Simple Arrays and Strings

Computing Lab

https://www.isical.ac.in/~dfslab

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What is an array?

- **Sequences in mathematics:** $A = (A)_i = A_1, A_2, A_3, \ldots$
- **Arrays in C:**

  - Sequence of n *contiguous* memory locations
  - *Length* of the array $= n$
  - *Elements* of the array $\equiv$ each of the n memory locations
  - Elements numbered 0 through $n - 1$

Syntax

```
char charArray[128], c;    // charArray : array of 128 chars
int intArray[64], i, j;    // intArray : array of 64 ints
...
charArray[i] = c; // 0 <= i <= 127
intArray[0] = i; j = intArray[63];
```

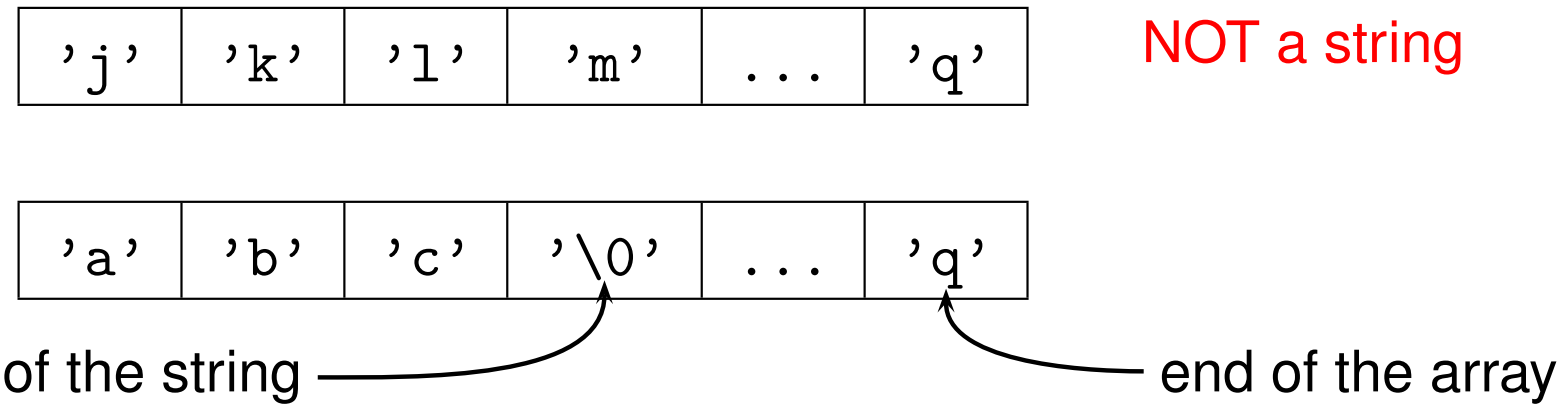
Strings

Definition

Strings are character arrays, but the end of the string is marked by the first occurrence of `'\0'` in the array (not the last element of the array)

Example:

```
1   char str0[8] = { 'a', 'b', 'c', 'd', 'e', 'f', 'g', 'h' };
2   char str1[8] = { 'j', 'k', 'l', 'm', 'n', 'o', 'p', 'q' };
3   char str2[8] = { 'z', 'y', 'x', 'w', 'v', 'u', 't', 's' };
4
5   str1[0] = 'a'; str1[1] = 'b'; str1[2] = 'c'; str1[3] = '\0';
6   /* str1 now holds the string "abc" */
```



Review questions

1. Try
   `printf("%s\n%s\n%s\n", str0, str1, str2);`
   at lines 4 and 7 in the example code given above.
2. At lines 4 and 7, try
   `for (i=0; i<8; i++) printf("%c\n", str0[i]);`
   Repeat for `str1` and `str2`.
3. Print `str0`, `str1` and `str2` after replacing line 5 by
   (a) `strcpy(str1, "abc");`
   (b) `strncpy(str1, "abc", j);` for `j` $\in \{0, 1, 2, \ldots, 10\}$.
   (c) `strncpy(str1, "abcdefgh...xyz", j);` for `j` $\in \{0, 1, 2, \ldots, 26\}$.

Defining / initialising strings

```
char *str1 = "Style 1";
char str2a[] = "Style 2A";
char str2b[16] = "Style 2B";
```

`str2a` contains 8 + 1 bytes

`str2b` contains 16 bytes

`strlen(str2b)` is 8

Permitted operations

```
str1 = "Another string"; // change str1 itself
str1++;                  // move str1 1 char forward (to 'n')
str2a[i] = 'X';          // change elements of string;
                         //  0 <= i < sizeof(str2a)
strcat(str2b, str1);     // strcpy also works
```

Detailed discussion of `Style 1` after pointers are introduced

Defining / initialising strings

```
char *str1 = "Style 1";
char str2a[] = "Style 2A";
char str2b[16] = "Style 2B";
```

`str2a` contains 8 + 1 bytes

`str2b` contains 16 bytes

`strlen(str2b)` is 8

NOT permitted

```
str1[i] = 'X';              // changing the elements of the string
strcat(str1, str2b);        // strcpy will also NOT work
str2a++; str2b++;           // changing the array variable itself
str2a = "Another string";   // reassigning the array variable
str2b = "Another string";
```

Detailed discussion of `Style 1` after pointers are introduced

Some useful string library functions

- At the beginning of your program, write `#include<string.h>`
- Some useful functions

`$ man 3 string`

`size_t`	`strlen(s);`
`int`	`strcmp(s1, s2);`
`int`	`strncmp(s1, s2, n);`
`char`	`*strcpy(destination, source);`
`char`	`*strncpy(destination, source, n);`
`char`	`*strdup(s);`
`char`	`*strndup(s, n);`
`char`	`*strcat(destination, source);`
`char`	`*strncat(destination, source, n);`

- LATER: `*strchr(s, int)`, `*strrchr(s, int)`, `strstr(s, s)`