



East West University

Project Report

Operating System

CSE-325

Modified Hilzer's Barbershop problem

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Modified Hilzer's Barbershop problem

William Stallings presents a more complicated version of the barbershop problem, which he attributes to Ralph Hilzer at the California State University at Chico. Our barbershop has three chairs, three barbers, and a waiting area that can accommodate four customers on a sofa and that has standing room for additional customers. Fire codes limit the total number of customers in the shop to 20.

A customer will not enter the shop if it is filled to capacity with other customers. Once inside, the customer takes a seat on the sofa or stands if the sofa is filled. When a barber is free, one of the customers from the sofa is served (whoever gets to the chair first) and, if there are any standing customers, one of them takes a seat on the sofa whoever gets the chance first. When a customer's haircut is finished, any barber can accept payment, but because there is only one cash register, payment is accepted for one customer at a time. The barbers divide their time among cutting hair, accepting payment, and sleeping in their chair waiting for a customer.

In other words, the following synchronization constraints apply:

- ☐ Customers do the following functions in order: enter the Shop, sit on sofa, sit in the barber chair, pay, exit shop.
- ☐ Barbers do the following: they cut hair and accept payment.
- ☐ Customers cannot enter the shop if the shop is at capacity.
- ☐ If the sofa is full, an arriving customer cannot sit on the sofa until one of the customers on the sofa sits in the barber chair.
- ☐ If all three barber chairs are busy, an arriving customer cannot sit in the barber chair until one of the customers in a chair pays for the hair cut
- ☐ The customer has to pay before the barber can accept payment.
- ☐ The barber must accept payment before the customer can exit shop.

Write code that enforces the synchronization constraints for Hilzer's barbershop.

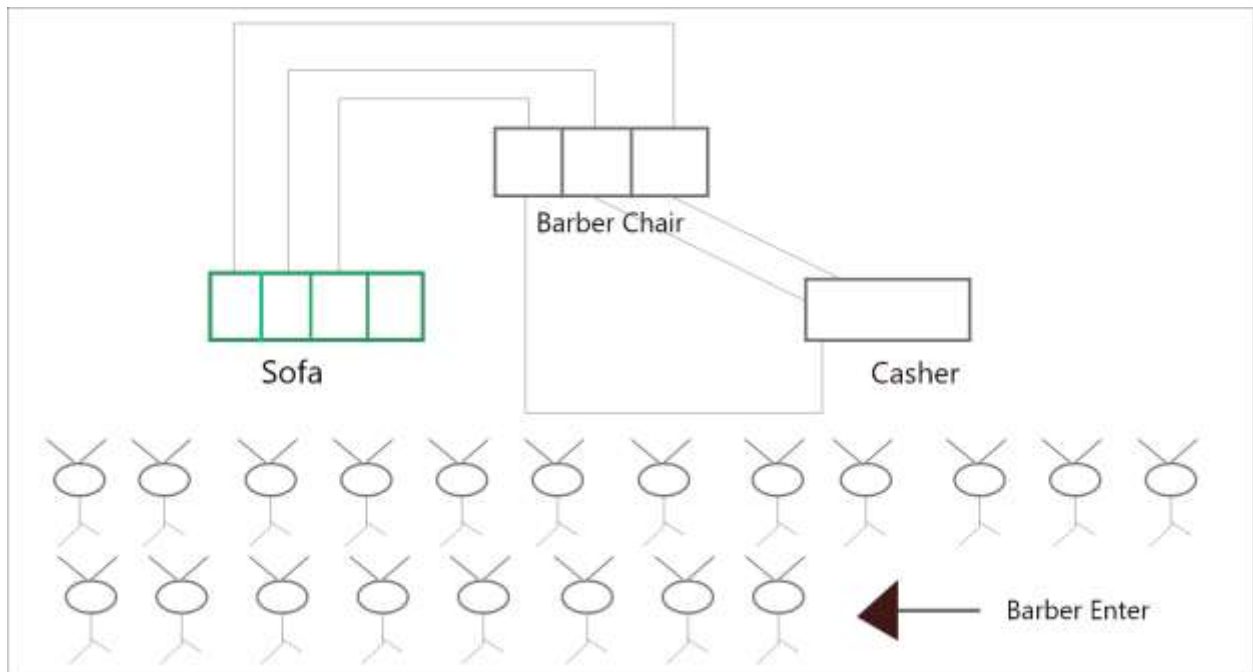


Figure: Problem Scratch

Problem Solve statement:

