Elevator design:

Problem: An Elevator needs to be designed that takes internal from inside the elevator (hereafter IR) and external requests from lobby (hereafter ER) and moves to fulfill the requests. The elevator needs to service all requests in one direction followed by requests in the other direction. The elevator can start start from stationary condition from any floor. After servcing all requests it should stay stay stationary at the last requested floor and proceed to service new requests when they are recieved.

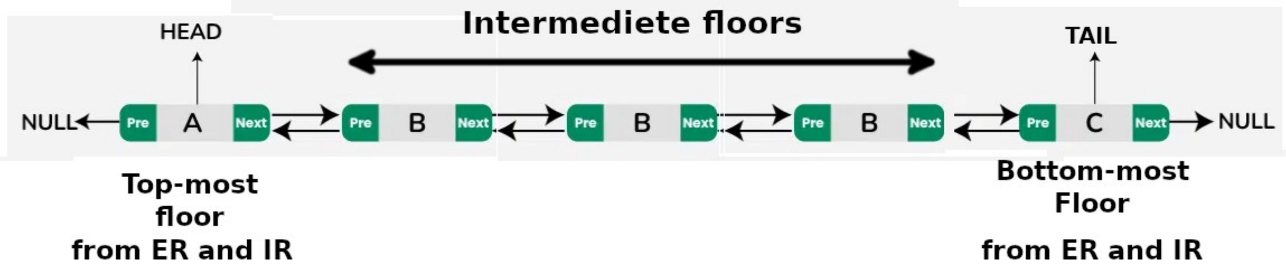
Assumptions:

- The elevator inputs (ER and IR) are recieved in a synchronized way at each floor.
- The elevator does not recieve any requests to the floor it is currently located. An user is expected not to press the same floor number internally where the lift is currently located. Similarly, an user does not need to press an up or down key if the elevator has stopped at the current floor. He can just walk into the elevator.
- If an elevator needs to stop at a floor, the request should be recieved atleast one floor prior to the intended stop.

Method:

The elevator is modelled as a doubly linked list(DLL). The head and tail of the DLL represents the topmost and bottom-most floor that needs to be traversed as per requests (external and internal). All intermediete floors between the top and the bottom floor form the intermediate nodes of the DLL. The DLL evolves as more new ER and IR are recieved and serviced by the lift. The elevator asks for ER and IR at every floor and keeps moving as per the requests. When all requests have been fulfilled the elevator becomes STATIONARY at the final serviced node. On receiving new requests at STATIONARY state, the elevator elevator decides direction of travel giving priority in the following order

- If there are one or more IR recieved, the lift moves in direction of the first IR
- If there is no IR, but one or more ER, the lift moves in direction of the first ER



Important Variables:

- ER: external requests emanating from the lobby at each floor represented as a pair (floor_index, direction)
- IR: internal requests emanating from the elevator represented as a pair (floor_index)
- ELEVATOR direction: UP, DOWN, STATIONARY (enumerated as 0,1,2)
- Pending IR, ER: pending requests.

User inputs:

- The prompt on the screen for capturing IR would be *“Enter IR (floor values) (enter -1 to finish)”*. The user can input the intended floor or press -1 if no input is desired.
- The prompt on the screen for capturing IR would be *“Enter ER (floor value with direction) (or -1 to finish)”*. The user can input the intended floor along with the direction of travel. Or he can press -1 if no input is desired.

How to compile:

