**Finite State Machine (FSM) Basics**

A **Finite State Machine (FSM)** is a logical model used to describe the behavior of a digital system through a limited number of defined states. It helps understand how systems respond to different inputs by transitioning between these states.

**States**

States represent distinct conditions or modes within the system.

Think of a state like a labeled block in code, similar to an if statement, with specific instructions that run while the system is in that state.

**State Transitions**

A **state transition** occurs when the system moves from one state to another based on certain inputs or conditions.

Imagine it like an if statement that determines which block of code to go to next based on a condition.

**State Diagram**

A **state diagram** is a visual representation of an FSM. It shows all the states and the transitions between them, helping to understand how the system behaves in response to inputs.

**Inputs and Outputs**

**Inputs**

Inputs are external signals or events that trigger transitions between states. These can come from:

* Sensors
* User input devices (keyboard, microphone, etc.)
* Other systems

**Outputs**

Outputs are the system’s responses, based on the current state and input. They can be used to:

* Trigger events
* Control actuators
* Provide feedback to the environment

**Types of FSMs**

**Mealy State Machine**

* In a **Mealy machine**, the output depends on both the **current state** and the **current input**.
* It uses **combinational logic** (for processing inputs and outputs) and **memory elements** (to remember past states).

Think of it like a conversation where the response depends on both what was said before and what's being said now—more responsive and dynamic.

**Moore State Machine**

* A **Moore machine** is similar but with one key difference: the output depends **only on the current state**, not the current input.
* It's often used in systems where predictable, consistent output is required.

Think of it as a system that reacts based on its current mood (state), regardless of the immediate input—more stable and continuous.

Cite sources  
<https://www.tutorialspoint.com/digital-electronics/digital-electronics-finite-state-machines.htm>