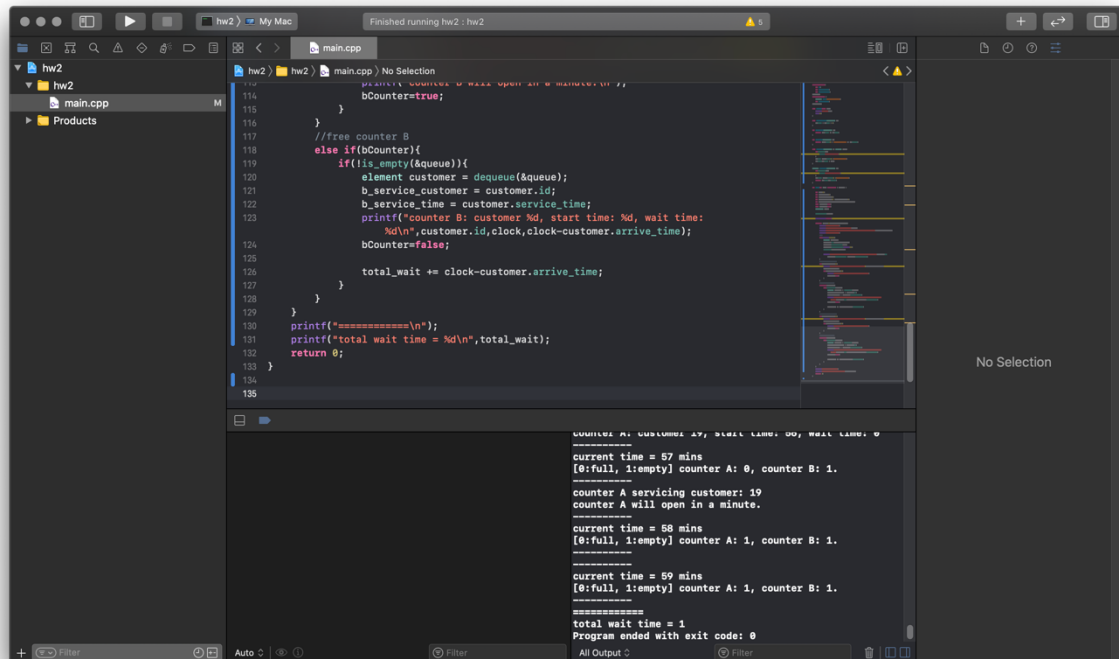


2018920065 루안리치 자료구조 과제#2



코드:

```

//
//  main.cpp
//  hw2
//
//  2018920065 LUAN LI CHI
//

#include <iostream>
#include <stdio.h>
#include <stdlib.h>

#define MAX_QUEUE_SIZE  200    //20 is too small

typedef struct{
    int id;
    int arrive_time;
    int service_time;
}element;
typedef struct {
    element data[MAX_QUEUE_SIZE];
    int front, rear;
}QueueType;

void error(char* msg){
    printf("%s\n",msg);
    exit(1);
}

void init_queue(QueueType* q){
    q->front = q->rear = 0;
}

int is_empty(QueueType* q){
    return (q->front == q->rear);
}
  