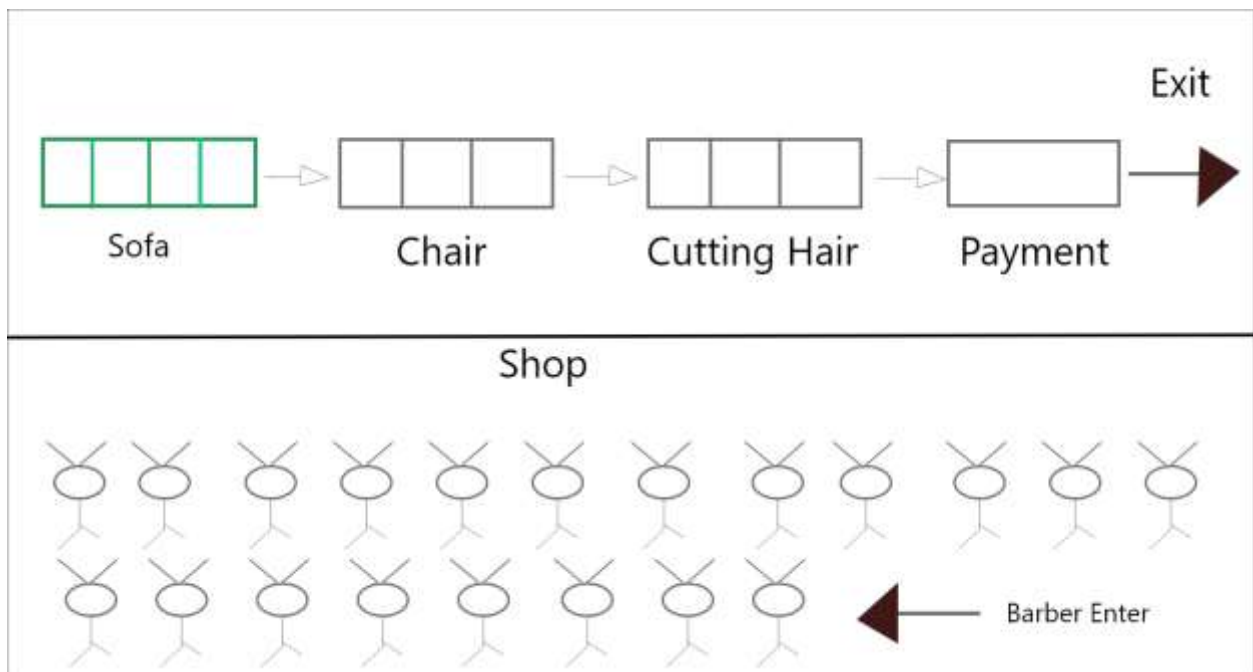


Figure: Solving Scratch

Using semaphore:

```
sem_t empty1; //using for shop  
sem_t empty2; //using for sofa  
sem_t empty3; //using for chair  
sem_t barber_ready; // using for barber ready  
sem_t finished; // using haircut is complete  
sem_t payment; // Customer pay bill  
sem_t receipt; //receipt for payment
```

Buffer use:

```
queue<int> shop; // Enter all customer  
queue<int> sofa; //Enter 4 customer seat sofa at a time  
queue<int> chair; //Enter 3 customer seat chair at a time  
queue<int> barbr; // Enter 3 customer seat chair at a time and cutting hair  
queue<int> paymnt; // Enter 1 Customer payment at a time
```

Mutex_Lock:

Using lock for avoid critical section.

For Example, pthread_mutex_t lock1;

pthread_mutex_t lock2;

For detail, check this link:

Project Code link:

https://github.com/saifulislamsarfaraz/CSE325_Operating_System_Lab_Process/blob/master/Project_CSE345/8.cpp

Output:

```
Group: 8
Name: Md Saiful
ID: 2019-2-60-040
Name: Md Jekrul Islam
ID: 2019-2-60-046

I am Customer 2
I am Customer 3
Enter room customer number 3
I am Customer 5
Enter room customer number 5
I am Customer 7
Enter room customer number 7
I am Customer 9
Enter room customer number 9
I am Customer 10
Enter room customer number 10
I am Customer 12
Enter room customer number 12
I am Customer 14
Enter room customer number 14
I am Customer 16
Enter room customer number 16
I am Customer 18
Enter room customer number 18
I am Customer 8
Enter room customer number 8
I am Customer 4
Enter room customer number 4
```

