

SOFTWARE ENGINEERING-I

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Week 9 Functional Modeling and Behavioral Modeling

- Functional Modeling
 - DFD with example
- Behavioral Modeling
 - STD with example

Functional Modeling

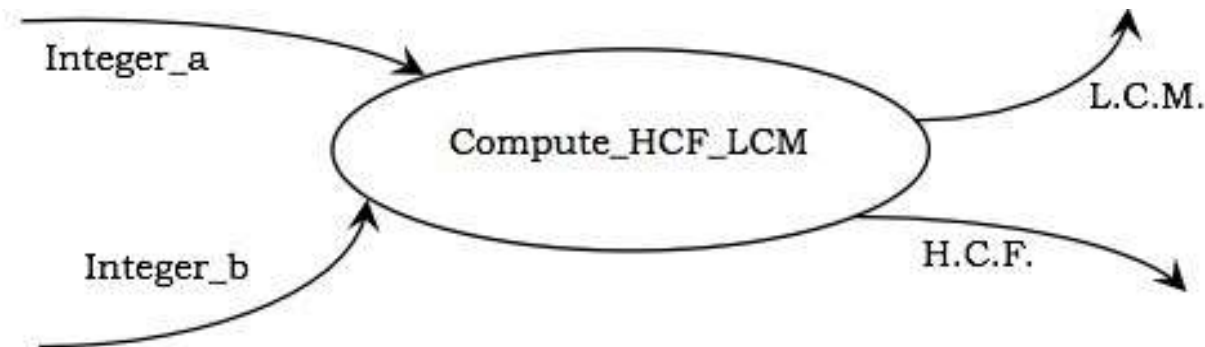
- Functional Modelling gives the process perspective of the analysis model and an overview of what the system is supposed to do.
- It defines the function of the internal processes in the system with the aid of Data Flow Diagrams (DFDs).
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Data Flow Diagrams

- Functional Modelling is represented through a hierarchy of DFDs.
- The DFD is a graphical representation of a system that shows the inputs to the system, the processing upon the inputs, the outputs of the system as well as the internal data stores.
- The four main parts of a DFD are –
 - Processes,
 - Data Flows,
 - Actors, and
 - Data Stores.
- The other parts of a DFD are –
 - Constraints, and
 - Control Flows.

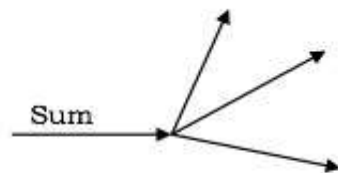
Processes

- Processes are the computational activities that transform data values.
- A whole system can be visualized as a high-level process. A process may be further divided into smaller components.
- **Example** – The following figure shows a process Compute_HCF_LCM that accepts two integers as inputs and outputs their HCF (highest common factor) and LCM (least common multiple).

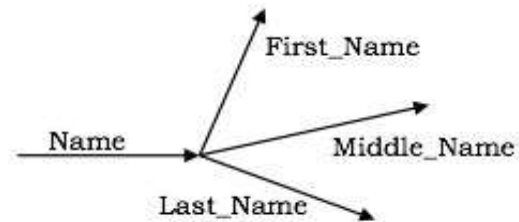


Data Flows

- Data flow represents the flow of data between two processes.
- It could be between an actor and a process, or between a data store and a process.
- A data flow denotes the value of a data item at some point of the computation. This value is not changed by the data flow.
- A data flow may be forked in the following cases –