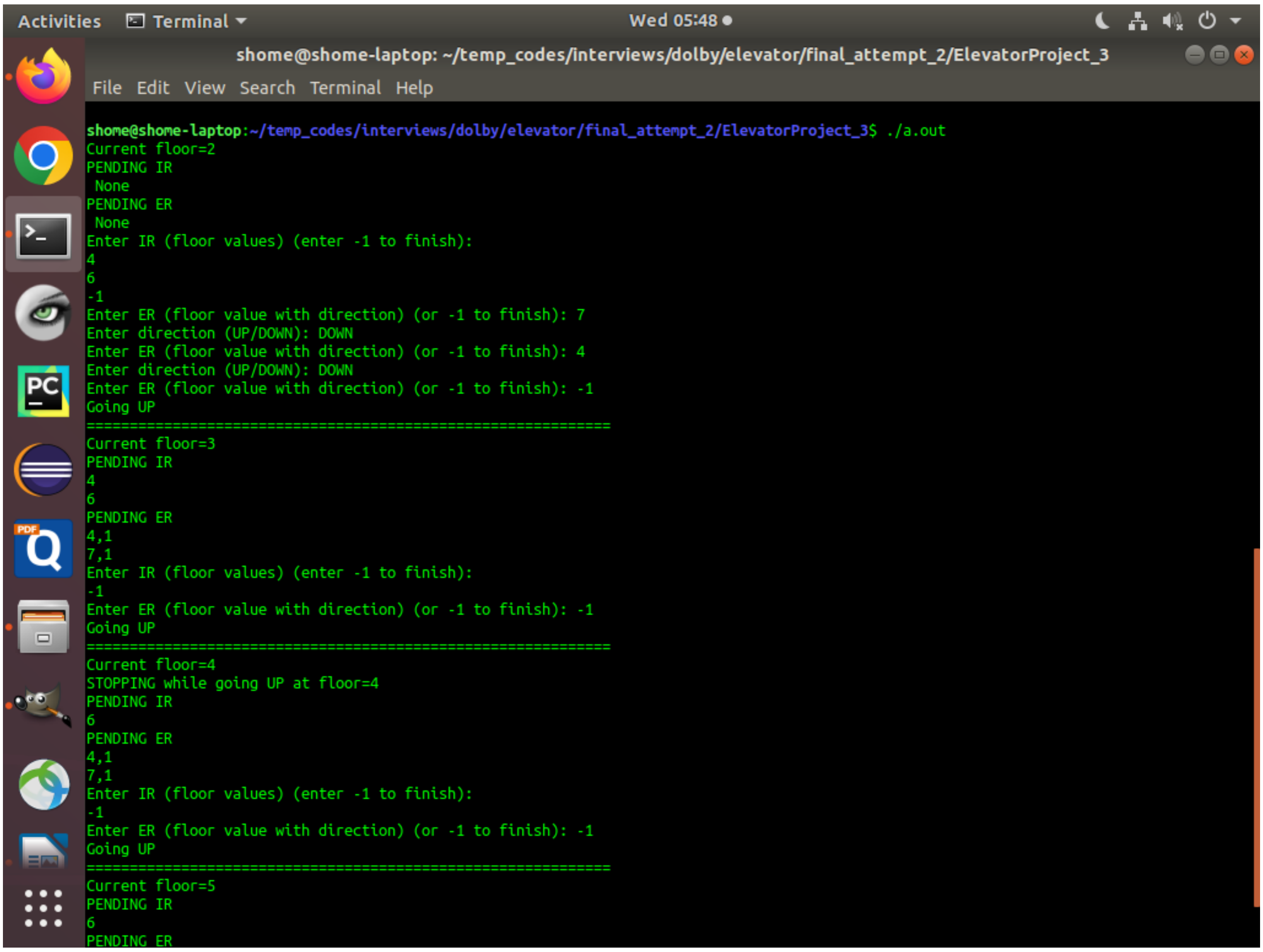
```
g++ -std=c++11 main.cpp create_requests.cpp elevator_DLL.cpp utils.cpp
```

Outputs screenshots:

The elevator is at floor 2 initially. It recieves two IR (4 and 6), two ER ((7, DOWN), (4, DOWN)). The elevator starts moving up (as shown in the going UP message). It stops at designated stops 4, 6, 7 while going up. While returning it stops at floor 4 and becomes stationary. This process of can keep going on forever as shown in attached video. The elevtaor works in the following sequence at each floor:

