Mid

Mahbub Sir - Chapter- 1 বই থেকে (D. S. Hira বই)

Masud Sir (Simulation Modeling and Analysis by Averill M. Law)

Chapter- 1

*Assumption: It usually take the form of mathematical or logical relationships, constitute a model that is used to try to gain some understanding of how the system behaves.

$$y = mx + c$$

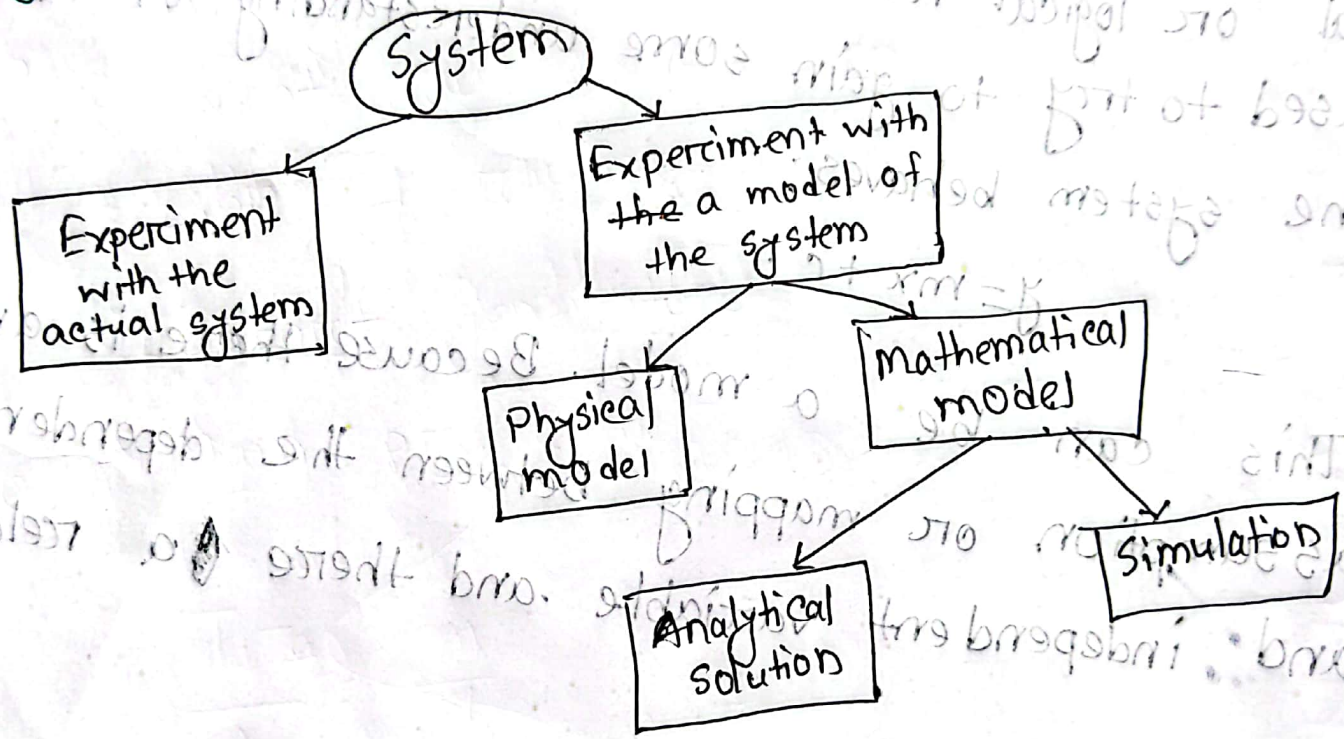
This can be a model. Because there is an assumption or mapping between the dependent and independent varciable, and there a relation between.

*Analytical solution: If the relationship ~~are~~ that compose the model are simple enough it is possible to use mathematical method to obtain exact information on question of interest. It is called analytical solution

*Application of Simulation (System simulation by D.S Hirca বই থেকে)

*System: System is ~~defined as~~ a collection of components that act and interact together toward the accomplishment of some logical end.

*ways to study a system:



*Discrete Event simulation. → Example - 1.1

* Time Advance Mechanism - " 1.2

→ In some discrete-event simulation models events are used for purposes that do not actually effect such a change.

*Experiment with Actual System vs Experiment with a model of the system:

Experiment with actual system	Experiment with a model of the system
1.	1.

*Analytical Solution vs simulation: 2018 – 1(b)

Analytical Solution	simulation
1. If the relationship that compose the model ~~is~~ are simple enough it is possible to use mathematical method to obtain exact information on question of intercest.	1. Simulation is the representation of real life system by another system which depicts important characte ristic of real life system and allows experiment on it.
2. In this, the model is simple.	2. In this the model is complex
3. It gives exact answer.	3. ~~Some~~ It doesn't give exact answer.
4. Some mathematical model is efficient for analytical solution.	4. Some mathematical model is ~~insu~~ inefficient for ~~stim~~ simulation

* Components of a Discrete-Event simulation model: [2018 - 1(a)]

⇒ System state

⇒ Simulation clock

⇒ Event list

⇒ Statistical counters

⇒ Initialization routine

⇒ Timing routine

⇒ Event routine

⇒ Library routine.

⇒ Report generator

⇒ Main program.

*Monte Carlo Method:

It is a method that use simulated random numbers to estimate some functions or solve a problem.