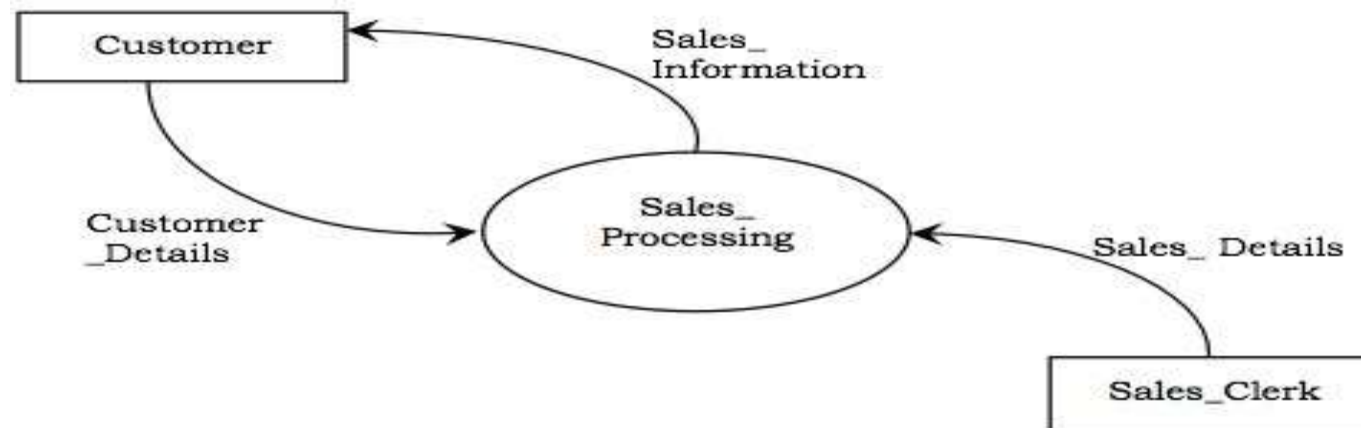
(a)



(b)

Actors

- Actors are the active objects that interact with the system by either producing data and inputting them to the system, or consuming data produced by the system.
- In other words, actors serve as the sources and the sinks of data.
- **Example** – The following figure shows the actors, namely, Customer and Sales_Clerk in a counter sales system.



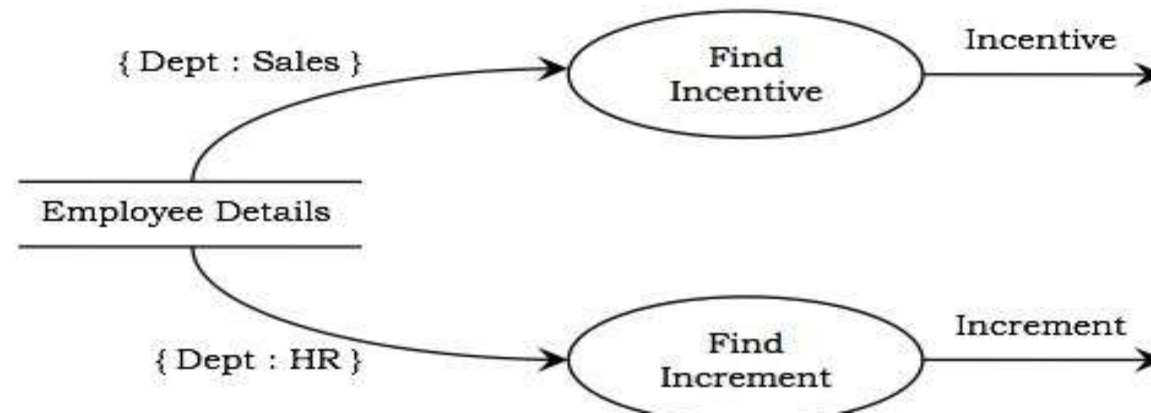
Data Stores

- Data stores are the passive objects that act as a repository of data.
- Unlike actors, they cannot perform any operations.
- They are used to store data and retrieve the stored data. They represent a data structure, a disk file, or a table in a database.
- **Example** – The following figure shows a data store, Sales_Record, that stores the details of all sales. Input to the data store comprises of details of sales such as item, billing amount, date, etc. To find the average sales, the process retrieves the sales records and computes the average.