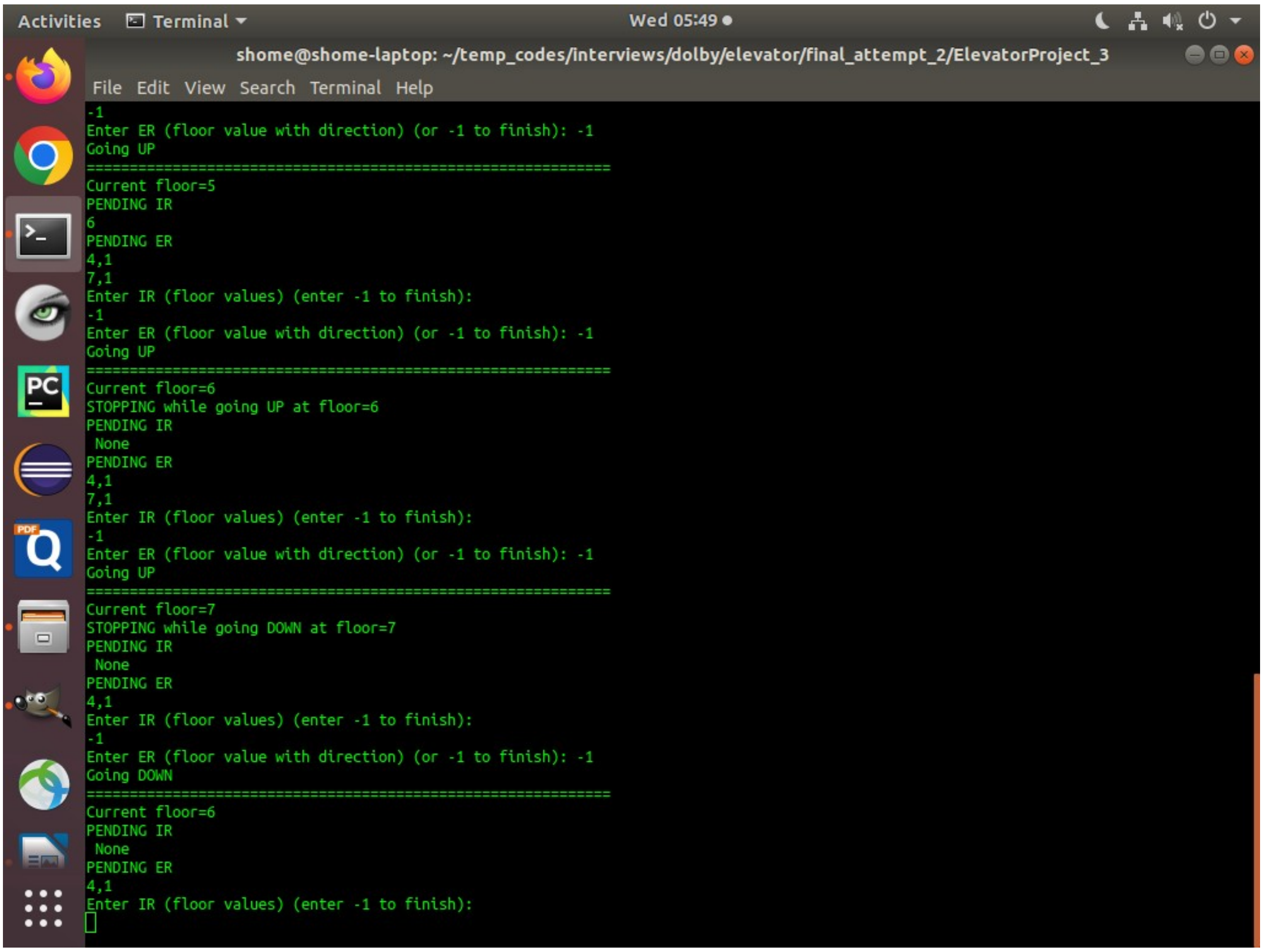
- Display current floor value
- Display current pending requests (external and internal)
  - ○ *ER (4,1) indicates that a user at 4th floor intends to go down*
  - ○ *IR (4) indicates that a person inside the elavtor wants the lift to stop at 4th floor.*
- Accept new requests (ER and IR)
- Compute and show the direction of motion of the elevator.

