Course: Programming Fundamental –ENSF 337

Lab #: Lab 5

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Lab Section: B01

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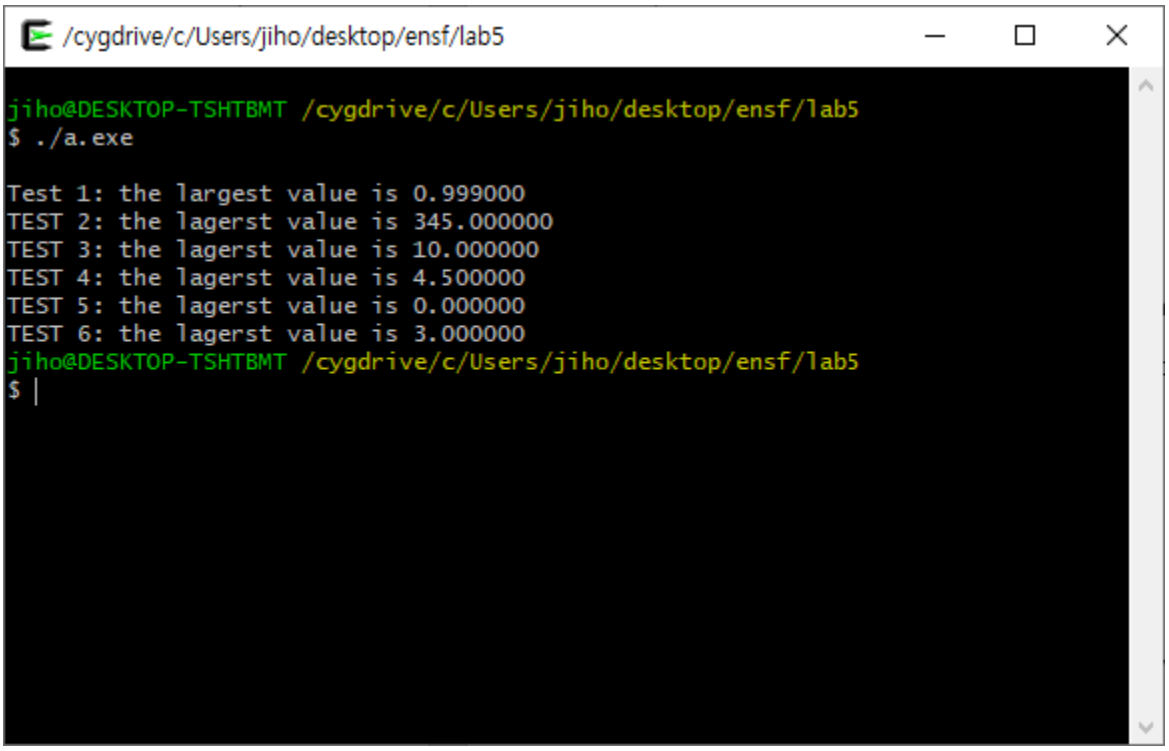
EXERCISE C

```
#include <stdio.h>

// Students should add the defintion of macro LARGEST_OF_THREE here.
#define LARGEST_OF_THREE(a, b, c) (( (a>b)? a:b) < c)? c : ( (a>b)? a:b)

int main(void)
{
   double x = 0.300, y = 0.500, z= 0.999;
   double largest = LARGEST_OF_THREE(x, y, z);
   printf("\nTest 1: the largest value is %f", largest);
   printf("\nTEST 2: the lagerst value is %f", LARGEST_OF_THREE(345, 99.8, 10));
   printf("\nTEST 3: the lagerst value is %f", LARGEST_OF_THREE(4, 9.8, 10.0));
   printf("\nTEST 4: the lagerst value is %f", LARGEST_OF_THREE(4.5, 4.5, 4.5));
   printf("\nTEST 5: the lagerst value is %f", LARGEST_OF_THREE(0.0, 0.0, 0.0));
   printf("\nTEST 6: the lagerst value is %f",
                              LARGEST_OF_THREE(x * 10, y * 2 , z * 3));
   return 0;
}
```


/cygdrive/c/Users/jiho/desktop/ensf/lab5
jiho@DESKTOP-TSHTBMT /cygdrive/c/Users/jiho/desktop/ensf/lab5
$ ./a.exe
Test 1: the largest value is 0.999000
TEST 2: the lagerst value is 345.000000
TEST 3: the lagerst value is 10.000000
TEST 4: the lagerst value is 4.500000
TEST 5: the lagerst value is 0.000000
TEST 6: the lagerst value is 3.000000
jiho@DESKTOP-TSHTBMT /cygdrive/c/Users/jiho/desktop/ensf/lab5
$

