San Jose State University

Department of Computer Science

Data Structures and Algorithms (CS 149)

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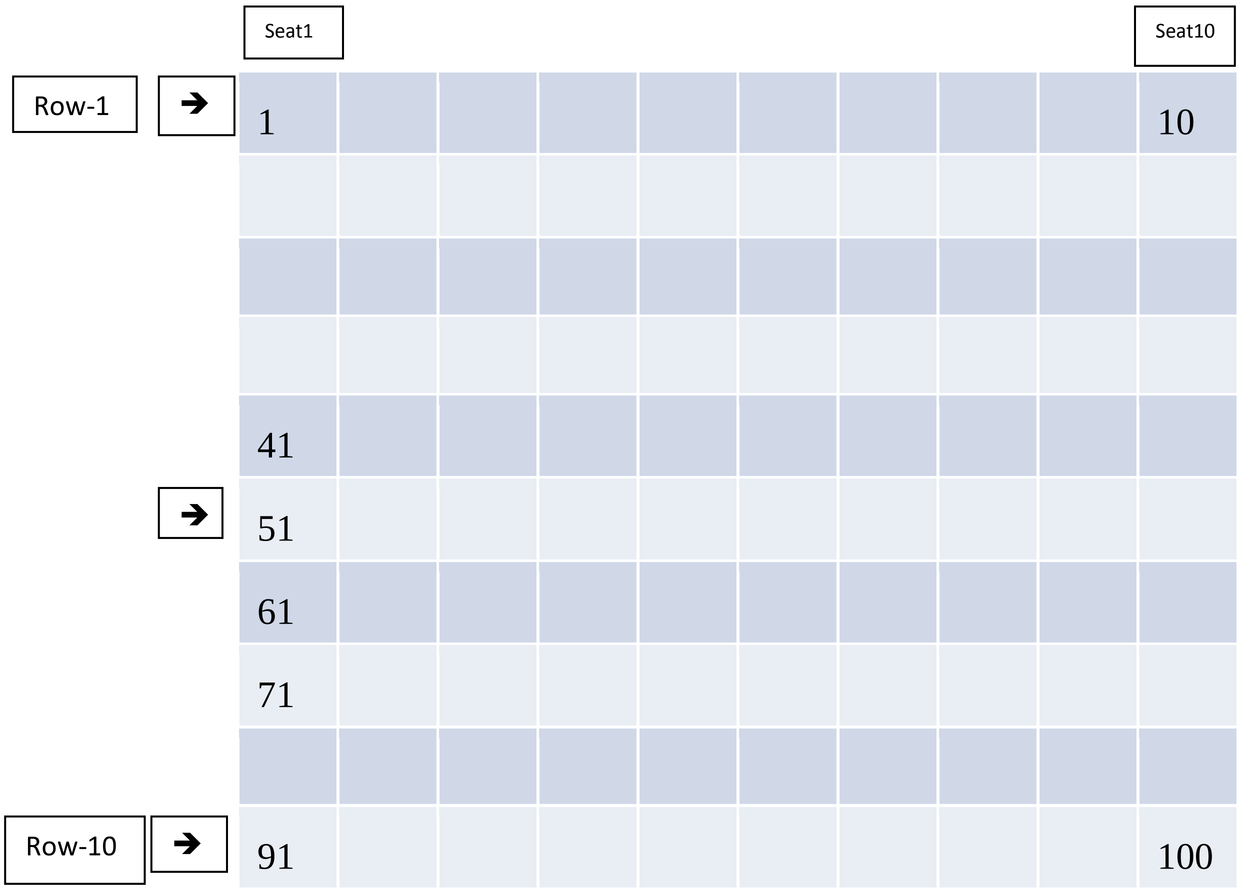
Homework #3 Preview

Multi-threaded Ticket Sellers

We will build simulation written in C or C++ programming language that experiment with 10 ticket sellers to 100 seats concert during one hour. Each ticket seller has their own queue for buyers.



H1 Seller: one seller and sell tickets starting from row-1

(M1, M2, M3) Sellers: 3 sellers start selling from row 5 then 6, then 4, then 7, etc.

(L1, L2, L3, L4, L5, L6) Sellers: 6 sellers start selling from row 10 then row-9, etc.

Each seller has in their queue N customers arriving at random time during the one hour; where N is a command-line option.
No 2 sellers can sell the same seat to different customers

Time for H-Seller to complete the ticket sale is random either 1 or 2 minutes.

Time for M-Seller to complete the ticket sale is random either 2 or 3 or 4 minutes.

Time for L-Seller to complete the ticket sale is random either 4 or 5 or 6 or 7 minutes.

Simulator:

1. Assume 10 threads, each represents a ticket seller: H1, M1, M2, M3, L1, L2, L3, L4, L5, L6.
2. Each seller has their own queue and customer stands in the queue using FIFO.
3. Initialize the simulation clock – initially to zero (0:00)
4. Create 10 threads and suspend them.
5. Think of the simulation as main() that include:
    a. Create the necessary data structures including the 10 queues for the different sellers and initialize each queue with its ticket buyers up front based on the N value.
    b. Create the 10 threads and each will be set with a **sell**() function and seller type as arguments.
    c. Wakeup all 10 threads to execute in parallel; wakeup_all_seller_threads();
    d. Wait for all threads to complete
    e. Exit

```
#include <stdio.h>
#include <pthread.h>

pthread_cond_t      cond     = PTHREAD_COND_INITIALIZER;
pthread_mutex_t    mutex = PTHREAD_MUTEX_INITIALIZER;

void *  sell(char *seller_type)
{
   While (having more work todo)
   {
          pthread_mutex_lock(&mutex);

          // atomically release mutex and wait on cond until somebody does signal or broadcast.
          // when you are awaken as a result of signal or broadcast, you acquire the mutex again.
          pthread_cond_wait(&cond, &mutex);
          pthread_mutex_unlock(&mutex);

          // Serve any buyer available in this seller queue that is ready
          // now to buy ticket till done with all relevant buyers in their queue
          ………………
    }
    return NULL;                    // thread exits
}


void wakeup_all_seller_threads()
{
   // get the lock to have predictable scheduling
   pthread_mutex_lock(&mutex);
   // wakeup all threads waiting on the cond variable
   pthread_cond_broadcast(&cond);
   pthread_mutex_unlock(&mutex);
}




int main()
{
   int i;
   pthread_t   tids[10];
   char  Seller_type;

   // Create necessary data structures for the simulator.
   // Create buyers list for each seller ticket queue based on the
   // N value within an hour and have them in the seller queue.
```

```
    // Create 10 threads representing the 10 sellers.
    seller-type = “H”;
    pthread_create(&tids[0], NULL, sell, &seller-type);

    seller-type = “M”;
    for (i = 1; i < 4; i++)
       pthread_create(&tids[i], NULL, sell, &seller-type);

    seller-type = “L”;
    for (i = 4; i < 10; i++)
       pthread_create(&tids[i], NULL, sell, &seller-type);

    // wakeup all seller threads
    wakeup_all_seller_threads();

    // wait for all seller threads to exit
    for (i = 0 ; i < 10 ; i++)
          Pthread_join(&tids[i], NULL);

    // Printout simulation results
    …………

    exit(0);
}
```