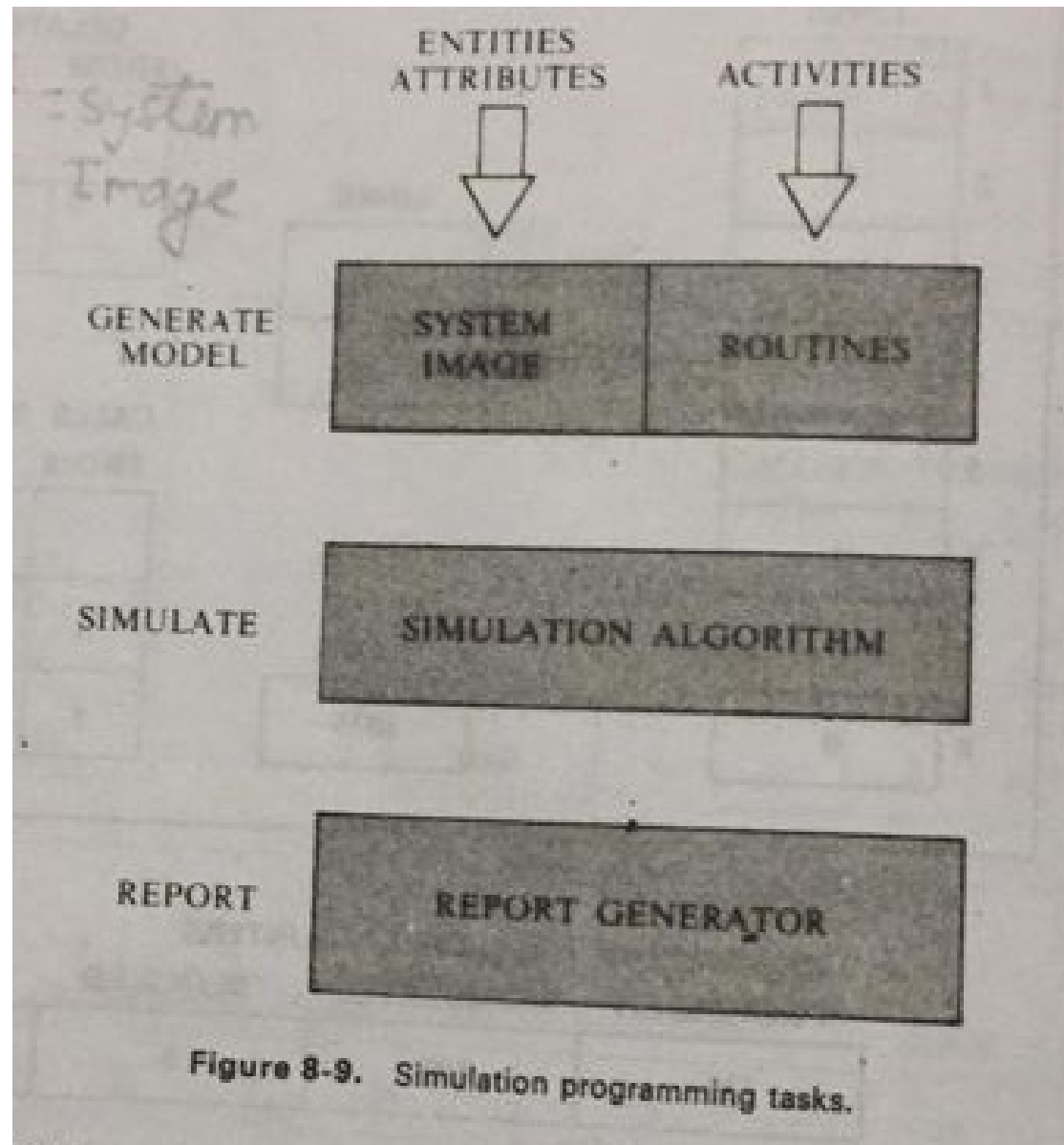# SIMULATION AND MODELING
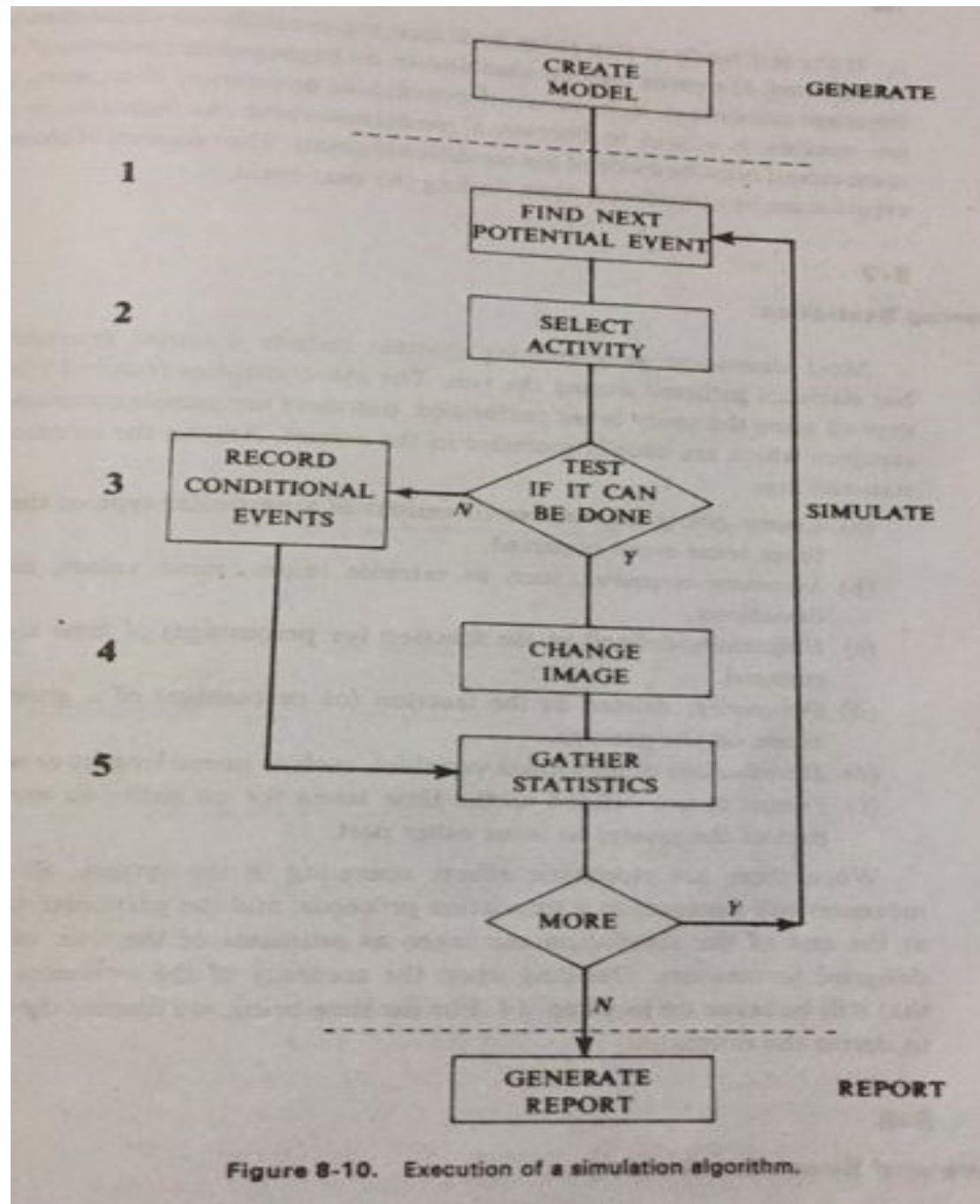## Prepared
by
Ramesh Thapa

