405410090 陳知余　物件導向程式設計 作業一 debugger 指令截圖

(1) 印出程式碼: list 每次 10 行

```
(gdb) list 1
1       #include <iostream>
2       #include <cstdlib>
3       #include <cstdio>
4       #define N 25 //There are 21 digits when n == 99
5       using namespace std;
6       int *add(int a[], int b[]) { //  add integer array a and b to b
7         int i = 0, carry = 0;
8         for (i = 0; i < N; i++) {
9           b[i] = a[i] + b[i] + carry;
10          carry = b[i] / 10;
(gdb) list
11          b[i] %= 10;
12        }
13        return b;
14      }
15
16      int *swap(int a[], int b[]) {//swap function to swap elements of two integer arrays
17        int i = N - 1, temp = 0;
18        while (a[i] == 0 && b[i] == 0 && i > 0) i--;
19        for (; i >= 0; i--) {
20          temp = a[i];
```

```
(gdb) list
21            a[i] = b[i];
22            b[i] = temp;
23          }
24          return a;
25        }
26        int *f(int n, int a[], int b[]) { //fibonacci function using tail recursion
27          if (n == 1) {
28                  return a;
29                } else if (n == 2) {
30                  return b;
(gdb) list
31                } else {
32            a = swap(a, b);
33            b = add(a, b);
34            return f(n - 1, a, b);
35          }
36        }
37        int main(int argc, char *argv[]) {
38          if (argc != 2) {
39            fprintf(stderr, "[usage]:./cpphw1 n\n");
40            exit(-1);
```

```
(gdb) list
41          }
42          int n = atoi(argv[1]);
43          if (n < 1 || n > 99) {
44            fprintf(stderr, "The integer argument n should locate between 1 to 99\n");
45            exit(-1);
46          }
47          cout << "The input number is " << n << endl;
48          printf("f(%d) = ", n);
49          int a[N], b[N], i = 0;
50          a[0] = 1, b[0] = 1;//f(1) = 1, f(2) = 1
(gdb) list
51          for (i = 1; i < N; i++) {
52            a[i] = 0;
53            b[i] = 0;
54          }
55          f(n, a, b);
56          i = N - 1;
57          while (b[i] == 0 && i > 0)
58            i--;
59          for (; i >= 0; i--)
60            cout << b[i];
```

```
(gdb) list
61        cout << endl;
62        return 0;
63      }
(gdb)
```

(2) 設定 breakpoint: break(or b) 加行數 n 會執行到 n-1 行，在第 n 行停下來。

```
(gdb) b 48
Breakpoint 1 at 0x400ed5: file cpphw1.cpp, line 48.
```

(3) 向下執行程式碼(直到 breakpoint):

先分別在 main 和第 50 行下 breakpoint，還未執行的話使用 run(or r)執行，如果已經執行了，並且在程式中的 breakpoint 停住，用 continue(or c)就能繼續執行，直到下個中斷點。

```
(gdb) b main
Breakpoint 1 at 0x400e2b: file cpphw1.cpp, line 38.
(gdb) b 50
Breakpoint 2 at 0x400ef0: file cpphw1.cpp, line 50.
(gdb) info b
Num     Type           Disp Enb Address            What
1       breakpoint     keep y   0x0000000000400e2b in main(int, char**)
                                                   at cpphw1.cpp:38
2       breakpoint     keep y   0x0000000000400ef0 in main(int, char**)
                                                   at cpphw1.cpp:50
(gdb) r 5
Starting program: /.amd_mnt/cs1/host/csdata/home/under/u105/ccyu105u/OOP/hw1/cpp
hw1 5

Breakpoint 1, main (argc=2, argv=0x7fffffffea18) at cpphw1.cpp:38
38        if (argc != 2) {
(gdb) c
Continuing.
The input number is 5

Breakpoint 2, main (argc=2, argv=0x7fffffffea18) at cpphw1.cpp:50
50        a[0] = 1, b[0] = 1;//f(1) = 1, f(2) = 1
(gdb)
```

(4) 向下執行一行程式碼:step(or s) or next(or n)，step 遇到 function call 會跳進去，next 不會。

```
Breakpoint 1, main (argc=2, argv=0x7fffffffea18) at cpphw1.cpp:48
48        printf("f(%d) = ", n);
(gdb) step
49        int a[N], b[N], i = 0;
(gdb) step
50        a[0] = 1, b[0] = 1;//f(1) = 1, f(2) = 1
(gdb)
```

(5) 印出特定變數值(ex: 變數 a 現在的值):print(or p) 變數名稱

```
48        printf("f(%d) = ", n);
(gdb) step
49        int a[N], b[N], i = 0;
(gdb) step
50        a[0] = 1, b[0] = 1;//f(1) = 1, f(2) = 1
(gdb) print i
$1 = 0
(gdb)
```

(i 在 49 行時被 assign 為 0 之後沒有變動)

(6) 設定持續印出某變數值:watch 變數名稱

```
(gdb) p i
$1 = 0
(gdb) watch i
Hardware watchpoint 2: i
(gdb) c
Continuing.

Hardware watchpoint 2: i

Old value = 0
New value = 1
0x0000000000400f08 in main (argc=2, argv=0x7fffffffea18) at cpphw1.cpp:51
51          for (i = 1; i < N; i++) {
(gdb) c
Continuing.

Hardware watchpoint 2: i

Old value = 1
New value = 2
0x0000000000400f2b in main (argc=2, argv=0x7fffffffea18) at cpphw1.cpp:51
51          for (i = 1; i < N; i++) {
(gdb)
```

(i 初值為 0，因為接下來進入迴圈，每次都 i++)

(7) 結束 debugger: quit(or q)

```
(gdb) quit
A debugging session is active.

        Inferior 1 [process 59589] will be killed.

Quit anyway? (y or n) y
```