

CME 112- Programming Languages II

Week 9

String Functions Sorting & Searching

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Science is trying to understand the language of nature. Those who understand the language are friendly to nature, and those who do not understand are enemies

String

A string is an array of characters terminated by the NULL char `'\0'`

Example: `char str[8];`

- ▶ Declares a char array that contains at most 8 chars
- ▶ If char array `str` will be used to store strings, it can contain at most 7 chars and **MUST** be terminated by the NULL char `'\0'`

String işlemleri

- ▶ C standard library provides many functions to manipulate strings.
- ▶ You need to include `<string.h>` to use these functions
`#include <string.h>`
- ▶ Here are some of the important functions:
 - `strcpy(char *str1, const char *str2);`
 - `strlen(const char *str);`
 - `strcat(char *str1, const char *str2);`
 - `strcmp(const char *str1, const char *str2);`

Strcpy Fonksiyonu

```
char *strcpy(char *str1, const char *str2)
{
    char *p = str1;

    while (*str2)
        *p++ = *str2++;

    *p = '\0';
    return str1;
} /* end-strcpy */
```

Strcpy Fonksiyonu

```
#include <stdio.h>
#include <string.h>
int main () {
    char src[40];
    char dest[100];
    strcpy(src, "This is tutorialspoint.com");
    strcpy(dest, src);
    printf("Final copied string : %s\n", dest);
    return(0);
}
```

Output:

Final copied string : This is tutorialspoint.com

Strlen Fonksiyonu

```
int strlen(const char *str)
{
    int len = 0;

    while(*str++)
        len++;

    return len;
} /* end-strlen */
```

Strlen Fonksiyonu

```
#include <stdio.h>
#include <string.h>
int main () {
    char str[50];
    int len;
    strcpy(str, "This is tutorialspoint.com");
    len = strlen(str);
    printf("Length of |%s| is |%d|\n", str, len);
    return(0);
}
```

Output:

Length of |This is tutorialspoint.com| is |26|



Strcat Fonksiyonu

```
char *strcat(char *str1, const char *str2)
{
    char *p = str1;

    while(*p)
        p++;

    while(*str2)
        *p++ = *str2++;

    *p = '\\0';
    return str1;
} /* end-strcat */
```


Strcat Fonksiyonu

```
#include <stdio.h>
#include <string.h>
int main () {
    char src[50],
    dest[50];
    strcpy(src, "This is source");
    strcpy(dest, "This is destination");
    strcat(dest, src);
    printf("Final destination string : |%s|", dest);
    return(0);
}
```

Output:

Final destination string : |This is destinationThis is source|



Strcmp Fonksiyonu

```
int strcmp(const char *str1, const char *str2)
{
    while (*str1 && *str2 && *str1 == *str2){
        str1++; str2++;
    } /* end-while */

    return *str1-*str2;
} /* end-strcmp */
```

Strcmp Fonksiyonu

```
#include <stdio.h>
#include <string.h>
int main () {
    char str1[15], str2[15];
    int ret;
    strcpy(str1, "abcdef");
    strcpy(str2, "ABCDEF");
    ret = strcmp(str1, str2);
    if(ret < 0)
        printf("str1 is less than str2");
    else if(ret > 0)
        printf("str2 is less than str1");
    else
        printf("str1 is equal to str2");
    return(0);
}
```

Output:

str2 is less than str1



Sorting

- ▶ Placing a group of data in descending or ascending order.
- ▶ Sorting data is very useful for computer systems.
- ▶ Makes searching and listing a group of data faster and easier.
- ▶ Most popular sorting algorithms:
 - Insertion sort
 - Selection sort
 - Bubble sort
 - Quick sort



Selection Sort

- ▶ If an item is in its true place it does not change its order.
- ▶ Change of items is less in half sorted group of data.
- ▶ Take the first item in the list and exchange with the minimum item of others.
Repeat this until the last item.

Before	After	
[] [7, 3, 5, 1, 2]	[1] [3, 5, 7, 2]	1 and 7 exchanged
[1] [3, 5, 7, 2]	[1, 2] [5, 7, 3]	2 and 3 exchanged
[1, 2] [5, 7, 3]	[1, 2, 3] [7, 5]	3 and 5 exchanged
[1, 2, 3] [7, 5]	[1, 2, 3, 5] [7]	5 and 7 exchanged
[1, 2, 3, 5] [7]	[1, 2, 3, 5, 7] []	end



Selection Sort

```
25 void selectionSort(int dizi[],int n)
26 {
27     int i,j;
28     int index, enkucuk;
29     for (i = 0; i < n - 1; i++)
30     {
31         enkucuk = dizi[n - 1];
32         index = n - 1;
33         for (j = i; j < n - 1; j++)
34         {
35             if (dizi[j] < enkucuk)
36             {
37                 enkucuk = dizi[j];
38                 index = j;
39             }
40         }
41         dizi[index] = dizi[i];
42         dizi[i] = enkucuk;
43     }
44 }
```

Selection Sort

```
1 #include <stdio.h>
2
3 void selectionSort(int [],int);
4 int main(void)
5 {
6     int i=0,a[5];
7     printf("Siralamak istediğın 5 sayı gir\n");
8     while(i<5){
9         scanf("%d",&a[i]);
10        i++;
11    }
12    i=0;
13    selectionSort(a,5);
14
15    printf("Selection sort isleminden sonra...\n");
16    while(i<5){
17        printf("%d ",a[i]);
18        i++;
19    }
20    return 0;
21 }
```

Search

- ▶ The process of finding a particular element of an array is called searching.
- ▶ Two searching techniques will be discussed
 - Linear Search
 - Binary Search

Linear Search

- ▶ Compares each element of the array with the search key.
- ▶ Since the array is not in any particular order, it is just as likely that the value will be found in the first element as in the last.
- ▶ In the worst case with N number of elements, the algorithm's complexity is $O(N)$
- ▶ It should not be used in large size arrays.



Linear Search

```
21 int linearSearch(int dizi[],int aranan,int n)
22 {
23     for (int i = 0; i < n; i++)
24     {
25         if (dizi[i] == aranan)
26             return i;
27     }
28     return -1;
29 }
```

Linear Search

```
1 #include <stdio.h>
2
3 int linearSearch(int [],int,int);
4 int main(void)
5 {
6     int dizi[] = { 1, 3, 5, 7, 8, 10, 11 };
7     int sonuc, aranan,i;
8     for (i = 0; i < 7; i++)
9         printf("%d ",dizi[i]);
10
11     printf("Aranani giriniz:");
12     scanf("%d",&aranan);
13
14     sonuc = linearSearch(dizi, aranan,7);
15     if (sonuc == -1)
16         printf("\nAranan dizide yok\n");
17     else
18         printf(sonuc + ". sirada bulundu\n");
19 }
```

Next Week

- ▶ File Operations
- ▶ Sequential Access Files



References

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- ▶ “A book on C”, All Kelley, İra Pohl

Q u e s t i o n s
A n y
?



Thanks for listening

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