Project 1 for Section 1

Implement a simulation of Nor's roastery.

By

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ITCS343 Principles of Operating Systems

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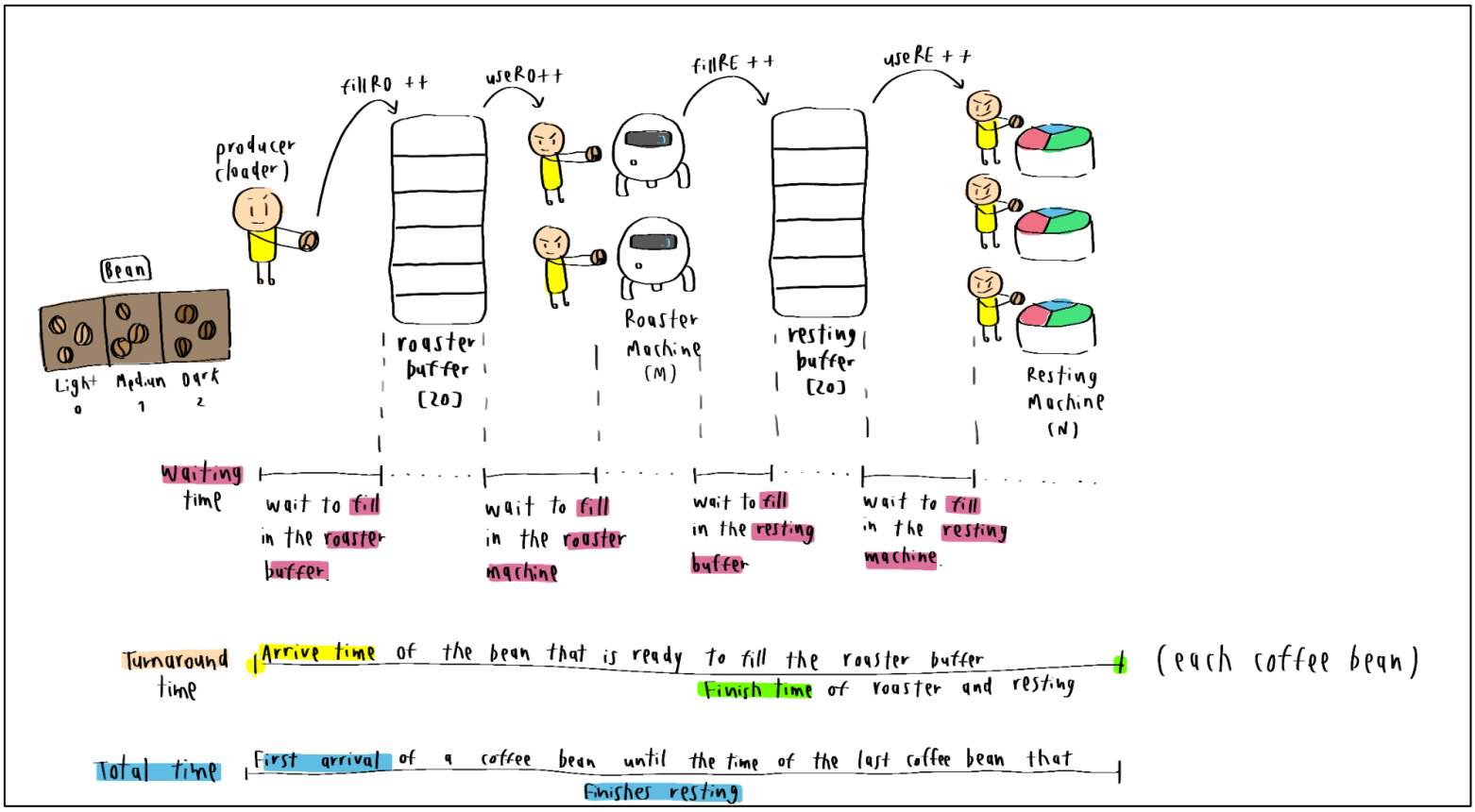
Introduction

Overview



Responsibility statement to describe the work of each member:

Suphavadee Cheng (6488120):

She did the process parts that each coffee bean moved into each buffer and into each machine.

Ponnapassorn Iamborisut (6488179):

She did the part of the time calculation which has total time, turnaround time and waiting time.

Recipes

We take a random number by calling the rand( ) function and modulo it by three to get the numbers zero, one, and two to represent each type of bean.

Type of coffee beans	Represent as number	CPU burst time of roaster machine	CPU burst time of resting machine
lighter	0	1 second	3 second
medium	1	2 seconds	2 seconds
darker	2	3 seconds	1 second

Total time formula

We have formulated the total time by setting the start time at loader before filling the item and the end time at the resting machine after finishing all processes, then calculating **the total time = end time - the start time** in the main.

