بِسۡمِ اللَّهِ الرَّحۡمَٰنِ الرَّحِيمِ

Lecture: 01

Simulation and Modeling

Simulation:

Simulation of a system is the operation of a model in terms of time or space, which helps analyze the performance of an existing or a proposed system. In other words, simulation is the process of using a model to study the performance of a system. It is an act of using a model for simulation.

Modeling:

Modelling is the process of representing a model which includes its construction and working. This model is similar to a real system, which helps the analyst predict the effect of changes to the system. In other words, modelling is creating a model which represents a system including their properties. It is an act of building a model.

Why we do Simulation?

- When the system is too much complex: We do simulation…….
- Safety Critical System: Some system is related to the human health or some system may have harmful caution for human being. So, we do Simulation.

What we have to know?

- Programming Ability
- Statistics and Probability Knowledge
- Mathematics

Areas of Application

- **Manufacturing application:** Industry, plan, raw materials etc.
- **Construction or Civil Engineering:** Building model, Bridge Model etc.
- **Military Application:** UAV/AUAV, Underwater life research, Submarine, Missiles, Atomic solutions, War Scenario etc.
- **Logistics, Transportation & Distribution:** Amazon Drone delivery, Home Delivery
- **Business Process or Plan:** Banking sector, Startup Business
- **Human System:** Air Traffic Control, Traffic Control System, Traffic Signal etc.

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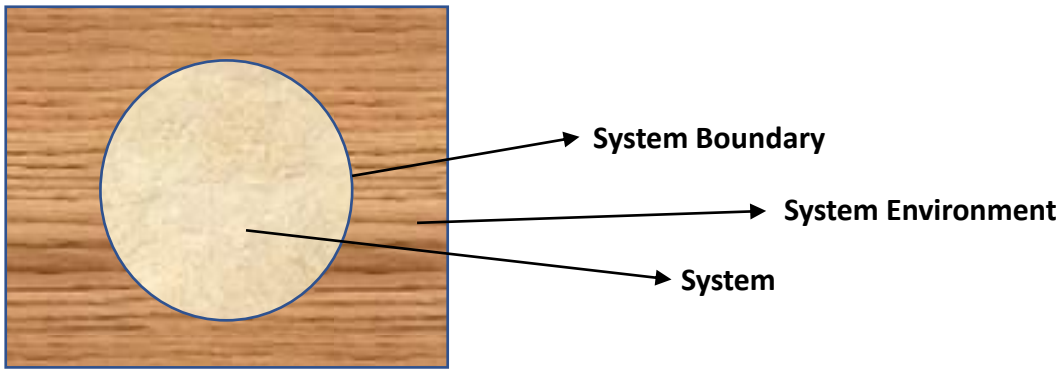
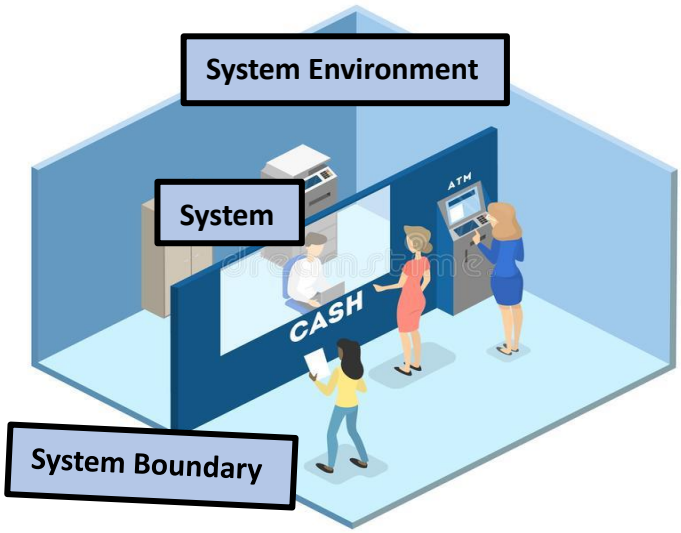
System:

A system is defined as a group of objects that are joined together in some regular interaction or independence towards the accomplishment of some purpose.



Example:

For a Bank: Cash Counter is a System



System Changes:

There are two types of system change.

- **External Change:** When the system change occurred by the system environment. (**If there is no change from the environment to system, we may not consider the system environment.)
- **Internal Change:** When the system change occurred by the system internal objects.

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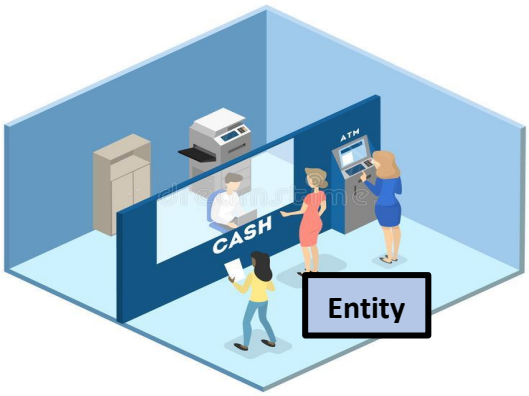
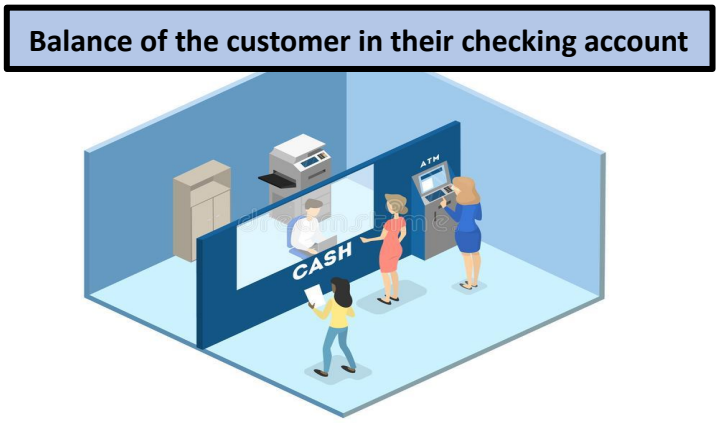
Component of a System