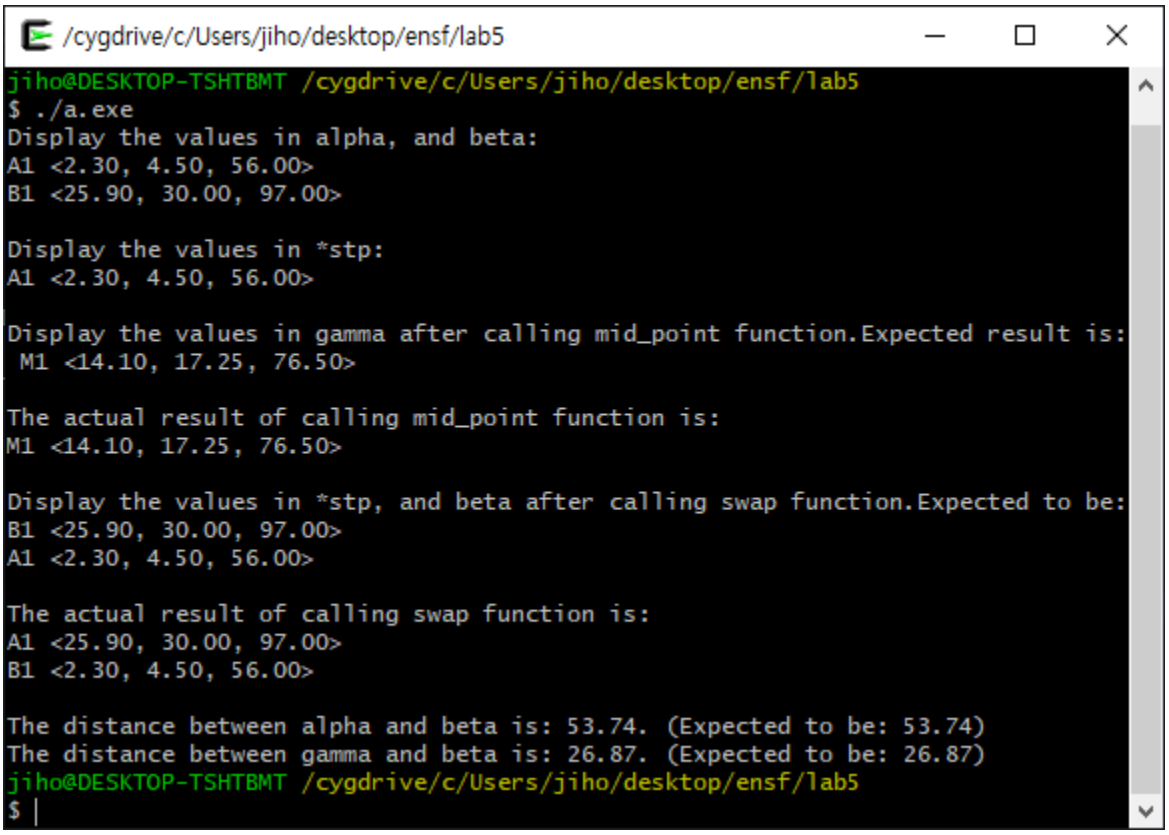
EXERCISE D

```
/* File: lab5exD.c
 * ENSF Fall 2019- lab 5 - Exercise D
 */

#include "lab5exD.h"
#include <stdio.h>
#include <math.h>
#include <string.h>

int main(void)
{
   Point alpha = { "A1", 2.3, 4.5, 56.0} ;
   Point beta = { "B1", 25.9, 30.0, 97.0 } ;
   printf ("Display the values in alpha, and beta: ");
   display_struct_point(alpha);
   display_struct_point(beta);

   Point *stp = &alpha;
   printf ("\n\nDisplay the values in *stp: ");
   display_struct_point(*stp);

   Point gamma = mid_point(stp, &beta, "M1");
   printf ("\n\nDisplay the values in gamma after calling mid_point function.");
   printf ("Expected result is: M1 <14.10, 17.25, 76.50>");

   printf("\n\nThe actual result of calling mid_point function is: ");
   display_struct_point(gamma);
```

```
    swap (stp, &beta);
    printf ("\n\nDisplay the values in *stp, and beta after calling swap function.");
    printf ("Expected to be:\nB1 <25.90, 30.00, 97.00>\nA1 <2.30, 4.50, 56.00>");


    printf("\n\nThe actual result of calling swap function is: ");
    display_struct_point(*stp);
    display_struct_point(beta);


    printf("\n\nThe distance between alpha and beta is: %.2f. ", distance(&alpha, &beta));
    printf ("(Expected to be: 53.74)");
    printf("\nThe distance between gamma and beta is: %.2f. ", distance(&gamma, &beta));
    printf ("(Expected to be: 26.87)");
    return 0;
}

void display_struct_point(const Point x)
{
    printf("\n%s <%.2lf, %.2lf, %.2lf>", x.label, x.x, x.y, x.z);
}


Point mid_point(const Point* p1, const Point* p2, const char* label)
{
    // This function is incomplete and must be completed by the students
    // YOU ARE NOT ALLOWED TO USE ANY STRING LIBRARY FUNCTIONS IN THIS FUNCTION
```

```
    Point middle = {"?", 0, 0};

        for(int i = 0; i < 10 || label[i] == '\0'; i++){
            middle.label[i] = label[i];
        }

        middle.x = (p2->x - p1->x)/2 + p1->x;
        middle.y = (p2->y - p1->y)/2 + p1->y;
        middle.z = (p2->z - p1->z)/2 + p1->z;

    return middle;
}

void swap(Point* p1, Point *p2)
{
        Point p3;
        p3.x = p1->x;
        p1->x = p2->x;
        p2->x = p3.x;

        p3.y = p1->y;
        p1->y = p2->y;
        p2->y = p3.y;

        p3.z = p1->z;
        p1->z = p2->z;
        p2->z = p3.z;
```

```
        return;
}

double distance(const Point* p1, const Point* p2)
{
   // This function is incomplete and must be completed by the students
   // NOTE: IN THIS FUNCTION YOU ARE NOT ALLOWED TO USE THE ARROW OPERATOR ->

        double distance;
        distance = sqrt(pow(((*p2).x - (*p1).x) , 2) + pow(((*p2).y - (*p1).y) , 2) + pow(((*p2).z - (*p1).z) ,
2) );

   return distance;
}
```


