

IE 3081 MODELLING AND DISCRETE SIMULATION – HW5

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DINING HALL SIMULATION | UNIVERSITY

SYSTEM COMPONENTS

ENTITIES and ATTRIBUTES:

- Student
- Academician
- Classic Dining Hall Food Service Points for Students (Speed, Probability)
 - Classic Service Left-side (Speed: slow by classic service)
 - Classic Service Right-side (Speed: fast by classic service)
- Vegetarian, vegan and Gluten-free Dining Hall Food Service Point for Students (Speed, Probability)
- Dining Hall Service Point for Academicians (Speed, Probability)
- Dining Area
- ATM Machine (Probability)

ACTIVITIES:

- Student may go to classic dining hall food service points.
- Student may go to vegetarian and gluten-free dining hall food service point.
- Student may go to ATM.
- Academicians go to dining hall service point.
- After the dining hall food service, everyone goes to the dining area.
- After loading money from the ATM, everyone goes to one of the dining hall food services.

EVENTS:

- Students or academicians arrival to the dining hall.
- Students may or may not pass dining hall service points according to their balance.
- Serve food.

STATES:

- Busy
- Idle

DELAYS:

- Students wait in one of the food service queue.
- Students wait in the ATM queue.
- Students wait in the dining area.
- Academicians wait in the food service queue.

RELATIONS BETWEEN SYSTEM COMPONENTS

- According to the possibilities, the academician or student arrive the dining hall.
- The student goes to ATM or classic or vegetarian, gluten-free food service depending on the possibilities. If there is a queue, they wait in line.
- If the student went to the ATM, he/she enters the food service queue after the ATM.
- Students leaving the food service points stand in line in case of a queue at the dining area.
- The academician goes directly to the academician food service point. If there is a queue, they wait in line.
- Academicians who leave the food service point go to the dining hall. If there is a queue, they wait.

INPUT VARIABLES

Person Arrival Time	
1.0	0.15
2.0	0.25
3.0	0.35
4.0	0.25

AcademicianDistrubution	
1.0	0.4
2.0	0.3
3.0	0.3

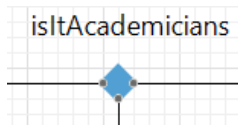
VGDistribution	
1.0	0.33
2.0	0.33
3.0	0.17
4.0	0.17

ClassicalDistrubutionFast	
1.0	0.17
2.0	0.32
3.0	0.21
4.0	0.3

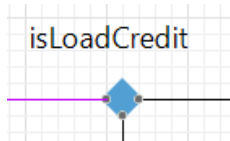
ClassicalDistrubutionSlow	
1.0	0.25
2.0	0.3
3.0	0.25
4.0	0.2

ClassicalDistrubutionSlow	
1.0	0.32
2.0	0.36
3.0	0.2
4.0	0.12

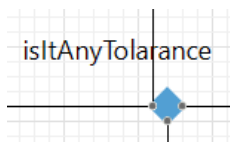
ATMDistrubution	
1.0	0.22
2.0	0.16
3.0	0.41
4.0	0.21



