

Computer Programming 143 – Lecture 13

Arrays I

Faculty of Engineering



Defining arrays

type name [size];

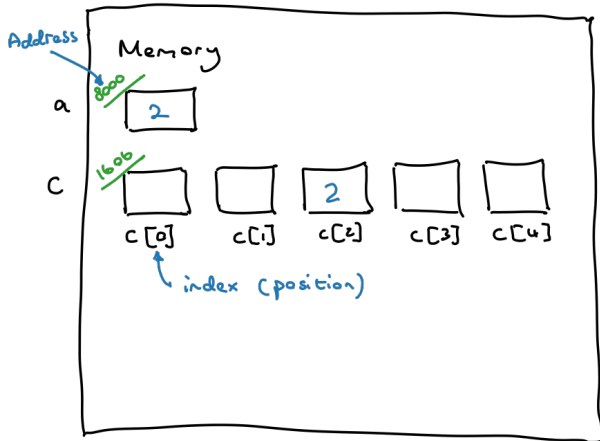
E.g. int waterLevels [8];

What happens in memory?

type name value
int a = 2;

type name
int c [5];
 ↑
 size

c[3] = 2;
a



6.2 Arrays II

```
int c[8];
```



Array elements are like normal variables

- Assign a value of 3 to the first element of array `c`:

```
c[ 0 ] = 3;
```

- Display the sum of the first 3 elements of `c`:

```
printf( "%d", c[ 0 ] + c[ 1 ] + c[ 2 ] );
```

- Halve the 7th element of `c` and store the result in variable `x`:

```
x = c[ 6 ] / 2;
```

- Can perform operations in index. If `a = 3` and `b = 2`, then

```
c[ a + b ] += 2;           c[ 5 ] += 2;
```

would increment the 6th element of `c` by 2

6.4 Examples Using Arrays

Initialising arrays

- Like other variables, array elements are not initialised automatically at declaration
- Initialise elements by assigning values one by one (Fig. 6.1 in D&D)
- Or use an initialiser list:

```
int n[5] = { 1, 2, 3, 4, 5 };
```

- If initialiser list shorter than array – remaining elements become 0

```
int n[5] = { 0 };
```

- All 5 elements of **n** are initialised to 0

- If size omitted, initialisers determine it

```
int n[ ] = { 1, 2, 3, 4, 5 };
```

- 5 initialisers, therefore 5-element array

6.4 Examples Using Arrays

Symbolic constants

#define SIZE 10

- Is a C preprocessor directive
- Defines a symbolic constant **SIZE** of value 10
- Preprocessor replaces all occurrences of **SIZE** in the text with 10 before program is compiled
- Makes program scalable – value is changed in only one place in the text

6.4 Examples Using Arrays

Survey example: problem statement

Forty students were asked to rate the quality of the food in the student cafeteria on a scale of 1 to 5 (1 means awful and 5 means excellent). Place the 20 responses in an integer array and summarise the results of the poll.

Student food survey

Ten

~~Forty~~ students were asked to rate the quality of the food in the student cafeteria on a scale of 1 to 5 (1 means awful and 5 means excellent). Place the ~~20~~¹⁰ responses in an integer array and summarise the results of the poll.

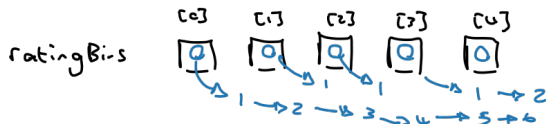
- 10 students

- 5 stars (between 1 and 5)

```
int ratings[10] = { 1, 1, 1, 2, 1, 3, 4, 1, 1, 4 };
```

How	many	students	gave	1 star?	6
"	"	"	gave	2 stars?	1
"	"	"	"	3 stars?	1
"	"	"	"	4 stars?	2
"	"	"	"	5 stars?	0

```
bin[0] = 6  
bin[1] = 1  
bin[2] = 1  
bin[3] = 2  
bin[4] = 0
```





6.5 Store and Manipulation of Strings

Character arrays

```
char str1[] = "first";
```

- String "first" is really a static array of characters
- Character arrays can be initialized using string literals
 - Null character '\0' terminates strings
 - **str1** actually has 6 elements
 - It is equivalent to

```
char str1[] = { 'f', 'i', 'r', 's', 't', '\0'};
```

- Can access individual characters
 - **str1[3]** is character 's'