/cygdrive/c/Users/jiho/desktop/ensf/lab5
jiho@DESKTOP-TSHTBMT /cygdrive/c/Users/jiho/desktop/ensf/lab5
$ ./a.exe
Display the values in alpha, and beta:
A1 <2.30, 4.50, 56.00>
B1 <25.90, 30.00, 97.00>
Display the values in *stp:
A1 <2.30, 4.50, 56.00>
Display the values in gamma after calling mid_point function.Expected result is:
M1 <14.10, 17.25, 76.50>
The actual result of calling mid_point function is:
M1 <14.10, 17.25, 76.50>
Display the values in *stp, and beta after calling swap function.Expected to be:
B1 <25.90, 30.00, 97.00>
A1 <2.30, 4.50, 56.00>
The actual result of calling swap function is:
A1 <25.90, 30.00, 97.00>
B1 <2.30, 4.50, 56.00>
The distance between alpha and beta is: 53.74. (Expected to be: 53.74)
The distance between gamma and beta is: 26.87. (Expected to be: 26.87)
jiho@DESKTOP-TSHTBMT /cygdrive/c/Users/jiho/desktop/ensf/lab5
$

Exercise E

```
// lab5exE.c
// ENSF 337- Fall 2019, Exercise E

#include "lab5exE.h"
#include <stdio.h>
#include <math.h>
#include<string.h>

int main(void)
{
   Point struct_array[10];
   int i;
   int position;

   populate_struct_array(struct_array, 10);

   printf("\nArray of Points contains: \n");

   for(i=0; i < 10; i++)
      display_struct_point(struct_array[i], i);


   printf("\nTest the search function");

   position = search(struct_array, "v0", 10);
   if(position != -1)
```