I am Customer 14
Enter room customer number 14
I am Customer 16
Enter room customer number 16
I am Customer 18
Enter room customer number 18
I am Customer 8
Enter room customer number 8
I am Customer 4
Enter room customer number 4
I am Customer 20
Enter room customer number 20
I am Customer 11
Enter room customer number 11
I am Customer 15
Enter room customer number 15
I am Customer 19
Enter room customer number 19
I am Customer 17
Enter room customer number 17
I am Customer 13
Enter room customer number 13
Enter room customer number 2
I am Customer 1
Enter room customer number 1
I am Customer 6
Enter room customer number 6
Customer seat sofa 1

Customer seat sofa 2
Customer seat sofa 3
Customer seat sofa 4
Get up from sofa 1
Get up from sofa 2
Get up from sofa 3
Seat in barber chair 1
Seat in barber chair 2
Seat in barber chair 3
Customer seat sofa 5
Customer seat sofa 6
Customer seat sofa 7
Barber 1 cutting hair 1
Get up from sofa 4
make payment 1
Accept payments from 1
Exit from shop 1
Barber 2 cutting hair 2
Barber 3 cutting hair 3
Get up from sofa 5
make payment 2
Accept payments from 2
Exit from shop 2
make payment 3
Get up from sofa 6
Accept payments from 3
Exit from shop 3
Seat in barber chair 4

Seat in barber chair 5
Seat in barber chair 6
Customer seat sofa 8
Barber 1 cutting hair 4
Customer seat sofa 9
make payment 4
Barber 2 cutting hair 5
Get up from sofa 7
Customer seat sofa 10
Accept payments from 4
Barber 3 cutting hair 6
Exit from shop 4
make payment 5
Accept payments from 5
Exit from shop 5
make payment 6
Accept payments from 6
Exit from shop 6
Get up from sofa 8
Get up from sofa 9
Seat in barber chair 7
Seat in barber chair 8
Customer seat sofa 11
Seat in barber chair 9
Customer seat sofa 12
Barber 1 cutting hair 7
Customer seat sofa 13
make payment 7

Get up from sofa 10
Accept payments from 7
Exit from shop 7
Barber 2 cutting hair 8
Get up from sofa 11
make payment 8
Accept payments from 8
Exit from shop 8
Barber 3 cutting hair 9
make payment 9
Get up from sofa 12
Accept payments from 9
Exit from shop 9
Seat in barber chair 10
Seat in barber chair 11
Customer seat sofa 14
Seat in barber chair 12
Customer seat sofa 15
Barber 1 cutting hair 10
Get up from sofa 13
make payment 10
Accept payments from 10
Exit from shop 10
Customer seat sofa 16
Barber 2 cutting hair 11
Get up from sofa 14
make payment 11
Accept payments from 11

Exit from shop 11
Barber 3 cutting hair 12
make payment 12
Get up from sofa 15
Accept payments from 12
Exit from shop 12
Seat in barber chair 13
Seat in barber chair 14
Seat in barber chair 15
Customer seat sofa 17
Customer seat sofa 18
Barber 1 cutting hair 13
Get up from sofa 16
make payment 13
Accept payments from 13
Exit from shop 13
Customer seat sofa 19
Barber 2 cutting hair 14
make payment 14
Get up from sofa 17
Accept payments from 14
Exit from shop 14
Barber 3 cutting hair 15
Get up from sofa 18
make payment 15
Accept payments from 15
Exit from shop 15
Seat in barber chair 16

Seat in barber chair 17
Seat in barber chair 18
Customer seat sofa 20
Barber 1 cutting hair 16
make payment 16
Get up from sofa 19
Accept payments from 16
Exit from shop 16
Barber 2 cutting hair 17
Get up from sofa 20
make payment 17
Accept payments from 17
Exit from shop 17
Barber 3 cutting hair 18
make payment 18
Accept payments from 18
Exit from shop 18
Seat in barber chair 19
Seat in barber chair 20
Barber 1 cutting hair 19
make payment 19
Accept payments from 19
Exit from shop 19
Barber 2 cutting hair 20
make payment 20
Accept payments from 20
Exit from shop 20