```

```

int is_full(QueueType* q){
    return ((q->rear+1) % MAX_QUEUE_SIZE == q->front);
}

void enqueue(QueueType* q, element item){
    if(is_full(q)){
        error("queue full\n");
    }
    q->rear = (q->rear+1) %MAX_QUEUE_SIZE;
    q->data[q->rear] = item;
}

element dequeue(QueueType* q){
    if(is_empty(q)){
        error("queue empty\n");
    }
    q->front = (q->front+1) %MAX_QUEUE_SIZE;
    return q->data[q->front];
}

int main(int argc, const char * argv[]) {

    int mins=60;
    int total_wait=0;
    int total_customer=0;
    int a_service_time=0, b_service_time=0;           //2 counters
    int a_service_customer, b_service_customer;
    bool aCounter=true;
    bool bCounter=true;
    QueueType queue;

    init_queue(&queue);

    srand(time(NULL));

    for(int clock=0;clock<mins;clock++){
        printf("-----\n");
        printf("current time = %d mins\n",clock);
        printf("[0:full, 1:empty] counter A: %d, counter B: %d.\n",aCounter,bCounter);
        printf("-----\n");
        //in
        if((rand()%10)<3){
            element customer;
            customer.id=total_customer++;
            customer.arrive_time=clock;
            customer.service_time=rand()%3+1;
            enqueue(&queue,customer);

            printf("customer:%d, arrival time:%d, service time:%d\n",customer.id,
customer.arrive_time, customer.service_time);
        }
        //service counter A
        if(a_service_time>0){
            printf("counter A servicing customer: %d\n", a_service_customer);
            a_service_time--;
            if(a_service_time==0){
                printf("counter A will open in a minute.\n");
                aCounter=true;
            }
        }
        //free counter A
        else if(aCounter){
            if(!is_empty(&queue)){
                element customer = dequeue(&queue);
                a_service_customer = customer.id;
                a_service_time = customer.service_time;
                printf("counter A: customer %d, start time: %d, wait time:
%d\n",customer.id,clock,clock-customer.arrive_time);
                aCounter=false;

                total_wait += clock-customer.arrive_time;
            }
        }
        //service counter B

```

```

        if(b_service_time>0){
            printf("counter B servicing customer: %d\n", b_service_customer);
            b_service_time--;
            if(b_service_time==0){
                printf("counter B will open in a minute.\n");
                bCounter=true;
            }
        }
        //free counter B
        else if(bCounter){
            if(!is_empty(&queue)){
                element customer = dequeue(&queue);
                b_service_customer = customer.id;
                b_service_time = customer.service_time;
                printf("counter B: customer %d, start time: %d, wait time: %d\n",customer.id,clock,clock-customer.arrive_time);
                bCounter=false;

                total_wait += clock-customer.arrive_time;
            }
        }
    }
    printf("=====\n");
    printf("total wait time = %d\n",total_wait);
    return 0;
}

```

실행결과:

```

-----
current time = 0 mins
[0:full, 1:empty] counter A: 1, counter B: 1.
-----
-----
current time = 1 mins
[0:full, 1:empty] counter A: 1, counter B: 1.
-----
-----
current time = 2 mins
[0:full, 1:empty] counter A: 1, counter B: 1.
-----
-----
current time = 3 mins
[0:full, 1:empty] counter A: 1, counter B: 1.
-----
customer:0, arrival time:3, service time:3
counter A: customer 0, start time: 3, wait time: 0
-----
current time = 4 mins
[0:full, 1:empty] counter A: 0, counter B: 1.
-----
counter A servicing customer: 0
-----
current time = 5 mins
[0:full, 1:empty] counter A: 0, counter B: 1.
-----
counter A servicing customer: 0
-----
current time = 6 mins
[0:full, 1:empty] counter A: 0, counter B: 1.
-----
customer:1, arrival time:6, service time:3
counter A servicing customer: 0
counter A will open in a minute.
counter B: customer 1, start time: 6, wait time: 0
-----
current time = 7 mins
[0:full, 1:empty] counter A: 1, counter B: 0.
-----
counter B servicing customer: 1