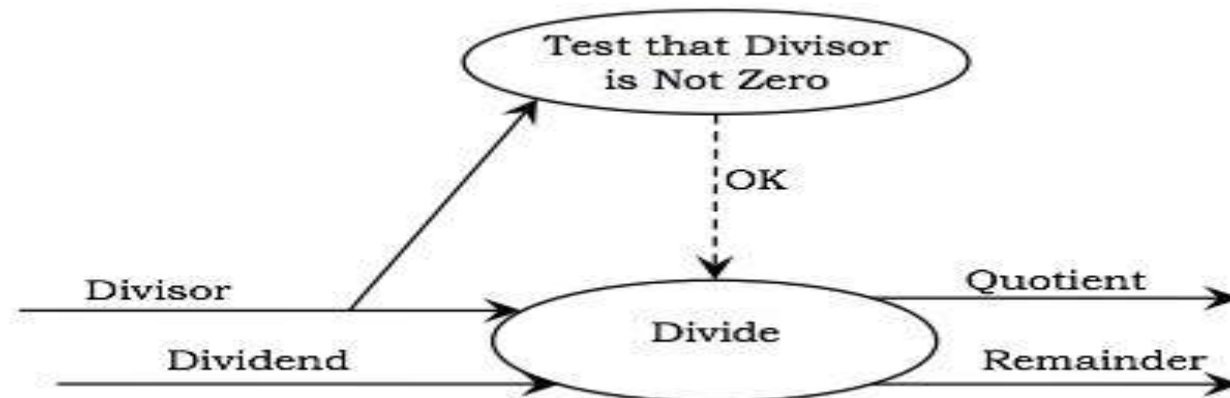
Constraints

- Constraints specify the conditions or restrictions that need to be satisfied over time.
- They allow adding new rules or modifying existing ones. Constraints can appear in all the three models of object-oriented analysis.
- **Example** – The following figure shows a portion of DFD for computing the salary of employees of a company that has decided to give incentives to all employees of the sales department and increment the salary of all employees of the HR department. It can be seen that the constraint {Dept:Sales} causes incentive to be calculated only if the department is sales and the constraint {Dept:HR} causes increment to be computed only if the department is HR.



Control Flows

- A process may be associated with a certain Boolean value and is evaluated only if the value is true, though it is not a direct input to the process.
- These Boolean values are called the control flows.
- **Example** – The following figure represents a DFD for arithmetic division. The Divisor is tested for non-zero. If it is not zero, the control flow OK has a value True and subsequently the Divide process computes the Quotient and the Remainder.



