The Josephus Puzzle Revisited

— Struct, Linked List, and Function Pointer

魏恒峰

hfwei@nju.edu.cn

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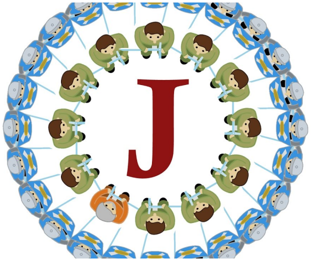
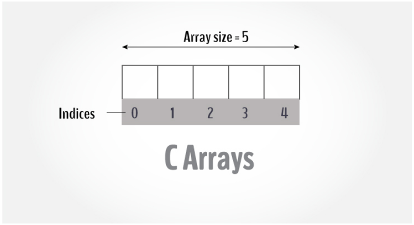
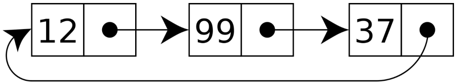


The Josephus Puzzle

$$J(n) = ?$$


Array size = 5
Indices
0
1
2
3
4
C Arrays


12
99
37

```
struct _node {...};
struct _linkedlist {...};
```

```c
struct _node {...};
struct _linkedlist {...};
```

```c
scanf(''%d'', &n);

LinkedList list;
initialize_list(&list);

sit_in_circle(&list, n);

kill_until_one(&list);

show(&list);
```

Struct

(struct-point.c)

```
typdef struct _point {
  int x;
  int y;
} Point;
```

```
typdef struct _point {
  int x;
  int y;
} Point;
```

```
struct _point p1 = {1, 1};
p1.x = 11;

Point p2 = {.x = 2, .y = 2};

Point ps[5];

Point *p = &p2;
p->x = 22;
```

```c
typdef struct _point {
  char c;
  int x;
  int y;
} Point;
```

```c
Point p = {.c = 'o', .x = 0, .y = 0};
sizeof(p);
```

```c
typdef struct _point {
  int x;
  int y;
} Point;
```

```c
void show(Point p);

void update(Point *p, int x, int y);

Point add(Point p1, Point p2);
```

```
typdef struct _point {
  int x;
  int y;
} Point;
```

```
typedef struct _rect {
  Point lup;
  Point rlp;
} Rect;

Rect r;

r.lup.x = 1;
```

Linked List

(`linkedlist.h` `linkedlist-test.c`)

```c
typedef struct _node {
  void *data;
  struct _node *next;
} Node;
```

```c
typedef struct _linkedlist {
  Node *head;
  Node *tail;
} LinkedList;
```

```c
void initialize_list(LinkedList *list);

int is_empty(LinkedList *list);
int is_singleton(LinkedList *list);

void add_tail(LinkedList *list, void *data);

void delete_next(LinkedList *list, Node *pre);
void kill_until_one(LinkedList *list) {
  Node *tmp = list->head;

  while (! is_singleton(list)) {
    delete_next(list, tmp);
    tmp = tmp->next;
  }
}
```

(josephus-linkedlist.c)

```c
void delete_node(LinkedList *list, Node *node);

void insert(LinkedList *list, Node *pre);
```

Function Pointer

```c
int (*fptr)(int);  // fptr is a function pointer

int square(int num) {
  return num * num;
}
```

```c
int n = 5;
fptr = square;  // fptr points to a function
fptr(n);
```

```c
typedef void (*fptr_show)(void *data);

void show(LinkedList *list, fptr_show show);
```

(linkedlist.h)

```c
typedef void (*fptr_show)(void *data);

void show(LinkedList *list, fptr_show show);
```

(linkedlist.h)

```c
void show_integer(const int *integer);

show(&list, show_integer);
```

(josephus-linkedlist.c)

```c
typedef int (*fptr_compare)(void *data1, void *
    data2);

Node *get_node(LinkedList *list, fptr_compare
    compare, void *data);
```

(linkedlist.h)

```c
typedef int (*fptr_compare)(void *data1, void *
    data2);

Node *get_node(LinkedList *list, fptr_compare
    compare, void *data);
```

(linkedlist.h)

```c
int compare_integer(int *data1, int *data2);

get_node(&list, compare_integer, &val);
```

(josephus-linkedlist.c)

```c
void qsort (void *base, size_t num, size_t size,
    int (*compar)(const void*, const void*));
```

(#include <stdlib.h>)

Thank
You!