The screenshots below show the elevator outputs while fulfilling the requests.


Activities
Terminal
Wed 05:48
shome@shome-laptop: ~/temp_codes/interviews/dolby/elevator/final_attempt_2/ElevatorProject_3
File Edit View Search Terminal Help

```
shome@shome-laptop:~/temp_codes/interviews/dolby/elevator/final_attempt_2/ElevatorProject_3$ ./a.out
Current floor=2
PENDING IR
 None
PENDING ER
 None
Enter IR (floor values) (enter -1 to finish):
4
6
-1
Enter ER (floor value with direction) (or -1 to finish): 7
Enter direction (UP/DOWN): DOWN
Enter ER (floor value with direction) (or -1 to finish): 4
Enter direction (UP/DOWN): DOWN
Enter ER (floor value with direction) (or -1 to finish): -1
Going UP
=============================================================
Current floor=3
PENDING IR
4
6
PENDING ER
4,1
7,1
Enter IR (floor values) (enter -1 to finish):
-1
Enter ER (floor value with direction) (or -1 to finish): -1
Going UP
=============================================================
Current floor=4
STOPPING while going UP at floor=4
PENDING IR
6
PENDING ER
4,1
7,1
Enter IR (floor values) (enter -1 to finish):
-1
Enter ER (floor value with direction) (or -1 to finish): -1
Going UP
=============================================================
Current floor=5
PENDING IR
6
PENDING ER
```

