

CSCI 2132

Software Development

Lecture 24:

Strings

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Previous Lecture

- Pointers and arrays
- Pointer arithmetic: pointer + integer
- Pointer arithmetic: subtraction and comparison
- Pointer examples
- Mergesort revisited, with pointers

Mergesort2 Example

- to finish mergesort2 example

Strings in C

- Closely related to pointers and arrays
- String is an array of characters followed by a null character (`' \0 '`)
- Length of a string does not include the null character, but the array must have space for the null character
- Important to distinguish:
 - `' \0 '` —is a null character, and
 - `NULL` —is a `NULL` pointer value

String Storage in Memory

- Example of a string literal: "hello, world\n"
- String literal is stored as a sequence of bytes; e.g.:

h	e	l	l	o	,		w	o	r	l	d	\n	\0
---	---	---	---	---	---	--	---	---	---	---	---	----	----

- or, more precisely:

h	e	l	l	o	,		w	o	r	l	d	\n	\0
104	101	108	108	111	44	32	119	111	114	108	100	10	0

- Example code:

```
char *p = "hello, world\n";  
char ch = p[0];  
char ch1 = *p;
```

String Variable

- Important to allocate space for the null character as well
- Example:

```
#define STRLEN 80  
char str[STRLEN+1];
```

- Example initialization (unnecessarily detailed):

```
str[0] = 'a';  
str[1] = 'b';  
str[2] = 'c';  
str[3] = '\0';
```

String Initialization

- Another example:

```
char str1[6] = "abc";
```

- Content in memory:

a	b	c	\0	\0	\0
---	---	---	----	----	----

- Another example:

```
char str2[] = "abc";
```

- In memory:

a	b	c	\0
---	---	---	----

Reading and Writing Strings

- Using `printf` function:

```
printf("%s\n", str2);
```

- Function `puts`, e.g.: `puts(str)`
- `puts` adds a newline character
- `scanf` can be used to read a string; e.g.

```
scanf("%s", str);
```

- Skips white space and reads a non-white-space word
- Dangerous: `str` must have enough capacity

Example

- Example input:

```
hello, world
```

- `scanf("%s", str);` would skip white space and read the following word into `str`:

h	e	l	l	o	,	\0
---	---	---	---	---	---	----

- Another example:

```
char word[20];  
scanf("%19s", word);
```