Turnaround Time formula

When storing a value into the **startTA** array, we must first include the start time value and keep the value after the execution is complete in the array of **endTA**. Computing the value of time into the **TA** array. Then calculate the value by subtracting the end time and the start time by **TA[count_TA] = endTA[count_TA] - startTA[count_TA]** and add the sum together and divide k according to this formula **sumTA * 1.0 /k**

Waiting Time formula

We have 4 waiting interval times. The first phase will start from the arrival time of each coffee bean. Each bean will be connected after the first one has filled in the roaster buffer so that the waiting time of arrival will not gain much time. The second will be waiting to fill in the roaster machine. The third is to wait for filling in the resting buffer. The final stage will wait for the resting machine to select it to rest the coffee bean.

To calculate, we have to calculate the four time periods by storing the values in **WT[countWT]** for each bean, then combine them by creating a **sumWT** variable using the **time_t** datatype to represent seconds. Then, find out the value and divide **sumWT** by the number **k** of coffee beans that we put in. According to this formula **sumWT * 1.0 /k**

Compute Utilization of roaster and resting machine

We have computed by defining **time_t utilizeS** mean start time to utilization, **time_t utilizeE** mean end time to utilization. Then use **time(&utilizeS)** of both machines and when the machine has finished sleeping, we will have **time(&utilizeE)** and it is calculated by taking the global variable come plus equals end time minus start time. According to this formula "**roasterUti += (utilizeE - utilizeS); and restingUti += (utilizeE - utilizeS)**" and print the value in the main()

Simulation results

Required Amount: K > 30, M = N = 1

K = 40, M = N = 1					
Experiment. ID	Total Time (Second)	Average Turnaround Time (Second)	Average Waiting Time (Second)	Utilization Roaster machine. (Second)	Utilization Resting machine. (Second)
1.1	87	39.50	8.30	81	81
1.2	90	42.13	5.60	89	71
1.3	87	38.90	8.53	77	83
1.4	90	41.35	7.40	83	77
Average	88.50	40.47	7.4575	82.5	78

Required Amount: K > 30, M = N > 1

K = 40, M = N = 3					
Experiment ID	Total Time (Second)	Average Turnaround Time (Second)	Average Waiting Time (Second)	Utilization Roaster machine (Second)	Utilization Resting machine. (Second)
2.1	34	16.77	5.75	76	89
2.2	32	15.00	4.53	78	82
2.3	33	15.28	4.05	84	76
2.4	32	15.55	4.33	87	71
Average	32.75	15.65	4.665	81.25	79.5

Required Amount: K > 30, M > N

K = 40, M = 5 > N = 4					
Experiment ID	Total Time (Second)	Average Turnaround Time (Second)	Average Waiting Time (Second)	Utilization Roaster machine. (Second)	Utilization Resting machine. (Second)
3.1	25	12.35	5.53	79	80
3.2	26	12.20	7.28	78	82
3.3	25	12.45	6.28	76	83
3.4	24	11.70	4.67	87	72
Average	25	12.175	5.94	80	79.25

Required Amount: K > 30, M < N

K = 40, M = 4 < N = 5					
Experiment ID	Total Time (Second)	Average Turnaround Time (Second)	Average Waiting Time (Second)	Utilization Roaster machine (Second)	Utilization Resting machine. (Second)
4.1	24	11.78	2.58	81	79
4.2	26	12.80	3.00	94	65
4.3	27	12.95	2.40	94	66
4.4	23	11.93	4.72	82	78
Average	25	12.365	3.175	87.75	73

Required Amount: K > 100, M = N > 4

K = 200, M = N = 5					
Experiment ID	Total Time (Second)	Average Turnaround Time (Second)	Average Waiting Time (Second)	Utilization Roaster machine (Second)	Utilization Resting machine. (Second)
5.1	89	16.34	6.73	408	399
5.2	87	13.94	4.74	413	387
5.3	85	15.06	6.33	408	392
5.4	90	13.30	4.88	417	388
Average	87.7	14.66	5.67	411.5	391.5

Add more tables for comparison.

K = 200, M = N = 10					
Experiment ID	Total Time (Second)	Average Turnaround Time (Second)	Average Waiting Time (Second)	Utilization Roaster machine (Second)	Utilization Resting machine. (Second)
6.1	50	8.76	4.49	430	379
6.2	47	9.84	6.91	373	412
6.3	47	8.73	5.63	397	388
6.4	49	8.55	5.22	413	388
Average	48.25	8.97	5.5625	403.25	391.75

K = 200, M = 50 > N = 40					
Experiment ID	Total Time (Second)	Average Turnaround Time (Second)	Average Waiting Time (Second)	Utilization Roaster machine (Second)	Utilization Resting machine. (Second)
7.1	16	6.17	4.74	388	446
7.2	16	5.61	4.52	381	390
7.3	14	5.45	4.13	387	357
7.4	15	5.39	4.39	404	362
Average	15.25	5.655	4.445	390	388.75

K = 200, M = 100 > N = 90					
Experiment ID	Total Time (Second)	Average Turnaround Time (Second)	Average Waiting Time (Second)	Utilization Roaster machine (Second)	Utilization Resting machine. (Second)
7.1	9	4.25	3.09	391	379
7.2	9	4.32	3.11	401	392
7.3	9	4.38	2.88	382	384
7.4	10	4.24	3.03	401	381
Average	9.25	4.2975	3.0275	393.75	384