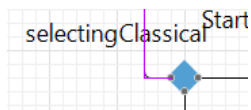
Condition : *randomTrue(0.1)*



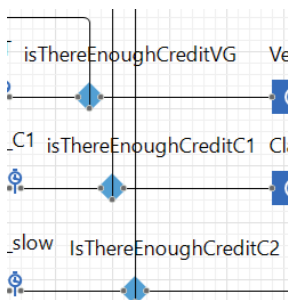
Condition : *randomTrue(0.2)*



Probability : 0.1

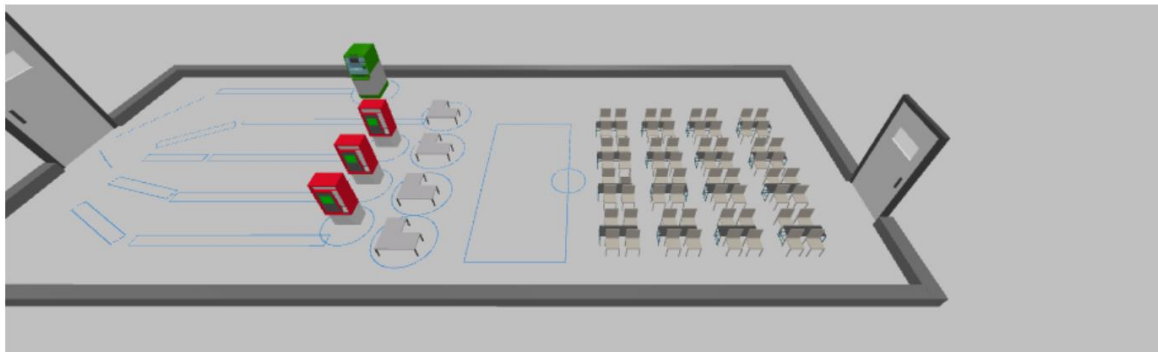
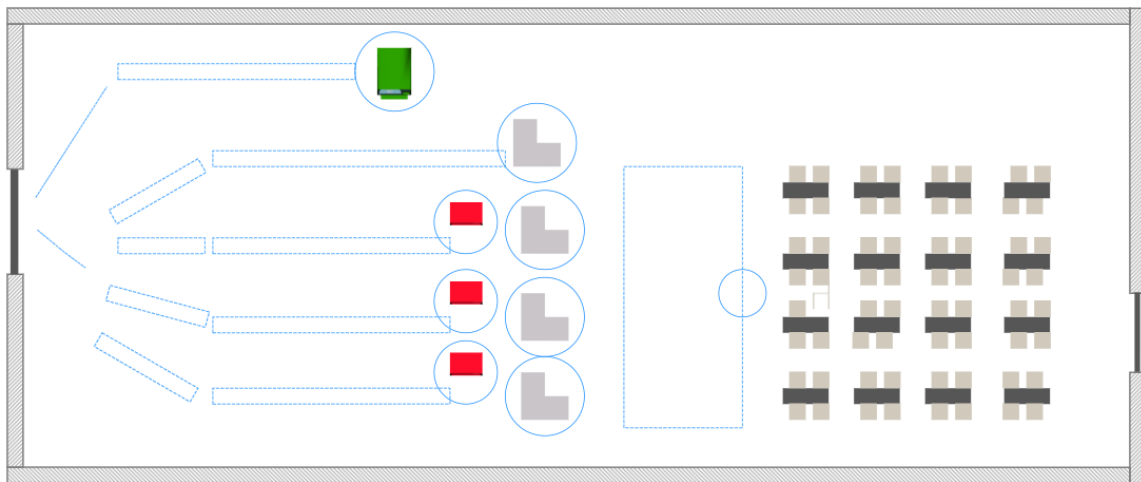
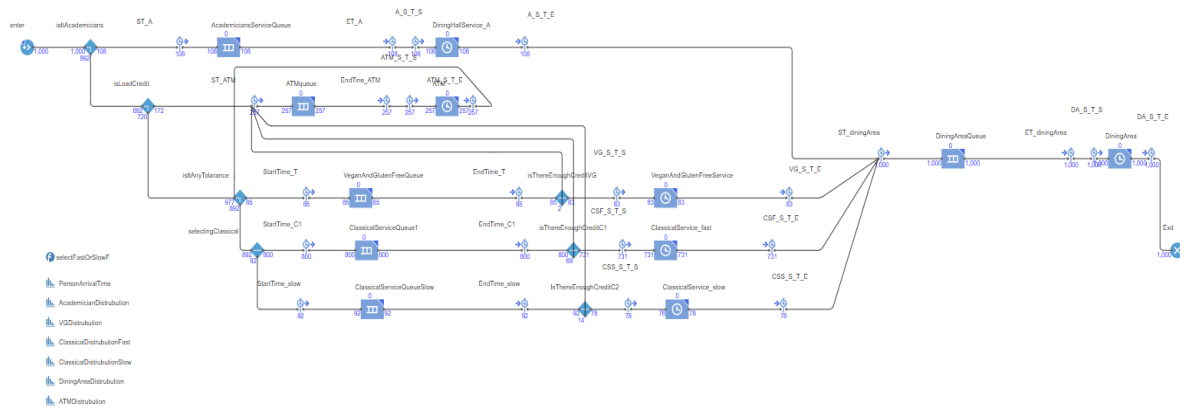


Condition: *selectFastOrSlowF();*



Probability of each of them: 0.9

2D And 3D View of The Model



OUTPUT VALUES AND RESPONSES

1. Number of all people that use dining hall

A: 1000

2. Number of students

A: 892

3. Number of academicians

A: 108

4. Number of students who use vegetarian and gluten-free dining hall service point

A: 85

5. Number of students who use classical dining hall service point that has more speed

A: 800

6. Number of students who use classical dining hall service point

A: 92

7. Number of students who use ATM

A: 257

8. Number of total dining hall service

A: 6

9. The total time students waiting in the queue without dining area

A: ATMqueue: 36s

VeganAndGlutenFreeQueue: 2s

ClassicalServiceQueue1: 527s

ClassicalServiceQueueSlow: 10s

= 36 + 2 + 527 + 10 = 575s

10. The total time academicians waiting in the queue without dining area

A: 0 s

11. The average time students or academicians waiting in the queue

A: for Student : $575 / 892 = 0.64$

For academicians: 0s

12. Total time academicians and student waiting in the queue with dining area

A: $575 + 0 + 1583 = 2158s$

13. Average academicians and student waiting in the queue with dining area

A: $2158 / 1000 = 2.15s$

14. The average service time of each dining hall service points and ATM and dining area

A: Dining Hall Service_A: 2.056s

ATM : 2.607s

VeganAndGlutenFreeService: 2.181s

ClassicalService_fast: 2.672s

ClassicalService_slow: 2.385s

DiningArea: 2.15s

15. Idle time of each dining hall service points and ATM and dining area

A: Total modeling time : 2815s

Dining Hall Service_A: $2815 - 222 = 2593s$

ATM : $2815 - 670 = 2145s$

VeganAndGlutenFreeService: $2815 - 181 = 2634s$

ClassicalService_fast: $2815 - 1953 = 862s$

ClassicalService_slow: $2815 - 186 = 2629s$

DiningArea: $2815 - 2150 = 665s$