MINSU KIM [minsukim123@gmail.com]

CSCI 10 B

term project write-up

Background

- Background is copied from the proposal word to word.
- Many people working in the tall building are tired and frustrated of the dumb elevator, which moves by some incomprehensible logic.
- As an example, saying I am at the ground floor and want to go upstairs. When I call the elevator, even though there is an available elevator at 3th floor, the other one at 20th floor is moving to me. I have to wait longer time.
- Some people said when elevator manufacturer cares for building owner's interests first, which is to reduce electricity consumption most, and then resident's conveniences is second to care. This opinion claims elevator logic is smart enough but they don't care me.
- Other people said that elevator logic is very difficult because elevator can't anticipate user's actions, and user always change their action. This opinion claims that elevator is dumb, but I can not be smarter than the existing dumb elevator.
- I was always curious if I was smart enough to enhance the elevator. This simulation program will conduct various test of elevator movement. The results is for minimizing passengers waiting time, and also elevator's electricity consumption minimize.

Objective

- Assuming you are a building owner, or building constructor, who want to make very effective in-building transportation system, so to say, elevators. Your challenge is to satisfy residents by minimizing their waiting time while keep the elevator's energy consumption low enough.
- This program will help you find out optimal elevator number, capacity, and logic. You can input manipulate variables such as number of elevators and floors, number of passengers staying, frequency of boarding elevator, and 6 more options.
- And you will get simulation report describing how successful your elevator system was, in the aspect of customer satisfaction and energy effecienty.

How to run

- 5 Files :
    - Building.java
    - Elevator.java
    - Passenger.java
    - Settings.java
    - Simulation.java
- Locate all java file into same directory

- Compile :
  - **javac *.java**
- Run :
  - **java –cp . Simulation**
- This program generates 'lastresult.out' in the directory. Be sure to delete this file if your program stop unexpectedly. Or the program may not produce report.

How to use the program : Detailed manual

- java –cp . Simulation

[CONFIGURATION]

- You will get configuration window. Set each item as desired or leave it default value and click the button [Do It] at bottom.
- If you put an invalid value, then you can't proceed.

[Configuration item and what it means]

Note that intuitive item is not described

Configuration item	What it means
Number of elevators	
Number of floors	* 15 floors or more result in incomplete display.
Number of Passengers	
Riding frequency for one hour	1 means a passenger is likely to move once an hour. 10 means a passenger is likely to move 10 times an hour.
Elevator capacity	
Simulation Duration in minute	Simulation duration
Elevator call algorithm	When a passenger call elevator, which one responds? 0 : Any WAITING elevator in elevator's serial order 1 : Calculate distance from the call, considering elevator's moving direction 2 : Same as 1, but avoid WAITING one to move because elevator staring is expensive.
Passenger patience	Passenger will be very angry when they wait more than travel multiplied by patience. In pseudo code : If (Waiting > (Travel * Patience)) Passenger.veryAngry ();
Resolution	1 : Low resolution 2 : High resolution

[SIMULATION]

- Now the simulation windows will show up. This will shows each elevator's movement in between floors, and where the passenger is and how they act.
- Far left top corner, there is time elapsed.
- You have three control buttons on top.

[Three control buttons]

Configuration item	What it means

FASTER	Make the simulation faster
SLOWER	Make the simulation slower
SKIP	Skip the graphical effect and jump to the result

[REPORT]

- After finishing each simulation, you will get report.
- The report consists of four part. Here is what each information means
  Note that intuitive item is not described

Configuration item		What it means
SIMULATION INFO		What you configured for the simulation
PASSENGER	Travel hour of all passenger	
	Waiting hour of all passenger	all passenger's WAITING and BOARDING hour. BOARDING is included as it sometimes succeed, sometimes not.
BUILDING OWNER	Travel hour of all Elevator	
	Stop and start number of all Elevator	
	Elevator energy consumption	Elevator stop and start requires more energy than usual moving. My assumption is five times more.
INDEX	Num of VERY ANGRY passenger	If number is big, some passengers may complain and the the building's bad reputation may spread out. So you have to keep it low.
	PASSENGER waiting / travel ratio	This number indicates general customer satisfaction as how long passengers had waited to board.
	OWNER energy consumption per moving a floor	This number indicates how many energy consumed to move one resident by one floor. If big, your elevator is not efficient enough.

- It is hard to see whether the simulation is successful or not by the simulation's own result. After the first simulation, you will see the current and previous result together.
- The report will indicates which simulation result was better, for INDEX items.

[EXPANSION]

- To develop more elevator movement algorithm. Currently it has three algorithms to assign elevator for call from each floor, and one algorithm how elevator set its destination.
- To store and report more information. This program can produce a lot more information about elevators and passengers.
- To accumulate more simulation results to analyze. Currently it has only one previous result to compare.

[REACTIONS]

- When I take CSCI 10 A, I had decided to develop elevator simulator as my personal project by end of CSCI 10 A. It was postponed a semester, but with a lot more detail. It was good to develop my own program instead of homework.
- Make simulation to work was more difficult than I expected. I developed this simulation on text base first. When I finish GUI, I realize that there were more bugs that I did not recognize.
- My good point to practice was as following :
  - Class design experience, of which basic idea is derived of CSCI 55. By designing elevator and passenger class, I practiced how to reflect the model of real world.
  - Make major status as static final variables, which enhanced code readability.
- My regret :
  - My program might have some inefficiency. I might have the building to store each floor's status that how many passengers are staying and waiting.

[UNDISCOVERED FEATURE]

- Do you think this simulation is unrealistic? Real constructor or building owner does not likely to use this simulation? Or you are not a building owner or constructor? If I admit all those challenges, still this program has very special feature :
- This program can give special treatment for busy people. If you are under severe pressure such as taking CSCI 10b final exams or grading the exam, you may watch the moving elevators as some goldfish and water plant in a small basin. It will empty your brain. That is the way how I use this program. ☺