The C Language

CS238P: Operating Systems - Fall ’18

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Data and Computation
Data can be of different types.

- char (1 byte)
- int, long (4/8 bytes)
- pointer (2, 4, or 8 bytes on x86 16, 32, and 64 bit machines respectively), structs, etc.

They can also be:

- constants
- variables
A data type therefore determines two things\(^1\):

- the size of the data variable
- how the data is to be interpreted.

\(^1\)https://www.tutorialspoint.com/cprogramming/c_data_types.htm
Computation
• declarations
• assignments
• for, do...while, while
• if...else
  
  pid = fork();
  if(pid == -1)
    perror("fork:");
Hw1(xv6 shell)

- if...else
  
  ```c
  pid = fork();
  if(pid == -1)
      perror("fork: ");
  ```

- switch...case
  
  ```c
  switch(cmd->type){
  case '>': ...; break;
  default: ...; break;
  }
  ```
• if...else
  pid = fork();
  if(pid == -1)
    perror("fork:");

• switch...case
  switch(cmd->type){
    case ‘>’: ...; break;
    default: ...; break;
  }

• Functions
  • Process creation (fork, exec)
  • File I/O (open, close, read, write)
Pointers

p points to integer a by storing a’s address. 1 byte is used. (not showing how the address is actually stored here in binary)

(a)

int a = 5;
int *p = &a;

(b)

Fig. 1(a). Simple illustration of how a pointer points to data in the memory.
(b) Corresponding C code for Fig. 1(a).
Arrays

- Collection of objects of the same data type
Arrays

- Collection of objects of the same data type
- Accessed by index (0 ... size - 1)
Arrays

- Collection of objects of the same data type
- Accessed by index \( (0 \ldots \text{size} - 1) \)
- String is an array of characters
Designated Initializers\(^2\)

\[
\begin{align*}
#define \text{CAPSLOCK} & (1<<3) \\
#define \text{NUMLOCK} & (1<<4) \\
#define \text{SCROLLLOCK} & (1<<5)
\end{align*}
\]

static uchar togglecode[256] = {
    [0x3A] \text{CAPSLOCK},
    [0x45] \text{NUMLOCK},
    [0x46] \text{SCROLLLOCK}
};

/* equivalent to */
togglecode[0x3A] = \text{CAPSLOCK};
togglecode[0x45] = \text{NUMLOCK};
togglecode[0x46] = \text{SCROLLLOCK};

Initialize the array elements 0x3A, 0x45, 0x46 only \(^3\)

\(^2\)http://gcc.gnu.org/onlinedocs/gcc-4.0.4/gcc/Designated-Inits.html
\(^3\)sheet 77, xv6-rev9.pdf
Examples
(arrays-ptrs.c & arrays-strings.c)