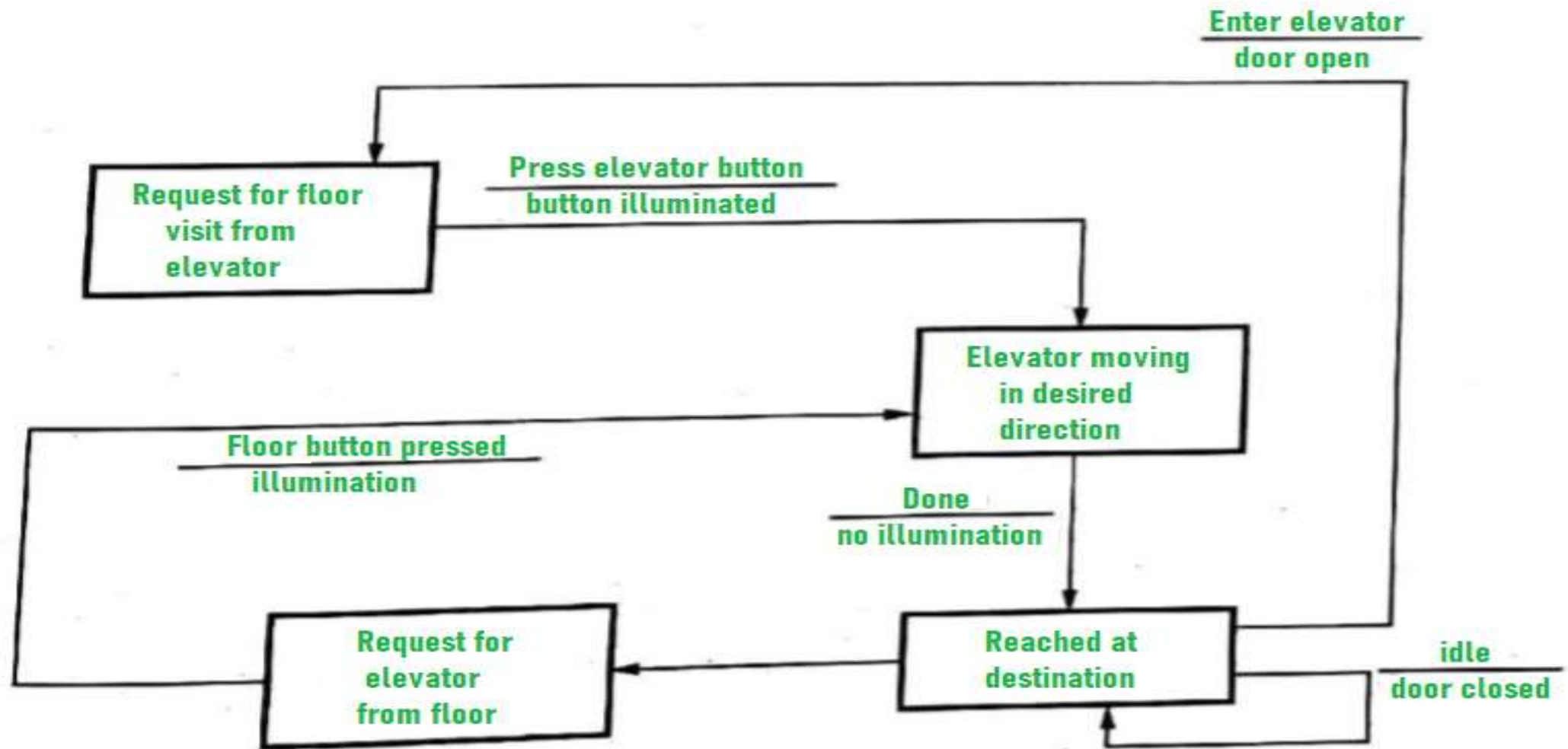
BEHAVIORAL MODELING

- Behavioral models describe the internal dynamic aspects of an information system that supports the business processes in an organization.
- During analysis, behavioral models describe what the internal logic of the processes is without specifying how the processes are to be implemented.
- Behavioral modeling attempts to explain why an individual makes a decisions and the model is then used to help predict future behavior.
- Companies use behavioral modeling to target offers and advertising to customers.

Example :

- Consider an Elevator. This elevator is for n number of floors and has n number of buttons one for each floor.
Elevator's working can be explained as follows :
- **Elevator buttons** are type of set of buttons which is there on elevator. For reaching a particular floor you want to visit, "elevator buttons" for that particular floor is pressed. Pressing, will cause illumination and elevator will start moving towards that particular floor for which you pressed "elevator buttons". As soon as elevator reaches that particular floor, illumination gets canceled.

- **Floor buttons** are another type of set of buttons on elevator. If a person is on a particular floor and he wants to go on another floor, then elevator button for that floor is pressed. Then, process will be same as given above. Pressing, will cause illumination and elevator to start moving, and when it reaches on desired floor, illumination gets canceled.
- When there is no request for elevator, it remains closed on current floor.



STATE TRANSITION DIAGRAM

Advantages :

- Behavior and working of a system can easily be understood without any effort.
- Results are more accurate by using this model.
- This model requires less cost for development as cost of resources can be minimal.
- It focuses on behavior of a system rather than theories.

Disadvantages :

- This model does not have any theory, so trainee is not able to fully understand basic principle and major concept of modeling.
- This modeling cannot be fully automated.
- Sometimes, it's not easy to understand overall result.
- Does not achieve maximum productivity due to some technical issues or any errors.