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Semaphore Elevators Design

Semaphore List

1. floorReached[] – a semaphore to track the location of the elevator. When the elevator reaches floor i, it will release permits equal to the amount of people expected to enter or exit the elevator on floor i.
2. max_cap – a semaphore used to track the number of people currently in the elevator. Starts at 7 when the elevator can fit 7 more people and decreases as people enter.
3. mutex – a simple mutex implemented as semaphore to prevent any writing faults to the queue.
4. exited – a semaphore used to signal when people exit the elevator onto their destination floor. Mainly for synchronization purposes, to make sure the elevator waits for people to exit before closing the door.
5. entered – a semaphore used to signal when people enter the elevator from the ground floor. Main for synchronization purposes, to make sure the elevator waits for 7 people to enter from the ground floor before closing the door.

Pseudocode

StairHater()

```
wait(max_cap);

wait(floorReached[1]);

enter(number, destination);

signal(entered);


wait(mutex);

queue.add(destination);

signal(mutex);


wait(floorReached[destination]);

exit(number);

signal(exited);

signal(max_cap);
```

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```
Elevator()
        cycles = 0;
        while(cycles < 7) //hard code loop to repeat seven times
                openDoor(1);
                signal(floorReached[1], 7);
                wait(entered, 7);
                closeDoor();
                int exitingPeople;
                for (int i = 2; i < 11; i++)
                        exitingPeople = 0;
                        for (int j : floor)
                                if (i == j)
                                        exitingPeople++;
                        if (exitingPeople > 0)
                                openDoor(i);
                                for (int k = 0; k < exitingPeople; k++)
                                        signal(floorReaced[i]
                                wait(exited, exitingPeople);
                                closeDoor();
                while (queue.isEmpty() == false)
                        queue.remove();
                cycles++;

enter(int number, int destination)
        println("Person "+number+" enters the elevator to go to floor " + destination);
exit(int number)
        println("Person "+number+" leaves the elevator");
openDoor(int number)
        println("The elevator door closes on floor "+number);
```

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closeDoor()

println(“The elevator door closes”);