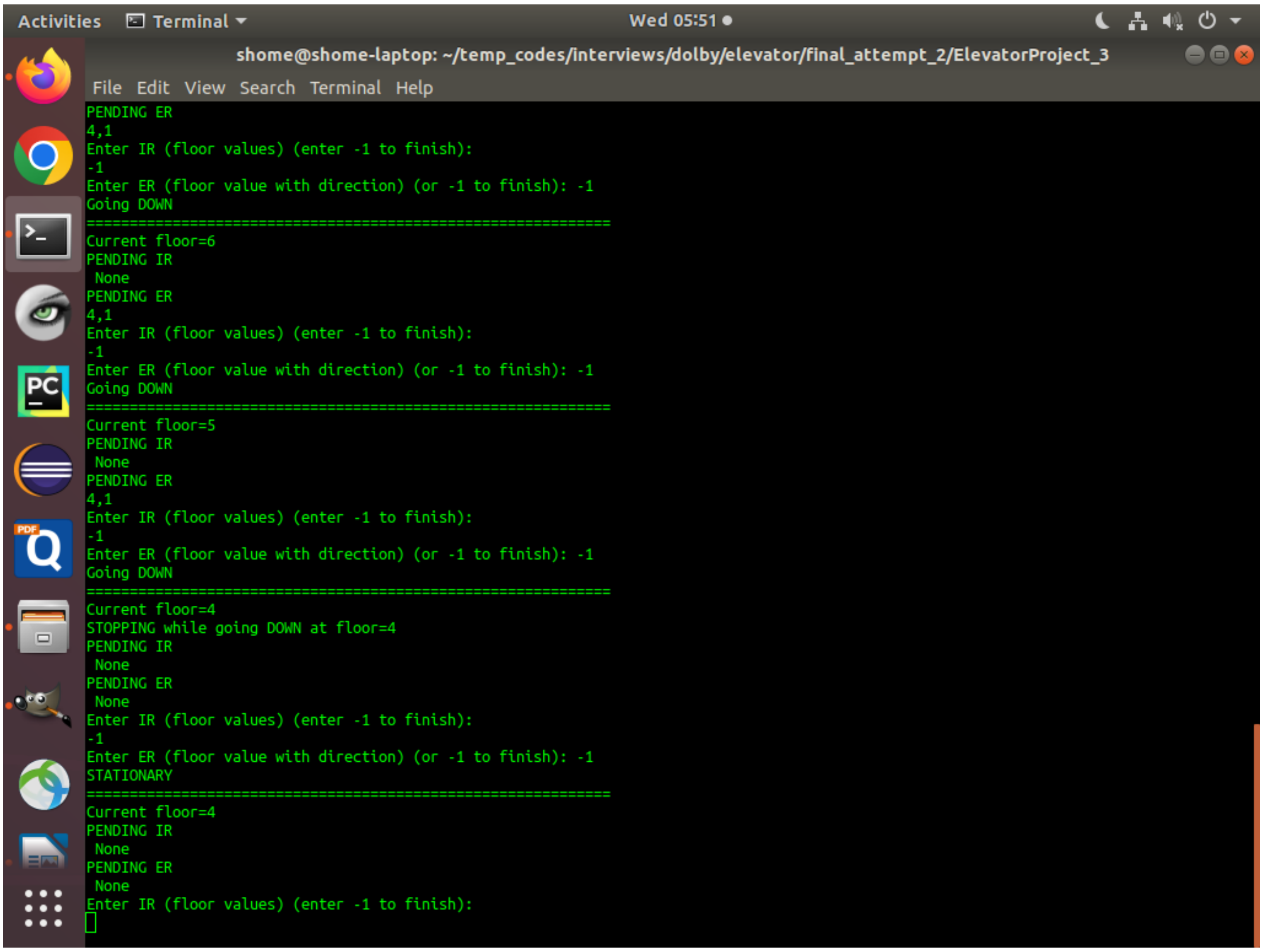
PTO



Activities
Terminal
Wed 05:49
shome@shome-laptop: ~/temp_codes/interviews/dolby/elevator/final_attempt_2/ElevatorProject_3
File Edit View Search Terminal Help

```
-1
Enter ER (floor value with direction) (or -1 to finish): -1
Going UP
============================================================
Current floor=5
PENDING IR
6
PENDING ER
4,1
7,1
Enter IR (floor values) (enter -1 to finish):
-1
Enter ER (floor value with direction) (or -1 to finish): -1
Going UP
============================================================
Current floor=6
STOPPING while going UP at floor=6
PENDING IR
 None
PENDING ER
4,1
7,1
Enter IR (floor values) (enter -1 to finish):
-1
Enter ER (floor value with direction) (or -1 to finish): -1
Going UP
============================================================
Current floor=7
STOPPING while going DOWN at floor=7
PENDING IR
 None
PENDING ER
4,1
Enter IR (floor values) (enter -1 to finish):
-1
Enter ER (floor value with direction) (or -1 to finish): -1
Going DOWN
============================================================
Current floor=6
PENDING IR
 None
PENDING ER
4,1
Enter IR (floor values) (enter -1 to finish):
```

PTO



Activities
Terminal
Wed 05:51
shome@shome-laptop: ~/temp_codes/interviews/dolby/elevator/final_attempt_2/ElevatorProject_3
File Edit View Search Terminal Help

```
PENDING ER
4,1
Enter IR (floor values) (enter -1 to finish):
-1
Enter ER (floor value with direction) (or -1 to finish): -1
Going DOWN
=============================================================
Current floor=6
PENDING IR
 None
PENDING ER
4,1
Enter IR (floor values) (enter -1 to finish):
-1
Enter ER (floor value with direction) (or -1 to finish): -1
Going DOWN
=============================================================
Current floor=5
PENDING IR
 None
PENDING ER
4,1
Enter IR (floor values) (enter -1 to finish):
-1
Enter ER (floor value with direction) (or -1 to finish): -1
Going DOWN
=============================================================
Current floor=4
STOPPING while going DOWN at floor=4
PENDING IR
 None
PENDING ER
 None
Enter IR (floor values) (enter -1 to finish):
-1
Enter ER (floor value with direction) (or -1 to finish): -1
STATIONARY
=============================================================
Current floor=4
PENDING IR
 None
PENDING ER
 None
Enter IR (floor values) (enter -1 to finish):
```

As shown above the elevator is stationary after processing all requests.

DONE!