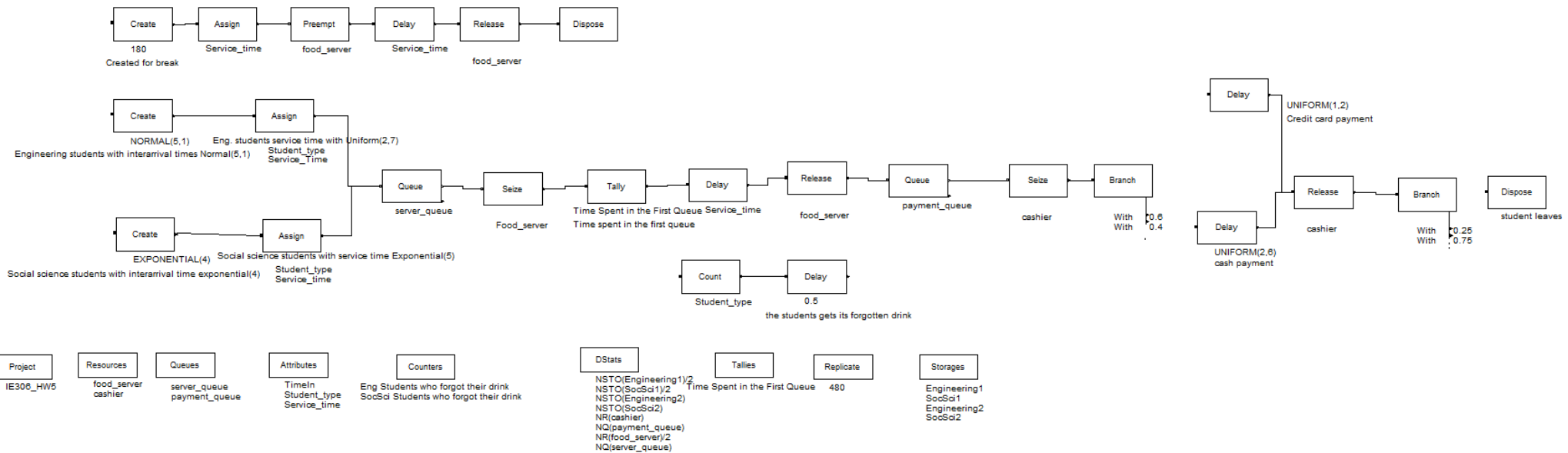


IE 306 Homework 4

2018400108

Model Diagram:



The experiment listing, program listing and summary report are included in the zip file. It can be difficult to read from here because the text is shifted in the summary report part.

- The Average Service Queue Length: $(10.365 + 4.0361 + 9.5161 + 17.100)/4 = 10.2543$
- The Average Payment Queue Length: $(25.646 + 25.623 + 30.708 + 24.257)/4 = 26.5585$
- The Average Time Spent in the First Queue: $(22.488 + 9.6390 + 20.636 + 36.813)/4 = 22.394$
- Utilization of Food Server by Engineering Student: $(0.39944 + 0.42898 + 0.40247 + 0.39923)/4 = 0.40753$

- Utilization of Food Server by Social Science Student: $(0.53970 + 0.51081 + 0.56555 + 0.55354)/4 = 0.5424$
- Utilization of Cashier by Engineering Student: $(0.44123 + 0.44425 + 0.46340 + 0.45015)/4 = 0.4497575$
- Utilization of Cashier by Social Science Student: $(0.52256 + 0.54792 + 0.53239 + 0.53462)/4 = 0.5343725$
- The Number of Students who forgot their drinks by Social Science Students: $(17 + 19 + 28 + 19)/4 = 20.75$
- The Number of Students who forgot their drinks by Engineering Students: $(32 + 34 + 28 + 20)/4 = 28.5$

NOTES:

In the summary report, the summation of the utilization of the food server by student type is not equal to the total utilization of the food servers. Because to have a break for the servers, I am creating another entity.

Program Listing:

Experiment Listing:

PROJECT, "IE306_HW5", "Elif Kizilkaya", Yes, No, Yes, No, No, No, No, No, No, No, No, No;

ATTRIBUTES: Student_type, DATATYPE(Real):

TimeIn, DATATYPE(Real):

Service_time, DATATYPE(Real);

STORAGES: 1, Engineering1:

2, SocSci1:

3, Engineering2:

4, SocSci2;

QUEUES: payment_queue, FirstInFirstOut, AUTOSTATS(Yes,):

server_queue, FirstInFirstOut, AUTOSTATS(Yes,);

RESOURCES: food_server, Capacity(2), Stationary, COST(0.0, 0.0, 0.0), AUTOSTATS(Yes,):

cashier, Capacity(1), Stationary, COST(0.0, 0.0, 0.0), AUTOSTATS(Yes,);

