



Faculty of Information Technology

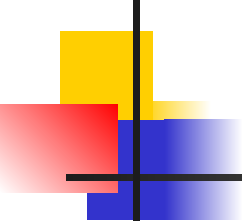
Fall 2020

Modelling and Simulation

IS 331

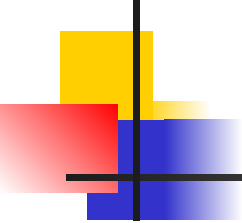
Lec (4)

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Simulation Examples

- Monte Carlo simulation
 - Estimating π
 - Craps (dice game)
- Time-stepped simulation
 - Mortgage scenarios
- Trace-driven simulation
 - Single-server queue (ssq1.c)
- Discrete-event simulation
 - Witchcraft hair salon



Simulation Examples

- Monte Carlo simulation
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 - Craps (dice game)

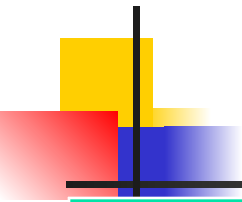
Example 6: Machines Breaks Down

A bank of machines in a manufacturing shop breaks down according to the following inter arrival time distribution. The time it takes one repair person to complete the repair of a machine is given in the service time distribution.

Inter-arrival time (hours)	P(X)	Service Time (hours)	P(X)
0.5	0.30	0.5	0.25
1.0	0.22	1.0	0.20
1.5	0.16	2.0	0.25
2.0	0.10	3.0	0.15
3.0	0.14	4.0	0.10
4.0	0.08	5.0	0.05
	1.00		1.00

Simulate the breakdown of 5 machines. Calculate the average machine downtime using two repairpersons and using the following random numbers sequence. Both repair persons cannot work on the same machine.

R.N.: 30, 81, 02, 91, 51, 08, 28, 44, 86, 84.



Solution 6: machines breaks down

Inter-arrival time (hours)	P(X)	Mapping of R.N.	Service Time (hours)	P(X)	Mapping of R.N.
0.5	0.30	00-29	0.5	0.25	00-24
1.0	0.22	30-51	1.0	0.20	25-44
1.5	0.16	52-67	2.0	0.25	45-69
2.0	0.10	68-77	3.0	0.15	70-84
3.0	0.14	78-91	4.0	0.10	85-94
4.0	0.08	92-99	5.0	0.05	95-99
	1.00			1.00	

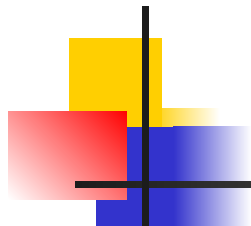
Solution 6: machines breaks down

R.N	Inter-arrival Time	Time of arrival	R.N	Service Time	Repair Man 1		Repair Man 2		Waiting Time	Down Time
					ON	OFF	ON	OFF		
30	1.0	1.0	81	3	1	4			0	3
02	0.5	1.5	91	4			1.5	5.5	0	4
51	1.0	2.5	08	0.5	4	4.5			1.5	2
28	0.5	3.0	44	1	4.5	5.5			1.5	2.5
86	3.0	6.0	84	3	6	9			0	3
Total Down Time										14.5

Simulate the breakdown of 5 machines. Calculate the average machine downtime using two repairpersons and using the following random numbers sequence. Both repair persons cannot work on the same machine.

R.N.: 30, 81, 02, 91, 51, 08, 28, 44, 86, 84.

$$\text{Average Down Time} = 14.5 / 5 = 2.9 \text{ hours.}$$



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