UPPSALA
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Model Based Design of Embedded Systems
1DT059
Assignment 3

Simulink Matlab

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Bridge Torch Problem:

A simulink model has been designed to solve the bridge torch problem. A stateflow diagram has been modelled in a way that all the inputs and the conditions have been provided where the system can use all different possibilities of the people crossing. The initial condition mentioned is that all input should be positive. The next condition is that all the inputs should add up to be less than or equal to two which means that only two people can cross the bridge at once and not more. The torch is modelled in a way where we use it to check the position. If the torch is 0 it means that it is on Side A and if it is 1 it means that it has moved. When two people are crossing the bridge their respective values are made 1 along with the torch which implies that the persons as well as the torch is moving. A parameter 'n' has been added which is connected to the verification block to find all the different possible time taken to cross the bridge. In the model the parameter is represented with a constant block whose value can be changed to compare and view all the different times taken.
The objective of the model is to find the shortest time that the four persons can take to cross the bridge. If we add up all the total times they take we get 18 minutes. Hence we set the parameter 'n' as 18 to find the shortest time taken. The last condition is used to filter out invalid inputs where the torch can move only with a person and cannot move by itself. The minimum time taken for all four persons to cross is 17 minutes. This is achieved when one and two cross first. Two comes back and then five and ten cross. One comes back and then one and two go back again, which leads to a total time of 17 minutes. The maximum time taken for the model is 50 minutes where ten goes back and forth in all time steps. A report of the design verifier has been attached which shows the simulation results for the shortest time taken.

Requirements for Elevator:

The elevator model has been changed completely post the feedback provided for assignment 2b and the problem of "teleportation" has been solved. The requirements for the elevator have been designed using the best of my learning's. The model take extremely long to run for each requirement and provide results for the same. As mentioned by the instructor, if the model takes too long it's fine to submit unsatisfied results as we are more keen on the correctness of the verification modelling.

- R1: This requirement asks to model a verification in such a way that the door opens only when it has reached any of the floor positions and shouldn't open when the elevator is moving. The conditions for the verification have been modelled and executed.
- R2: This requirement asks to model a verification to show that the door once opened stays opened for at least 5 seconds. Here the door signal has

been checked in such a way that it must be open or at least 5 seconds if not it moves to a state where a flag is set.

- R3: This requirements asks the model to verify that only if a button for a particular floor has been pressed then the lift must stop only at that floor. Here only one floor has been modelled as the remaining floors are a replication. Hence if the model is satisfied for one floor it should logically satisfy it for the remaining.

- R4: This requirement states that the elevator stops at a floor only if the button for that floor has been pressed and it the button for any other floor has been pressed and the button for the same floor has been pressed, the elevator must got to the floor which was pressed and then come back to the next floor. Ex: if the button for floor 2 has been pressed and the elevator moves to it, it stops opens the door and then closes the door. If the button for floor 3 has been pressed and then 2 is pressed again then the elevator must move to floor 3 and then come back to floor 2 and it shouldn't open at 2 again and then move to floor 3.

- R5: If the button for floor 4 and floor 3 is pressed. The elevator must stop at 3 at most once before it moves to floor 4.

- R6: If a button for any floor has been pressed, the time taken for the elevator to arrive to that floor has to be calculated and it should arrive to that floor within "d" times unit. For this requirement only floor 3 has been modelled.