COUNTERS: SocSci Students who forgot their drink, Replicate:

Eng Students who forgot their drink, Replicate;

TALLIES: Time Spent in the First Queue;

DSTATS: NR(food_server)/2, Utilization of food server:

NSTO(Engineering1)/2, The Utilization of food Server by Engineering:

NR(cashier), Utilization of cashier:

NSTO(SocSci2), The Utilization of cashier by SocSci:

NSTO(Engineering2),The Utilization of cashier by Engineering:

NQ(server_queue),Service Queue Length:

NQ(payment_queue),Payment Queue Length:

NSTO(SocSci1)/2,The Utilization of food Server by SocSci;

REPLICATE, 4,0.0,480,Yes,Yes,0.0,,,24.0,Minutes,No,No,,,No,No;

Model Listing:

0\$ CREATE, 1:NORMAL(5,1):NEXT(2\$);
Engineering students with interarrival times Normal(5,1)

2\$ ASSIGN: Student_type=1:
Service_time=UNIFORM(2,7); Eng.
students service time with Uniform(2,7)

4\$ QUEUE, server_queue:MARK(TimeIn);

5\$ SEIZE, 1,Other:
Food_server,1:NEXT(19\$);

19\$ TALLY: Time Spent in the First Queue,INTERVAL(TimeIn),1; Time
spent in the first queue

6\$ DELAY: Service_time,Student_type,Other:NEXT(7\$);

7\$ RELEASE: food_server,1;
queue2 QUEUE, payment_queue;

8\$ SEIZE, 1,Other:
cashier,1:NEXT(9\$);

9\$ BRANCH, 1:

With,0.6,credit_card,Yes:

With,0.4,cash,Yes;

credit_card DELAY: UNIFORM(1,2),Student_type+2,Other:NEXT(10\$);
Credit card payment

10\$ RELEASE: cashier,1;

11\$ BRANCH, 1:

With,0.25,forget,Yes:

With,0.75,leave,Yes;

forget COUNT: Student_type,1;

12\$ DELAY: 0.5,Other:NEXT(queue2); the
students gets its forgotten drink

leave DISPOSE: No; student
leaves

cash DELAY: UNIFORM(2,6),Student_type+2,Other:NEXT(10\$); cash
payment

1\$ CREATE, 1:EXPONENTIAL(4):NEXT(3\$);
Social science students with interarrival time exponential(4)

3\$ ASSIGN: Student_type=2:
Service_time=EXPONENTIAL(5):NEXT(4\$); Social
science students with service time Exponential(5)

13\$ CREATE, 1,180:180:NEXT(14\$); Created
for break

14\$	ASSIGN:	Service_time=15;
15\$	PREEMPT,	1,Other:food_server:NEXT(16\$);
16\$	DELAY:	Service_time,,Other:NEXT(17\$);
17\$	RELEASE:	food_server,1;
18\$	DISPOSE:	No;

Summary Report:

ARENA Simulation Results

IE - License: STUDENT

Summary for Replication 1 of 4

Project: IE306_HW5
:12/19/2022

Run execution date

Analyst: Elif Kizilkaya
date:12/19/2022

Model revision

Replication ended at time : 480.0 Minutes

Base Time Units: Minutes

TALLY VARIABLES

Identifier	Average	Half Width	Minimum	Maximum
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Observations

Time Spent in the First Queue	22.488	(Insuf)	.00000	45.018
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197

DISCRETE-CHANGE VARIABLES

Identifier Final Value	Average	Half Width	Minimum	Maximum
Utilization of food server	.97039	(Insuf)	.00000	1.0000
The Utilization of food Server by Engineer .50000	.39944	(Insuf)	.00000	1.0000
Utilization of cashier	.96379	(Insuf)	.00000	1.0000
The Utilization of cashier by SocSci	.52256	(Insuf)	.00000	1.0000
The Utilization of cashier by Engineering	.44123	(Insuf)	.00000	1.0000
Service Queue Length 22.000	10.365	(Corr)	.00000	23.000
Payment Queue Length 62.000	25.646	(Corr)	.00000	64.000
The Utilization of food Server by SocSci .50000	.53970	(Insuf)	.00000	1.0000

COUNTERS

Identifier	Count	Limit
SocSci Students who forgot their drink	17	Infinite
Eng Students who forgot their drink	32	Infinite

OUTPUTS

Identifier	Value
------------	-------

System.NumberOut .00000

Beginning replication 2 of 4

ARENA Simulation Results

IE - License: STUDENT

Summary for Replication 2 of 4

Project: IE306_HW5
:12/19/2022

Run execution date

Analyst: Elif Kizilkaya
date:12/19/2022

Model revision

Replication ended at time : 480.0 Minutes

Base Time Units: Minutes

TALLY VARIABLES

Identifier	Average	Half Width	Minimum	Maximum
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Observations