```

```

-----
current time = 8 mins
[0:full, 1:empty] counter A: 1, counter B: 0.
-----
customer:2, arrival time:8, service time:1
counter A: customer 2, start time: 8, wait time: 0
counter B servicing customer: 1
-----
current time = 9 mins
[0:full, 1:empty] counter A: 0, counter B: 0.
-----
customer:3, arrival time:9, service time:1
counter A servicing customer: 2
counter A will open in a minute.
counter B servicing customer: 1
counter B will open in a minute.
-----
current time = 10 mins
[0:full, 1:empty] counter A: 1, counter B: 1.
-----
counter A: customer 3, start time: 10, wait time: 1
-----
current time = 11 mins
[0:full, 1:empty] counter A: 0, counter B: 1.
-----
counter A servicing customer: 3
counter A will open in a minute.
-----
current time = 12 mins
[0:full, 1:empty] counter A: 1, counter B: 1.
-----
customer:4, arrival time:12, service time:3
counter A: customer 4, start time: 12, wait time: 0
-----
current time = 13 mins
[0:full, 1:empty] counter A: 0, counter B: 1.
-----
counter A servicing customer: 4
-----
current time = 14 mins
[0:full, 1:empty] counter A: 0, counter B: 1.
-----
counter A servicing customer: 4
-----
current time = 15 mins
[0:full, 1:empty] counter A: 0, counter B: 1.
-----
customer:5, arrival time:15, service time:2
counter A servicing customer: 4
counter A will open in a minute.
counter B: customer 5, start time: 15, wait time: 0
-----
current time = 16 mins
[0:full, 1:empty] counter A: 1, counter B: 0.
-----
counter B servicing customer: 5
-----
current time = 17 mins
[0:full, 1:empty] counter A: 1, counter B: 0.
-----
counter B servicing customer: 5
counter B will open in a minute.
-----
current time = 18 mins
[0:full, 1:empty] counter A: 1, counter B: 1.
-----
-----
current time = 19 mins
[0:full, 1:empty] counter A: 1, counter B: 1.
-----
-----
current time = 20 mins
[0:full, 1:empty] counter A: 1, counter B: 1.
-----

```

```

-----
current time = 21 mins
[0:full, 1:empty] counter A: 1, counter B: 1.
-----

current time = 22 mins
[0:full, 1:empty] counter A: 1, counter B: 1.
-----
customer:6, arrival time:22, service time:3
counter A: customer 6, start time: 22, wait time: 0
-----
current time = 23 mins
[0:full, 1:empty] counter A: 0, counter B: 1.
-----
customer:7, arrival time:23, service time:1
counter A servicing customer: 6
counter B: customer 7, start time: 23, wait time: 0
-----
current time = 24 mins
[0:full, 1:empty] counter A: 0, counter B: 0.
-----
counter A servicing customer: 6
counter B servicing customer: 7
counter B will open in a minute.
-----
current time = 25 mins
[0:full, 1:empty] counter A: 0, counter B: 1.
-----
customer:8, arrival time:25, service time:1
counter A servicing customer: 6
counter A will open in a minute.
counter B: customer 8, start time: 25, wait time: 0
-----
current time = 26 mins
[0:full, 1:empty] counter A: 1, counter B: 0.
-----
customer:9, arrival time:26, service time:3
counter A: customer 9, start time: 26, wait time: 0
counter B servicing customer: 8
counter B will open in a minute.
-----
current time = 27 mins
[0:full, 1:empty] counter A: 0, counter B: 1.
-----
counter A servicing customer: 9
-----
current time = 28 mins
[0:full, 1:empty] counter A: 0, counter B: 1.
-----
counter A servicing customer: 9
-----
current time = 29 mins
[0:full, 1:empty] counter A: 0, counter B: 1.
-----
customer:10, arrival time:29, service time:2
counter A servicing customer: 9
counter A will open in a minute.
counter B: customer 10, start time: 29, wait time: 0
-----
current time = 30 mins
[0:full, 1:empty] counter A: 1, counter B: 0.
-----
customer:11, arrival time:30, service time:3
counter A: customer 11, start time: 30, wait time: 0
counter B servicing customer: 10
-----
current time = 31 mins
[0:full, 1:empty] counter A: 0, counter B: 0.
-----
counter A servicing customer: 11
counter B servicing customer: 10
counter B will open in a minute.
-----
current time = 32 mins