Discrete System Simulation

Simulation Programming Tasks

- Outline in general the tasks involved in preparing a computer program for a simulation.

- There are three main tasks to be performed:

- 1. Generate a model and initialize it.

- 2. Execute the cycle of actions(Simulation)

- 3. Generation of an output report.

ENTITIES
ATTRIBUTES   ACTIVITIES

=System
Image

GENERATE
MODEL

| SYSTEM IMAGE | ROUTINES |

SIMULATE

SIMULATION ALGORITHM

REPORT

REPORT GENERATOR

Figure 8-9.   Simulation programming tasks.

- Carrying out the simulation algorithm involves repeated execution of the five steps.
- 1. Find the next potential event.
- 2. Select an activity.
- 3. Test if the event can be executed.
- 4. Change the system image.
- 5. Gather Statistics.

```
                         CREATE
                         MODEL              GENERATE
                    - - - - - - - - - - - - - - -
     1
                       FIND NEXT
                    POTENTIAL EVENT

     2                  SELECT
                       ACTIVITY

             RECORD            TEST
     3     CONDITIONAL     N  IF IT CAN
             EVENTS            BE DONE      SIMULATE
                                 Y

     4                  CHANGE
                        IMAGE

     5                  GATHER
                      STATISTICS

                                       Y
                         MORE

                           N
                    - - - - - - - - - - - - - - -
                      GENERATE
                       REPORT             REPORT
```

Figure 8-10. Execution of a simulation algorithm.

Gathering Statistics

- Most simulation programming system include a report generator to print out statistics gathered during run.

- There are certain commonly required statistics which are usually included in the output.

- (a) COUNT : Counts giving the number of entities of a particular type or the number of times some event occurred.

- (b) SUMMARY : Summary measures, such as extreme values, mean values, and standard derivations.

Gathering Statistics

- (c) UTILIZATION: Utilization, defines as the fraction (or Percentage) of time some entity is engaged.

- (d) OCCUPANCY : Occupancy, defined as the fraction (or Percentage) of a group of entities in use on the average.

- (e) DISTRIBUTIONS : Distributions of important variables such as queue lengths or waiting times.

- (f) TRANSIT TIMES : Transit Times, defined as the time taken for an entity to move from one part of the system to another part.