CS2351
Data Structures

"Pass by Value" or "Pass by Pointer"

About this slide

- In today's lecture, we mentioned two ways to perform enqueue in a queue
  - In fact, one of the way is WRONG

- We shall see why it is wrong

The wrong enqueue

- The following function tries to perform enqueue using pass by value :

```
void enqueue( struct node *head,
  struct node *tail, struct node y )
{
  if ( head != NULL )  // if not empty
  {  tail->next = &y ;  tail = &y; }
  else
  {  head = tail = &y ; }
}
```

The wrong enqueue

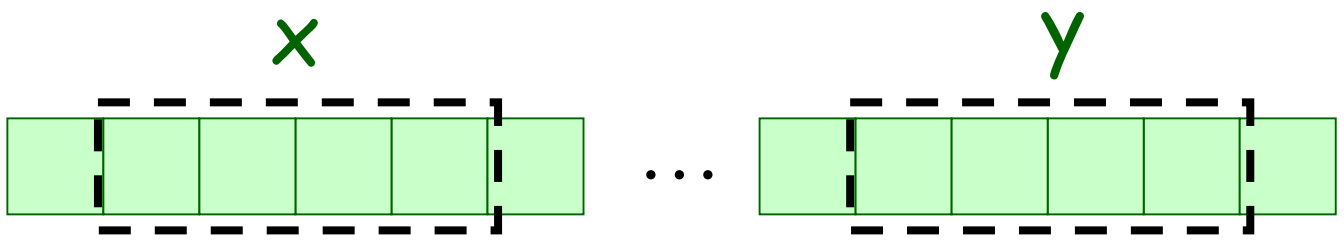
- Unfortunately, it is WRONG
- Suppose in the main program, we write :

```
struct node *head, *tail, x ;
head = NULL ;
enqueue( head, tail, x ) ;
```

- What happens is that after enqueue, head nor tail do not point at x as we expect
- Reason: During enqueue, there is a temp memory space for the local variable y …

The wrong enqueue

- Then, y copies all the contents of x from the main program



- Then inside enqueue, the local variables head and tail are assigned to point at y
- Consequently, head and tail in main program have no change, and no one points at x !

The correct enqueue

- We need to ensure that after enqueue, both head and tail in the main program are set correctly (point at x, not y)
- In this case, we shall use pass by pointers
  - Another scheme called pass by reference may be used instead
- Since values of head and tail need to be changed, we need to know their actual memory addresses inside enqueue

The correct enqueue

- To pass the address of a pointer p is easy
  - Simply use a pointer that points at p

```
void enqueue( struct node **head,
  struct node **tail, struct node *y )
{
  if ( *head != NULL )  // if not empty
  {  (*tail)->next = y ;  (*tail) = y; }
  else
  {  (*head) = (*tail) = y ; }
}
```

The correct enqueue

- Then inside the main program, we write :

```
struct node *head, *tail, x ;
head = NULL ;
enqueue( &head, &tail, &x ) ;
```

- After the enqueue call, the actual memory locations of both head and tail will be filled with the actual address of x