* De Solve the integral $I = \int_0^5 x^3 dx$ by monte carlo method. [USE: Random number 61 to 70 for X coordinate and Random Number 71 to 80 for Y coordinate, from table: [Previous mid-3]

Solution:

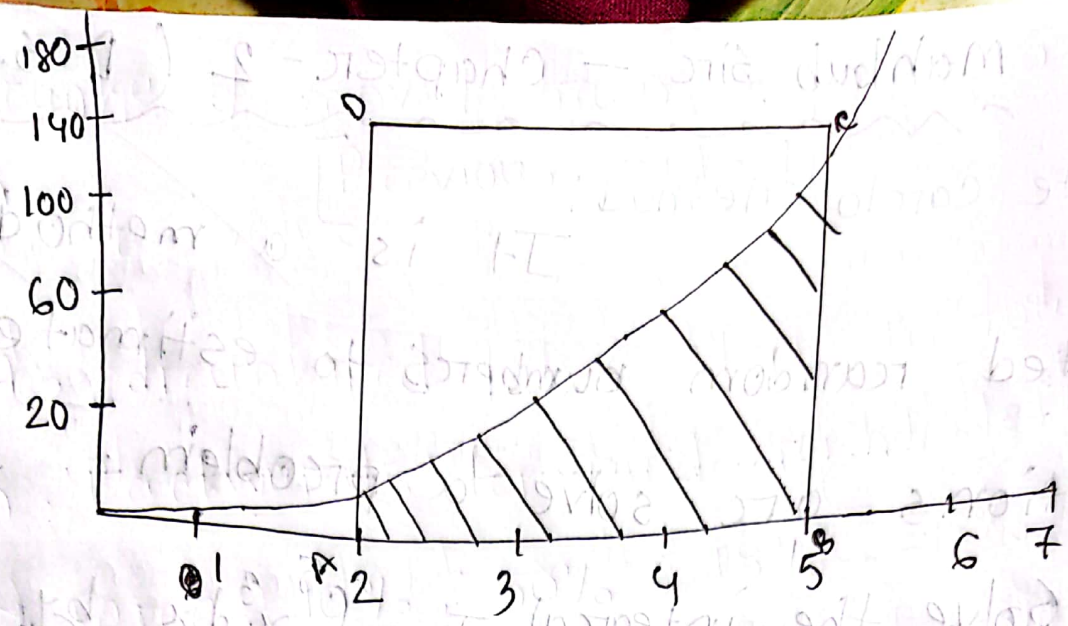
$$I = \int_2^5 x^3 dx$$

The exact value of the integral, $I = \left[\frac{x^4}{4}\right]_2^5$

$$= \frac{5^4}{4} - \frac{2^4}{4}$$

$$= 15225$$

The function $f(x) = x^3$ is plotted in the below figure. The area under the curve between limits $x = 2$ and $x = 5$ shown shaded is the value of the integral.



Let the area be enclosed in a rectangle ABCD whose area is $140 \times 3 = 420$. Let N dots fall in the rectangle ABCD and let m dots fall in the shaded area. Then the ratio of the shaded area I to the area A of rectangle ABCD is m to N.

$$\frac{I}{A} = \frac{m}{N}$$

$$\text{or, } I = \frac{m}{N} A$$

Let us take random number between ~~20~~ 61 to 70 to represent x co-ordinate.

(N.B. : Pseudo Random value as test data)

S.N.	RN	S.N.	RN	S.N.	RN	S.N.	RN

Now, to generate y coordinate, let's take random numbers between 71 to 80.

Table : Simulation of $I = \int_2^5 x^3 dx$

Random Number(R)	x (0·1×R)	Random Number(R)	y (140+R)	x^3	M	N
25	2·5	0·42	588·42	15·625	0	1
15	1·5	0·10	14·10	3·375	0	2
43	4·3	0·90	126	79·507	0	3
47	4·7	0·57	79·8	103·823	1	4
22	2·2	0·76	106·4	10·648	1	5
18	1·8	0·77	107·8	5·832	1	6
27	2·7	0·05	7	19·683	2	7
45	4·5	0·18	25·2	91·125	3	8
40	4·0	0·66	92·4	64	3	9
48	4·8	0·00	0	116·592	4	10

$$\therefore \frac{I}{A} = \frac{M}{N}$$

$$\Rightarrow I = \frac{M}{N} \times A$$

$$= \frac{4}{10} \times 420$$

$$= 168$$

* A drunkard moved from a point to a direction ... [Previous mid-1]

Solution:

As drunkard takes step in four direction. Backward, forward, right, left. Probability are. 10%, 50%, 15%, 25%. Distance covered to backaward, forward, right, left are 30 cm, 80 cm, 60 c.m, 40 c.m

Direction	Probability	Random number
Forward (F)	0.5	61 - 80 c.m
Backward (B)	0.1	1 - 30 c.m
Left (L)	0.25	31 - 40 c.m.
Right (R)	0.15	41 - 60 c.m

*Forward (+1) গেলে y axis → 1 বাড়বে। Backward (-1) গেলে y → 1 কমবে।

*Left গেলে x axis → -1 হবে। Right গেলে x-axis → +1 হবে।

Table: Random Walk Simulation

Step	Random Number	Direction	Position	
			x	y
1	23	B	0	-1
2	01	B	0	-2
3	67	F	0	-1
4	56	R	1	-1
5	84	F	1	0
6	95	F	1	1
7	77	F	1	2
8	76	F	1	3
9	18	B	1	2
10	82	F	1	3
11	45	R	2	3
12	55	R	3	3
13	29	B	3	2
14	68	F	3	3
15	21	B	3	2
16	15	B	3	1
17	86	F	3	2
18	00	B	3	1
19	89	F	4	2
20	43	R		

when the drunkard takes steps in forward direction, the value of y increased by 1. If drunkard takes steps in backward the value of y decreased by 1. If drunkard takes steps in left value of x decreased by 1 and for right value of x increased by 1. The simulation for 20 steps is given in table. In the first 20 steps, drunkard moves to a position (4, 2)