PI = 3.1415926536;
   double dx, dy, dz;
   double dist_mile;
   long1 = long1 - long2;
   long1 = long1 * (PI / 180);
   lat1 = lat1 * (PI / 180);
   lat2 = lat2 * (PI / 180);

   dz = sin(lat1) - sin(lat2);
   dx = (cos(long1) * cos(lat1)) - cos(lat2);
   dy = sin(long1) * cos(lat1);
   dist_mile = (asin(sqrt(dx * dx + dy * dy + dz * dz) / 2)*2*R)/1.609344;
   return dist_mile;
 }
```

```
void selection(int x[], int size){
  int i, j;
  int max;
  for (i = 0; i < size; i++){
     max= i; // start searching from currently unsorted
     for (j = i; j<size; j++){
        if (x[j] > x[max]) // if found a larger element
        max = j; // move it to the front
     }
     swap(&x[i], &x[max]);
  }
}
```

```
void swap(int *x, int *y){
        int temp;
        temp = *x;
        *x = *y;
        *y = temp;
}
```

Make sure you understand the sample code execution thoroughly before writing the code.

Sample Code Execution:
Places in Database NOT in USA

Vancouver International Airport, Canada
(Latitude, Longtitude) = (49.196691, -123.181512)

Big Ben, UK
(Latitude, Longtitude) = (51.500729, -0.124625)

Forbidden City, China
(Latitude, Longtitude) = (39.916345, 116.397155)

Sydney Opera House, Australia
(Latitude, Longtitude) = (-33.856784, 151.215297)

Ministro Pistarini International Airport , Argentina
(Latitude, Longtitude) = (-34.815004, -58.534828)

Colosseo, Italy
(Latitude, Longtitude) = (41.890210, 12.492231)

Places in database sorted by distance from Tucson city center
(its latitude and longitude are 32.225750 and -110.979413)

University of Arizona, USA
(Latitude, Longitude) = (32.231885, -110.950109)
Distance is 1.764 miles

Note that the distance is displayed

Tucson International Airport, USA
(Latitude, Longitude) = (32.114510, -110.939227)
Distance is 8.037 miles

Golden Gate Bridge, USA
(Latitude, Longitude) = (37.819929, -122.478255)
Distance is 755.920 miles

Vancouver International Airport, Canada
(Latitude, Longitude) = (49.196691, -123.181512)
Distance is 1331.545 miles

Statue of Liberty, USA
(Latitude, Longitude) = (40.689249, -74.044500)
Distance is 2117.048 miles

Big Ben, UK
(Latitude, Longitude) = (51.500729, -0.124625)
Distance is 5300.223 miles

Ministro Pistarini International Airport , Argentina
(Latitude, Longitude) = (-34.815004, -58.534828)
Distance is 5746.655 miles

Colosseo, Italy
(Latitude, Longitude) = (41.890210, 12.492231)
Distance is 6183.815 miles

Forbidden City, China
(Latitude, Longitude) = (39.916345, 116.397155)
Distance is 6603.798 miles

Sydney Opera House, Australia
(Latitude, Longitude) = (-33.856784, 151.215297)
Distance is 7815.125 miles