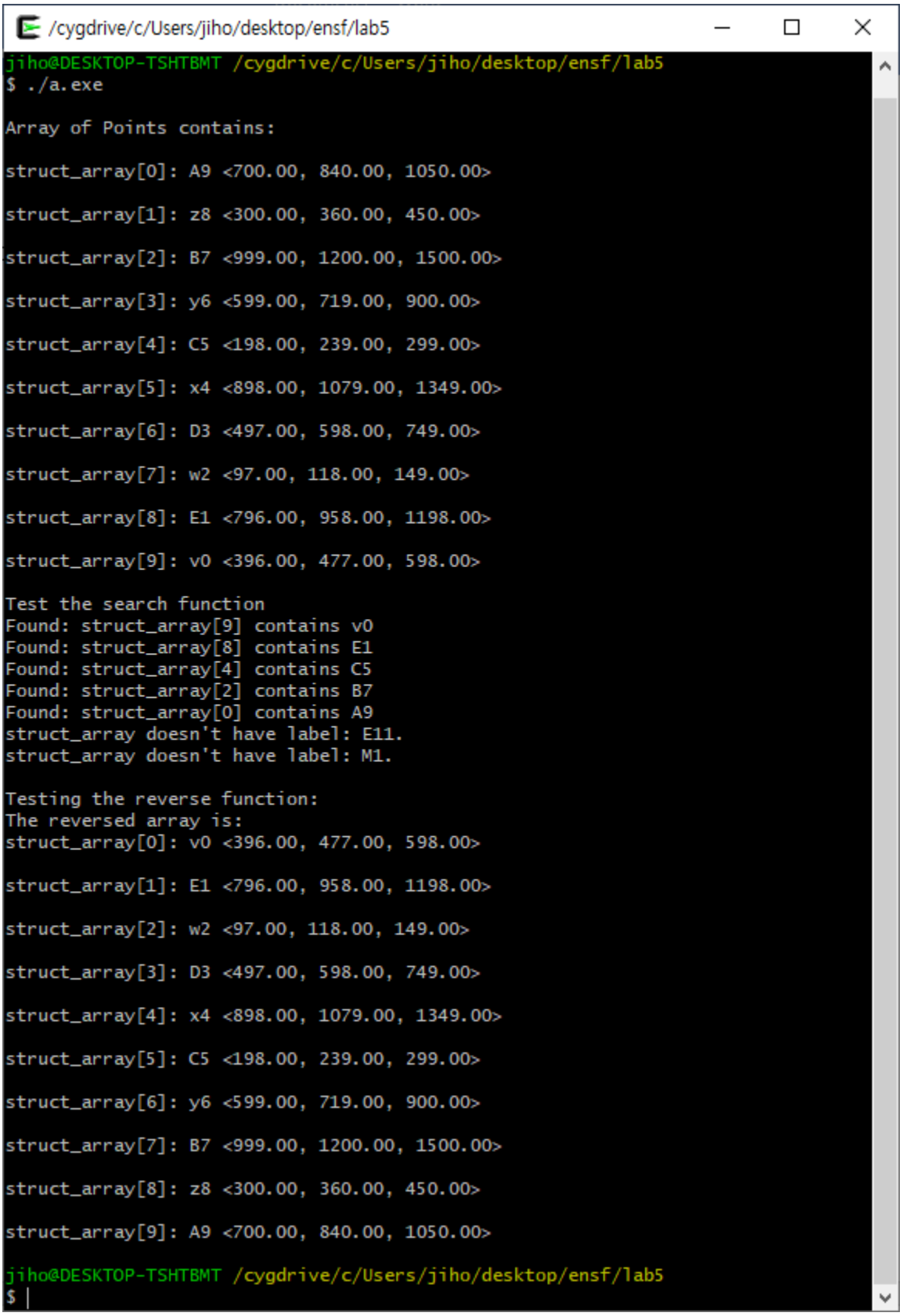
```
   printf("\nFound: struct_array[%d] contains %s", position,
        struct_array[position].label);
else
   printf("\nstruct_array doesn't have label: %s.", "v0");

position = search(struct_array, "E1", 10);
if(position != -1)
   printf("\nFound: struct_array[%d] contains %s", position,
        struct_array[position].label);
else
   printf("\nstruct_array doesn't have label: %s.", "E1");

position = search(struct_array, "C5", 10);

if(position != -1)
   printf("\nFound: struct_array[%d] contains %s", position,
        struct_array[position].label);
else
   printf("\nstruct_array doesn't have label: %s.", "C5");

position = search(struct_array, "B7", 10);
if(position != -1)
   printf("\nFound: struct_array[%d] contains %s", position,
        struct_array[position].label);
else
   printf("\nstruct_array doesn't have label: %s.", "B7");
position = search(struct_array, "A9", 10);
if(position != -1)
```

```
   printf("\nFound: struct_array[%d] contains %s", position,
        struct_array[position].label);
else
   printf("\nstruct_array doesn't have label: %s.", "A9");
position = search(struct_array, "E11", 10);
if(position != -1)
   printf("\nFound: struct_array[%d] contains %s", position,
        struct_array[position].label);
else
   printf("\nstruct_array doesn't have label: %s.", "E11");

position = search(struct_array, "M1", 10);
if(position != -1)
   printf("\nFound: struct_array[%d] contains %s", position,
        struct_array[position].label);
else
   printf("\nstruct_array doesn't have label: %s.", "M1");

printf("\n\nTesting the reverse function:");

reverse(struct_array, 10);

printf("\nThe reversed array is:");

for(i=0; i < 10; i++)
   display_struct_point(struct_array[i], i);

return 0;
```

```
}


void display_struct_point(const Point x , int i)
{
   printf("\nstruct_array[%d]: %s <%.2lf, %.2lf, %.2lf>\n",
         i, x.label, x.x, x.y, x.z);
}

void populate_struct_array(Point* array, int n)
{
   int i;
   char ch1 = 'A';
   char ch2 = '9';
   char ch3 = 'z';

   for( i = 0; i < 10; i++)
   {
      /* generating some random values to fill them elements of the array: */
      array[i].x = (7 * (i + 1) % 11) * 100 - i /2;
      array[i].y = (7 * (i + 1) % 11) * 120 - i / 3;
      array[i].z = (7 * (i + 1) % 11) * 150 - i /4;

      if(i % 2 == 0)
         array[i].label[0] = ch1++;
      else
         array[i].label[0] = ch3--;
      array[i].label[1] = ch2--;
```

```
        array[i].label[2] = '\0';
    }
}




int search(const Point* struct_array, const char* label, int n)
{
    // Students should complete the definiton of this function
    // NOTE: YOU ARE NOT ALLOWED TO USE LIBRARY FUNCTION strcmp IN THIS FUNCTION
            int counter = 0;


            for(int i = 0; i < n; i++){
                    while(label[counter] != '\0'){
                            if(label[counter] == struct_array[i].label[counter]){
                                    counter++;
                            } else{
                                    break;
                            }


                            if(label[counter] == '\0')
                                    return i;
                    }
                    counter = 0;
            }


    return -1;
}
```

```
void reverse (Point *a, int n)
{
   // Students should complete the definiton of this function
        Point b;
        for(int i = 0; i < n/2; i++){
                b = a[i];
                a[i] = a[n-i-1];
                a[n-i-1] = b;
        }
        return;
}
```