Time Spent in the First Queue	9.6390	(Insuf)	.00000	26.868
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199

DISCRETE-CHANGE VARIABLES

Identifier Final Value	Average	Half Width	Minimum	Maximum
Utilization of food server	.97103	(Insuf)	.00000	1.0000
The Utilization of food Server by Engineer .00000	.42898	(Insuf)	.00000	1.0000
Utilization of cashier	.99218	(Insuf)	.00000	1.0000
The Utilization of cashier by SocSci	.54792	(Insuf)	.00000	1.0000
The Utilization of cashier by Engineering	.44425	(Insuf)	.00000	1.0000
Service Queue Length 4.0000	4.0361	(Corr)	.00000	11.000
Payment Queue Length 55.000	25.623	(Corr)	.00000	56.000
The Utilization of food Server by SocSci 1.0000	.51081	(Insuf)	.00000	1.0000

COUNTERS

Identifier	Count	Limit
SocSci Students who forgot their drink	19	Infinite
Eng Students who forgot their drink	34	Infinite

OUTPUTS

Identifier	Value
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System.NumberOut .00000

Beginning replication 3 of 4

ARENA Simulation Results

IE - License: STUDENT

Summary for Replication 3 of 4

Project: IE306_HW5
:12/19/2022

Run execution date

Analyst: Elif Kizilkaya
date:12/19/2022

Model revision

Replication ended at time : 480.0 Minutes

Base Time Units: Minutes

TALLY VARIABLES

Identifier	Average	Half Width	Minimum	Maximum
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Observations

Time Spent in the First Queue	20.636	(Insuf)	.00000	39.345
202				

DISCRETE-CHANGE VARIABLES

Identifier Final Value	Average	Half Width	Minimum	Maximum
Utilization of food server	.99927	(Insuf)	.00000	1.0000
The Utilization of food Server by Engineer .50000	.40247	(Insuf)	.00000	1.0000
Utilization of cashier	.99579	(Insuf)	.00000	1.0000
The Utilization of cashier by SocSci	.53239	(Insuf)	.00000	1.0000
The Utilization of cashier by Engineering	.46340	(Insuf)	.00000	1.0000
Service Queue Length 22.000	9.5161	(Corr)	.00000	24.000
Payment Queue Length 60.000	30.708	(Corr)	.00000	61.000
The Utilization of food Server by SocSci .50000	.56555	(Insuf)	.00000	1.0000

COUNTERS

Identifier	Count	Limit
SocSci Students who forgot their drink	28	Infinite
Eng Students who forgot their drink	28	Infinite

OUTPUTS

Identifier	Value
------------	-------

System.NumberOut .00000

Beginning replication 4 of 4

ARENA Simulation Results

IE - License: STUDENT

Summary for Replication 4 of 4

Project: IE306_HW5
:12/19/2022

Run execution date

Analyst: Elif Kizilkaya
date:12/19/2022

Model revision

Replication ended at time : 480.0 Minutes

Base Time Units: Minutes

TALLY VARIABLES

Identifier	Average	Half Width	Minimum	Maximum
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Observations

Time Spent in the First Queue	36.813	(Insuf)	.00000	60.885
206				

DISCRETE-CHANGE VARIABLES

Identifier Final Value	Average	Half Width	Minimum	Maximum
Utilization of food server	.98402	(Insuf)	.00000	1.0000 1.0000
The Utilization of food Server by Engineer 1.0000	.39923	(Insuf)	.00000	1.0000
Utilization of cashier	.98477	(Insuf)	.00000	1.0000 1.0000
The Utilization of cashier by SocSci	.53462	(Insuf)	.00000	1.0000 .00000
The Utilization of cashier by Engineering	.45015	(Insuf)	.00000	1.0000 1.0000
Service Queue Length 22.000	17.100	(Corr)	.00000	29.000
Payment Queue Length 59.000	24.257	(Corr)	.00000	59.000
The Utilization of food Server by SocSci .00000	.55354	(Insuf)	.00000	1.0000

COUNTERS

Identifier	Count	Limit
SocSci Students who forgot their drink	19	Infinite
Eng Students who forgot their drink	20	Infinite

OUTPUTS

Identifier	Value
------------	-------

System.NumberOut .00000

ARENA Simulation Results

IE - License: STUDENT

Output Summary for 4 Replications

Project: IE306_HW5
:12/19/2022

Run execution date

Analyst: Elif Kizilkaya
date:12/19/2022

Model revision

OUTPUTS

Identifier Replications	Average	Half-width	Minimum	Maximum	#
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System.NumberOut	.00000	.00000	.00000	.00000	4
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Simulation run time: 0.12 minutes.

Simulation run complete.