Intro. Computing with the C Programming Language

Arrays

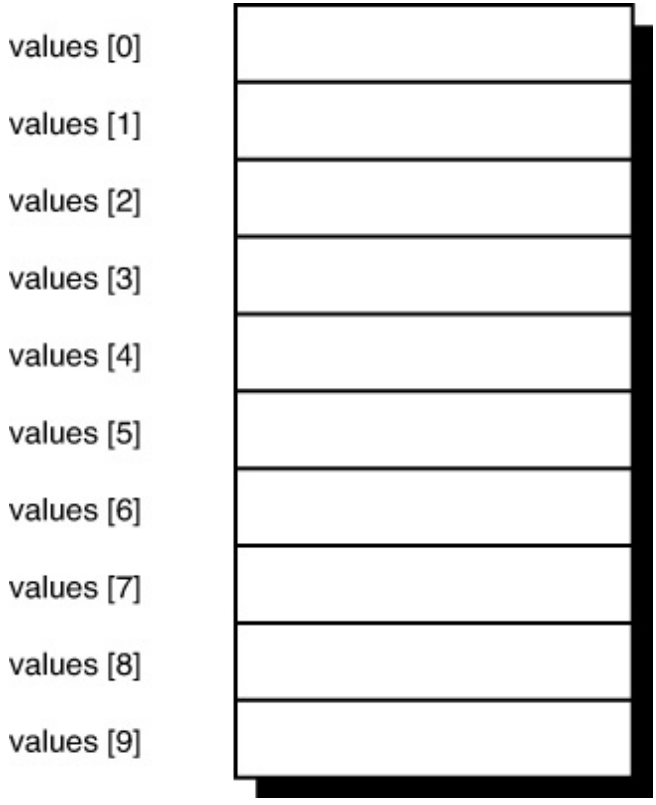
- PIC: Ch. 6. Working with Arrays

Shin Hong

13 November 2023

Array

- An array variable is to represent a set of variables, rather than an individual variable
- All element variables of an array are allocated consecutively in memory
  - e.g., `int values[10]`



Initializing Array

- Cases

```
int  integers[5] = { 0, 1, 2, 3, 4 };

float sample_data[500] = { 10.0, 30.0, 50.5 };

float sample_data[500] =
   { [2] = 500.5, [1] = 300.0, [0] = 100.0 };

int  M[4][5] = {
   { 10,  5, -3, 17, 82 },
   {  9,  0,  0,  8, -7 },
   { 32, 20,  1,  0, 14 },
   {  0,  0,  8,  7,  6 } };

int  M[4][5] = { 10, 5, -3, 17, 82, 9, 0, 0, 8,
   -7, 32, 20, 1, 0, 14, 0, 0, 8, 7, 6 };
```

Referencing Array via Pointer

- The value of an array variable is a pointer of the first element

- Given an array `arr`, `arr + i` is the pointer of `arr[i]`
  - `&(arr[i])` is the same as `arr + i`

The const Qualifier

- The compiler allows you to associate the const qualifier with variables whose values will not be changed by the program.

- Examples

```
const  double  pi = 3.141592654;

const char baseDigits[16] = {
   '0', '1', '2', '3', '4', '5',
   '6', '7', '8', '9', 'A', 'B',
   'C', 'D', 'E', 'F' };
```

Variable Length Arrays

- Basically, the size of an array must be given statically
- Yet, the ANSI C99 standard makes support for variable length arrays
  - From ANSI C11, it becomes optional
- Dynamic memory allocation is often used to allocate space for array while a program is executing