/cygdrive/c/Users/jiho/desktop/ensf/lab5
jiho@DESKTOP-TSHTBMT /cygdrive/c/Users/jiho/desktop/ensf/lab5
$ ./a.exe
Array of Points contains:
struct_array[0]: A9 <700.00, 840.00, 1050.00>
struct_array[1]: z8 <300.00, 360.00, 450.00>
struct_array[2]: B7 <999.00, 1200.00, 1500.00>
struct_array[3]: y6 <599.00, 719.00, 900.00>
struct_array[4]: C5 <198.00, 239.00, 299.00>
struct_array[5]: x4 <898.00, 1079.00, 1349.00>
struct_array[6]: D3 <497.00, 598.00, 749.00>
struct_array[7]: w2 <97.00, 118.00, 149.00>
struct_array[8]: E1 <796.00, 958.00, 1198.00>
struct_array[9]: v0 <396.00, 477.00, 598.00>
Test the search function
Found: struct_array[9] contains v0
Found: struct_array[8] contains E1
Found: struct_array[4] contains C5
Found: struct_array[2] contains B7
Found: struct_array[0] contains A9
struct_array doesn't have label: E11.
struct_array doesn't have label: M1.
Testing the reverse function:
The reversed array is:
struct_array[0]: v0 <396.00, 477.00, 598.00>
struct_array[1]: E1 <796.00, 958.00, 1198.00>
struct_array[2]: w2 <97.00, 118.00, 149.00>
struct_array[3]: D3 <497.00, 598.00, 749.00>
struct_array[4]: x4 <898.00, 1079.00, 1349.00>
struct_array[5]: C5 <198.00, 239.00, 299.00>
struct_array[6]: y6 <599.00, 719.00, 900.00>
struct_array[7]: B7 <999.00, 1200.00, 1500.00>
struct_array[8]: z8 <300.00, 360.00, 450.00>
struct_array[9]: A9 <700.00, 840.00, 1050.00>
jiho@DESKTOP-TSHTBMT /cygdrive/c/Users/jiho/desktop/ensf/lab5
$