Government Islamia Graduate College Civil lines Lahore

Affiliated with University of Punjab (PU Lahore)

Bachelor of Science in Information Technology (BSIT)

Modeling and Simulation (SI - 241)

Assignment: 01

Submission Date: 04/08/2023 **Total Marks:** 50

Class: BS (IT) 4th Semester **Professor:** Syed M Mustaghees Abbas

Questions

1. **What is the difference between a discrete event simulation model and continuous event simulation model?** **(15)**
2. **Generate a manual list for customer arriving in a single queue, single server system.** **(25)**
   Calculate system time, average number in queue and resource utilization based on the system for 18 min.
   Inter-arrival time in minutes for 10 arrivals: 2,1,3,1,3,2,4,2,1,1.
   Service time in minutes for 10 arrivals: 2,3,1,3,2,2,1,3,2,2.
3. **Explain typical service application that can be modeled and analyzed using simulation? (Any 3 Application)** **(10)**

Solution

1. What is the difference between a discrete event simulation model and continuous event simulation model?

Event:

Anything that occurs during the simulation run, and that can affect the state of the system is defined as an event. Event can be discrete or continuous.

- **Discrete Event:** The event that occur at distinct time points.
- **Continuous Event:** The event that occur over a range of time.

Discrete-Event Simulation

Discrete-Event simulation, is a technique for modeling complex system behavior over time. It involves simulating the sequence of events and their impact on the system's state in discrete time steps. This model captures the timing and order of events, allowing for

→ Analysis of performance under different conditions.

→ Evaluation of performance under different conditions.

→ Prediction of performance under different conditions.

Continuous-Event Simulation

Continuous event simulation combines elements of continuous and discrete simulation. In this simulation, modeling of a system is done using continuous variables and equations, but it also incorporates (include) discrete events that impact the system's behavior at specific points in time, like in discrete event simulation.

Model Event Simulation:

"Model is a simplified formal description of a suitable extract from the item of interest, which helps the analyst to predict the effect of changes to the system".

There are two types of model event simulation

i. Discrete Event Simulation Model.
ii. Continuous Event Simulation Model.

The main difference between a discrete and a continuous event simulation model is the way how time is represented. A discrete event simulation model represents time as a discrete sequence of points, while a continuous model represents time as a continuous variable.

Key differences between Discrete & Continuous Event Simulation Model are:

Sr.	Discrete Event Simulation Model	Continuous Event Simulation Model
1.	Time represented as Discrete points.	Time represented as continuous variable.
2.	Event handled as they occur.	Event handled continuously over time.
3.	Less complexity in this simulation model.	More complexity in this simulation model.
4.	This simulation model is faster.	This simulation model is faster.

2. Generate a manual list for customer arriving in a single queue, single server system. Calculate system time, average number in queue and resource utilization based on the system for 18 min.
Inter-arrival time in minutes for 10 arrivals: 2,1,3,1,3,2,4,2,1,1.
Service time in minutes for 10 arrivals: 2,3,1,3,2,2,1,3,2,2.

3. Explain typical service application that can be modeled and analyzed using simulation? (Any 3 Application)

Modeling and Simulation

Modeling and Simulation is a powerful approach used to represent real-world systems and processes it in a controlled environment. It allows analysts, developers, and engineers to study, analyze, and optimize the behavior of systems without directly affecting the actual system.

Service Application

A service application refers to a software application or system that provides specific services to users or other applications. In Modeling and Simulation service application run under various condition without directly affecting the actual system.

Examples of service systems or application models

- Hospitals and medical clinics model
- Retail stores model
- Entertainment facilities model
- Information technology model
- Customer order systems model

Explanation of service application models examples

- **Hospital and medical clinic models** can be simulated to determine the number of rooms, nurses, physicians for a particular location, scheduling appointments, managing patient records, ordering medications, and tracking patient progress etc.
- **Retail stores models** include managing inventories, tracking sales, processing customer payments, and providing customer service etc.
- **Entertainment facilities model** such as multi-theater movie complexes may be interested in how many ticket sellers, ticket checkers, or concession stand clerks to employ and it also includes managing reservations, tracking customer spending and providing entertainment etc.
- **Information technology models** typically involve how many and what type of network or support resources to have available or in other word IT models include managing IT assets, providing support to users, and troubleshooting problems.
- **Customer order systems model** includes tracking orders, processing payments, and providing customer support and it also may need to know how many customer order representatives are needed to be on duty.