Data Structures and its Applications

Dinesh Singh

Department of Computer Science & Engineering

DATA STRUCTURES AND ITS APPLICATIONS

Queues – Implementation of Josephus Problem

Dinesh Singh

Department of Computer Science & Engineering

Queues – Implementation of Josephus Problem

- Josephus Problem : Postulates a group of soldiers surrounded by an overwhelming enemy force. There is no hope of victory without reinforcements. There is one horse available for escape

- The soldiers agree to a pact to determine which of them is to escape and seek help. The soldiers form a circle and a number n is picked from a hat. One of the names is also picked from the hat.

- Beginning with the soldier whose name is picked , they begin to count clockwise around the circle. when the count reaches n, that soldier is removed from the circle and the count begins with the next soldier.

- The process continues so that each time the count reaches n, another soldier is removed from the circle. Any soldier removed from the circle is no longer counted. The last soldier remaining is to take the horse and escape.

Queues – Implementation of Josephus Problem

- The input to the program is the number n and list of names, which is the clockwise ordering of the circle, beginning with the soldier from whom the count is to start.

- The program should print the names in the order that they are eliminated and the name of soldier who esapes.

- For example if n=3 and that there are five solders named A,B,C,D and E. We count three soldiers starting at A, so that C is eliminated first.

- We then begin at D and count D E and back to A. A is eliminated. Then we count B D and E, E is eliminated. And finally B D and B is eliminated.

- D is the one who escapes

Queues – Implementation of Josephus Problem

- Data structure used is a circular list where each node represents one soldier

- To represent the removal of a soldier form the circle, a node is deleted from the circular list.

- Finally one node remains on the list and the result is determined

Queues – Implementation of Josephus Problem

Pseudo code of implementation using circular list

```
read(n)
read(name)
while(all the names are read)
{
        insert name on the circular list
        read(name)
}
while(there is more than one node on the list)
{
        count through n-1 nodes on the list
        print name in the nth node
        delete the nth node
}
print the name of the only node on the list
```

Queues – Implementation of Josephus Problem

Code of implementation using circular list

```
int survivor(struct node **head, int n)
{
 // head is pointer to first node

    struct node *p, *q;
    int i;
    q = p = *head;
    while (p->next != p)
      {
         for (i = 0; i < n - 1; i++)
           {
              q = p;
              p = p->next;
           }
            q->next = p->next;
             printf("%d has been killed.\n", p->num);
             free(p);
             p = q->next;
          }
      *head = p;
      return (p->num);
  }
```

Queues – Implementation of Josephus Problem

Pseudo code of implementation using circular queue

```
Enter n
while(all the names are read)
{
  insert name into the queue
  read(name)
}
while( q has one element)
{
   dequeue n-1 names from the queue and enqueue it.
   dequeue the nth name
   print the nth name
 }
 dequeue the only name of the queue
 print the name
```

Queues – Implementation of Josephus Problem

Assignment :

Implement the Josephus by using circular queue

Implement Josephus Problem by using linked list

PES UNIVERSITY ONLINE

THANK YOU

Dinesh Singh

Department of Computer Science & Engineering

dineshs@pes.edu

+91 8088654402