```

```

[0:full, 1:empty] counter A: 0, counter B: 1.
-----
counter A servicing customer: 11
-----
current time = 33 mins
[0:full, 1:empty] counter A: 0, counter B: 1.
-----
customer:12, arrival time:33, service time:3
counter A servicing customer: 11
counter A will open in a minute.
counter B: customer 12, start time: 33, wait time: 0
-----
current time = 34 mins
[0:full, 1:empty] counter A: 1, counter B: 0.
-----
counter B servicing customer: 12
-----
current time = 35 mins
[0:full, 1:empty] counter A: 1, counter B: 0.
-----
customer:13, arrival time:35, service time:3
counter A: customer 13, start time: 35, wait time: 0
counter B servicing customer: 12
-----
current time = 36 mins
[0:full, 1:empty] counter A: 0, counter B: 0.
-----
counter A servicing customer: 13
counter B servicing customer: 12
counter B will open in a minute.
-----
current time = 37 mins
[0:full, 1:empty] counter A: 0, counter B: 1.
-----
counter A servicing customer: 13
-----
current time = 38 mins
[0:full, 1:empty] counter A: 0, counter B: 1.
-----
customer:14, arrival time:38, service time:2
counter A servicing customer: 13
counter A will open in a minute.
counter B: customer 14, start time: 38, wait time: 0
-----
current time = 39 mins
[0:full, 1:empty] counter A: 1, counter B: 0.
-----
counter B servicing customer: 14
-----
current time = 40 mins
[0:full, 1:empty] counter A: 1, counter B: 0.
-----
counter B servicing customer: 14
counter B will open in a minute.
-----
current time = 41 mins
[0:full, 1:empty] counter A: 1, counter B: 1.
-----
customer:15, arrival time:41, service time:2
counter A: customer 15, start time: 41, wait time: 0
-----
current time = 42 mins
[0:full, 1:empty] counter A: 0, counter B: 1.
-----
counter A servicing customer: 15
-----
current time = 43 mins
[0:full, 1:empty] counter A: 0, counter B: 1.
-----
counter A servicing customer: 15
counter A will open in a minute.
-----
current time = 44 mins
[0:full, 1:empty] counter A: 1, counter B: 1.

```

```

-----
customer:16, arrival time:44, service time:1
counter A: customer 16, start time: 44, wait time: 0
-----
current time = 45 mins
[0:full, 1:empty] counter A: 0, counter B: 1.
-----
counter A servicing customer: 16
counter A will open in a minute.
-----
current time = 46 mins
[0:full, 1:empty] counter A: 1, counter B: 1.
-----
current time = 47 mins
[0:full, 1:empty] counter A: 1, counter B: 1.
-----
current time = 48 mins
[0:full, 1:empty] counter A: 1, counter B: 1.
-----
current time = 49 mins
[0:full, 1:empty] counter A: 1, counter B: 1.
-----
current time = 50 mins
[0:full, 1:empty] counter A: 1, counter B: 1.
-----
current time = 51 mins
[0:full, 1:empty] counter A: 1, counter B: 1.
customer:17, arrival time:51, service time:3
counter A: customer 17, start time: 51, wait time: 0
-----
current time = 52 mins
[0:full, 1:empty] counter A: 0, counter B: 1.
-----
customer:18, arrival time:52, service time:3
counter A servicing customer: 17
counter B: customer 18, start time: 52, wait time: 0
-----
current time = 53 mins
[0:full, 1:empty] counter A: 0, counter B: 0.
-----
counter A servicing customer: 17
counter B servicing customer: 18
-----
current time = 54 mins
[0:full, 1:empty] counter A: 0, counter B: 0.
-----
counter A servicing customer: 17
counter A will open in a minute.
counter B servicing customer: 18
-----
current time = 55 mins
[0:full, 1:empty] counter A: 1, counter B: 0.
-----
counter B servicing customer: 18
counter B will open in a minute.
-----
current time = 56 mins
[0:full, 1:empty] counter A: 1, counter B: 1.
-----
customer:19, arrival time:56, service time:1
counter A: customer 19, start time: 56, wait time: 0
-----
current time = 57 mins
[0:full, 1:empty] counter A: 0, counter B: 1.
-----
counter A servicing customer: 19
counter A will open in a minute.
-----

```

```
current time = 58 mins
[0:full, 1:empty] counter A: 1, counter B: 1.
-----
current time = 59 mins
[0:full, 1:empty] counter A: 1, counter B: 1.
-----
=====
total wait time = 1
Program ended with exit code: 0
```