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Section: UCOS 3-2

CAR WASH SYSTEM

System Description

The car wash facility modeled here is an automated simple facility that is designed for cleaning vehicles. This discrete-event system starts in the Idle state, accepting a car by an input event that sets it off into a sequence of events through distinct operational states. The vehicle first enters the Washing state where soapy water cleanses the vehicles. Once the wash cycle ends, the system switches to the Rinsing state where soap residue is washed off. The car then moves into the Drying state where extra water is removed. The vehicle then moves to the exit state as it leaves the facility; the system returns to the Idle state where it waits for the next customer. It thus quite aptly demonstrates the main principles of discrete-event systems: clearly defined states that are called to change by a variety of events and a logical flow of operations. Though greatly simplified for clarity, it actually does depict the real inherent dynamics of a car wash process.

1. **Identifying the States**

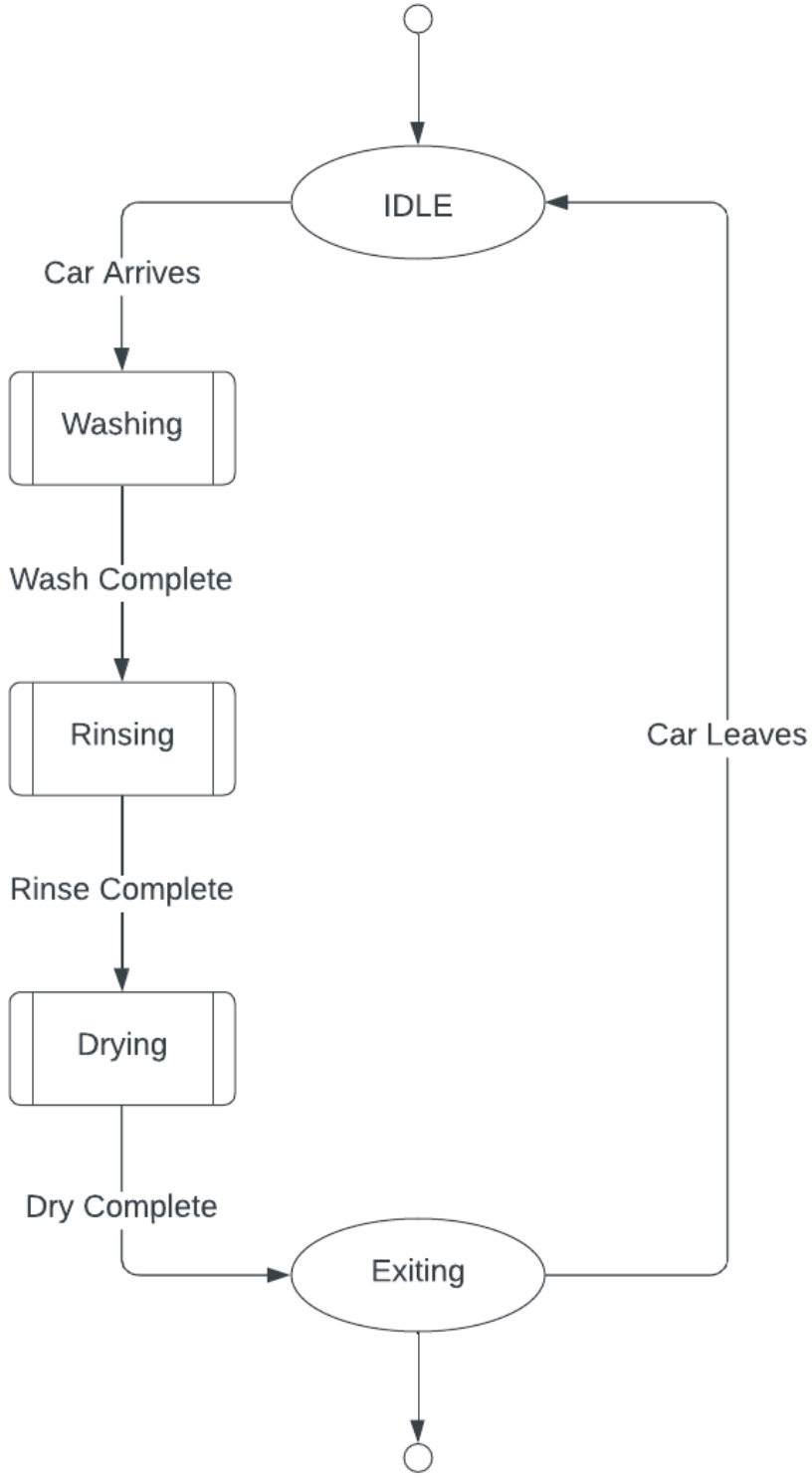
   - **Idle**
     The car wash is empty and ready for a new car
   - **Washing**
     A car is being washed
   - **Rinsing**
     A car is being rinsed
   - **Drying**
     A car is being dried
   - **Exiting**
     A car is leaving the car wash

2. **The events that cause transitions between these states**

   - **Car arrives**
     A new car enters the car wash
   - **Wash complete**
     The washing cycle is finished
   - **Rinse complete**
     The rinsing cycle is finished
   - **Dry complete**
     The drying cycle is finished

- **Car leaves**
  The car exits the car wash

3. State Transition Diagram



4. **State Transition Table**

Current State	Event	Next State
Idle	Car Arrives	Washing
Washing	Wash Complete	Rinsing
Rinsing	Rinse Complete	Drying
Drying	Dry Complete	Exiting
Exiting	Car Leave	Idle

5. **Reflection**

I considered modeling a car wash as a discrete event because the majority of states associated with a car's passing through this process need to be concentrated on. The states selected are Idle, Washing, Rinsing, Drying, and Exiting for they point towards obvious phases within the car wash process that are relatively simple, have well-defined start and end points, and are based on precise events.

Events such as those chosen serve as important triggers for state transitions in the behavior model. These include: Car arrives, when one state changes to another; Wash complete, when the other state changes; Rinse complete, Dry complete, and Car leaves. These events are clearly observable and point to a clear change in state. Problems with defining transitions included determining how detailed the model should be. For simplicity's sake, I have avoided the potential sub-states or other events like "payment received," "wash settings" or variables like “car dirt level". All these could be added for a richer system representation in a more complex model.

One may also consider whether error states or events-such as "system malfunction"-belong to the model. For this simple model I have excluded such extraordinary states and events from consideration and adhere to the pure flow of the car wash process. In much more detailed models, of course, some such exceptional states and events could be included for a more realistic description. And I think that this model helps to demonstrate a good, high-level overview of the car wash process as a discrete-event system and depict well the main ideas about states, events, and transitions in DES modeling.