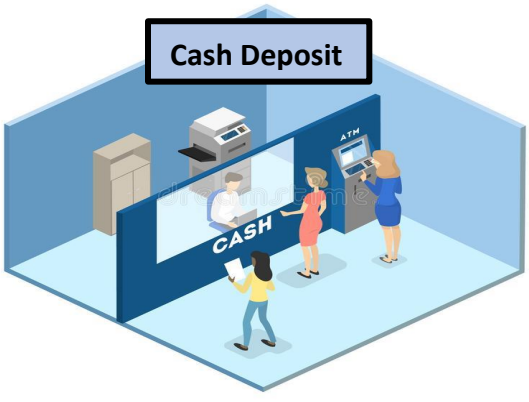
Entity: An entity is an object of interest in the system. E.g. Customer in the bank



Attribute: A property of an entity.



Activity: Activity represent a time period of specified length.



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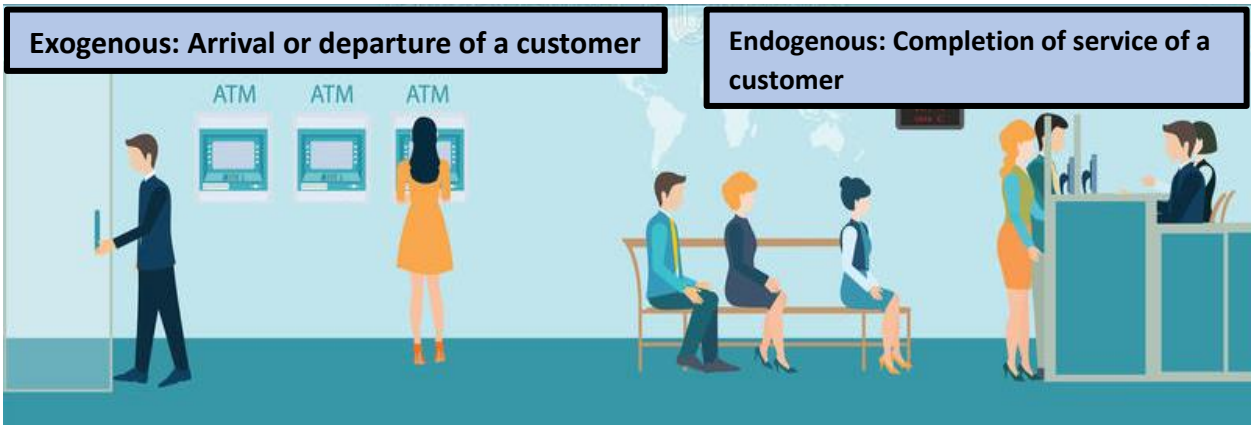
State: A state of a system defined to be that collection of variables necessary to describe a system at any time, relative to the objectives of the study

Event: An event is defined as an instantaneous occurrence that may change the state of the system.

- Endogenous: occurring within the system
- Exogenous: activities and events in the environment that affects the system



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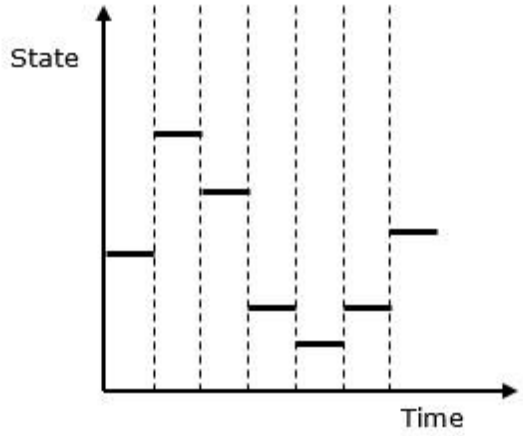
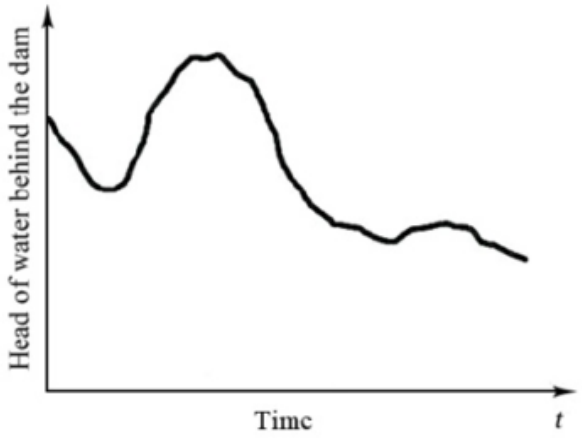
Types of System

Discrete System: The state variables change only at the discrete set of points in time.



Continuous System: The state variables change continuously over time.



From the above important topic:

System & System Environment

Components of a System

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