計算機概論與程式設計

Lab 12
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李雍皓

Function Pointer

- Variable that point to function.

- Note:
  - **int (*pfunc)(int)** is a declaration of function pointer pointing to **int func(int)**
  - **int* pfunc(int)** is a declaration of function that return int pointer

- So why bother using function pointer when you can call it?

- We can pass function pointer as a parameter of another function.

qsort

Function pointer

- A sorting function written in stdlib.h
- void qsort(void *base, size_t nitems, size_t size, **int (*compare)(const void *, const void*)**)
  - base: The pointer to the first element of the array to be sorted.
  - nitems: Number of elements in the array pointed by base.
  - size: Size in bytes of each element in the array.
  - compare: The function that compares two elements.
- You should self define the rule of comparison in order to use qsort.

Two issue of qsort

- How to decide the order of sorting?
  - When comparing two element a and b, the relationship between order and return value is:
  - Return value < 0 -> Place a before b.
  - Return value == 0 -> ignore.
  - Return value > 0 -> Place a after b.

- Type conversion?
  - Since the parameter type of cmpFunction is *const void**, const void*.
  - You should convert the type to origin type of data by yourself
  - e.g.

```
void ptr*;

int* iptr = (int*) ptr;
```

Lab 12-1 Sort integer list with qsort

- Given a list of integer, sort the list in both way.
  - Ascending and decending
  - Non-determined length

Sample Input #1

```
10 5 92 85 231 59 581 129 13 583
```

Sample Output #1

```
5 10 13 59 85 92 129 231 581 583
583 581 231 129 92 85 59 13 10 5
```

Lab 12-2 Bit operation

- Given four integer n ,k a, b, use bit operation to find the followings

1. Simulate multiply ,divide and mod operation of power of 2.
   a. Find out $n * 2^k$, $n / 2^k$, $n \% 2^k$.
   b. Using for loop and +, - operator is forbidden.

2. Find if a and b is equal without using arithmetic operation.
   a. Something like a - b == 0 or a == b is forbidden.
   b. You must only use bit operation and equal operator to solve this.

Sample Input #1

```
2
10 3 5 5
15 2 9 10
```

Sample Output #1

```
80
1
2
Yes

60
3
3
No
```

Grading

- If you pass TA's demo, you will get score of Formosa OJ.
  - Lab12-1 (60%)
    - You must use qsort in order to get points.
  - Lab12-2 (40%)
    - You must use bit operation to calculate the result in order to get points.

- Total: 100%

- Formosa OJ