PXL – Digital
421280 Software Analysis

Model Based Documentation of Requirements – State Transition diagram

Week 11 – period 01

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    - Functional: Data Flow Diagram, Activity diagram
    - Behavioral: State charts
  - Sequence diagram
- Key learning points
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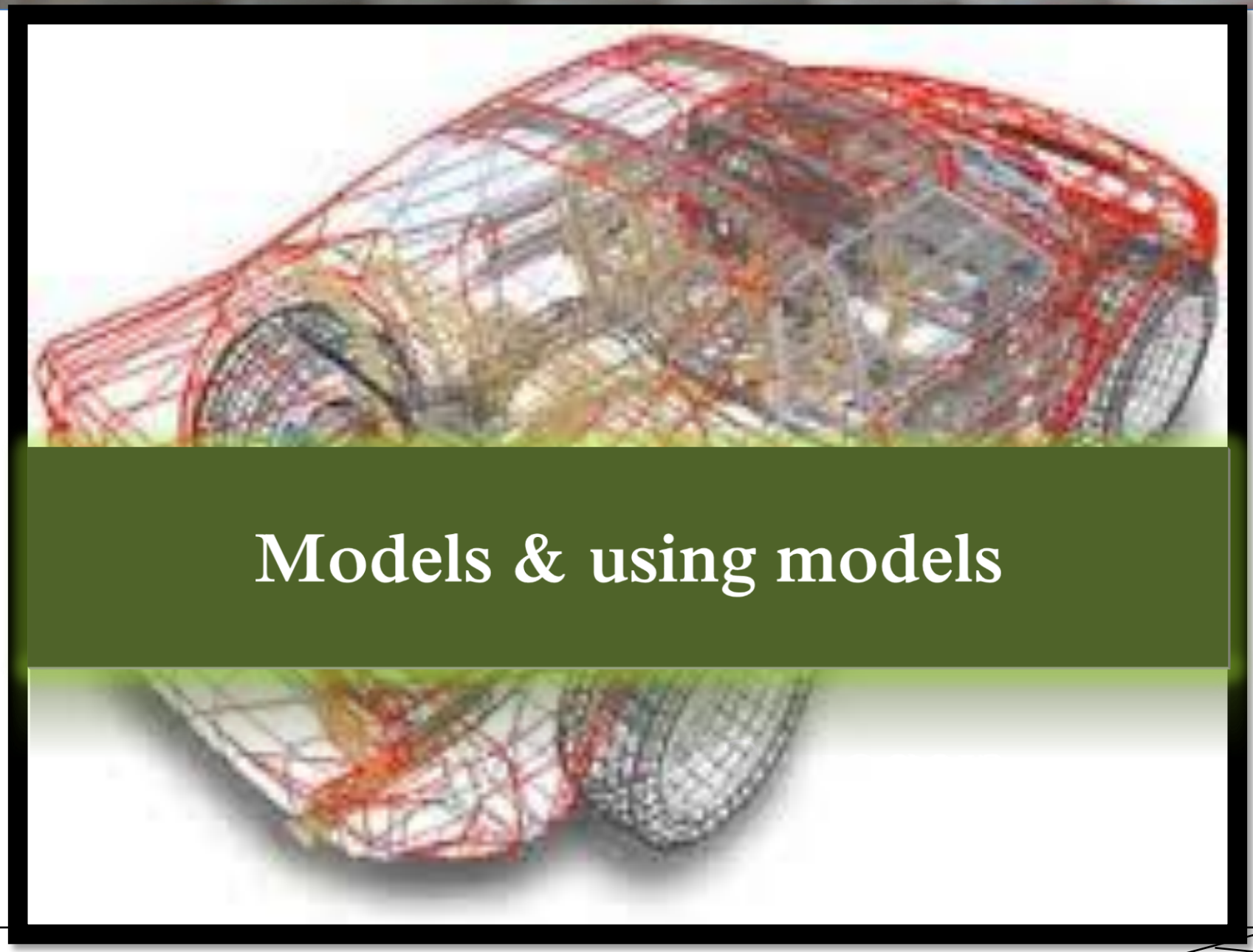


Models & using models

Topic Overview

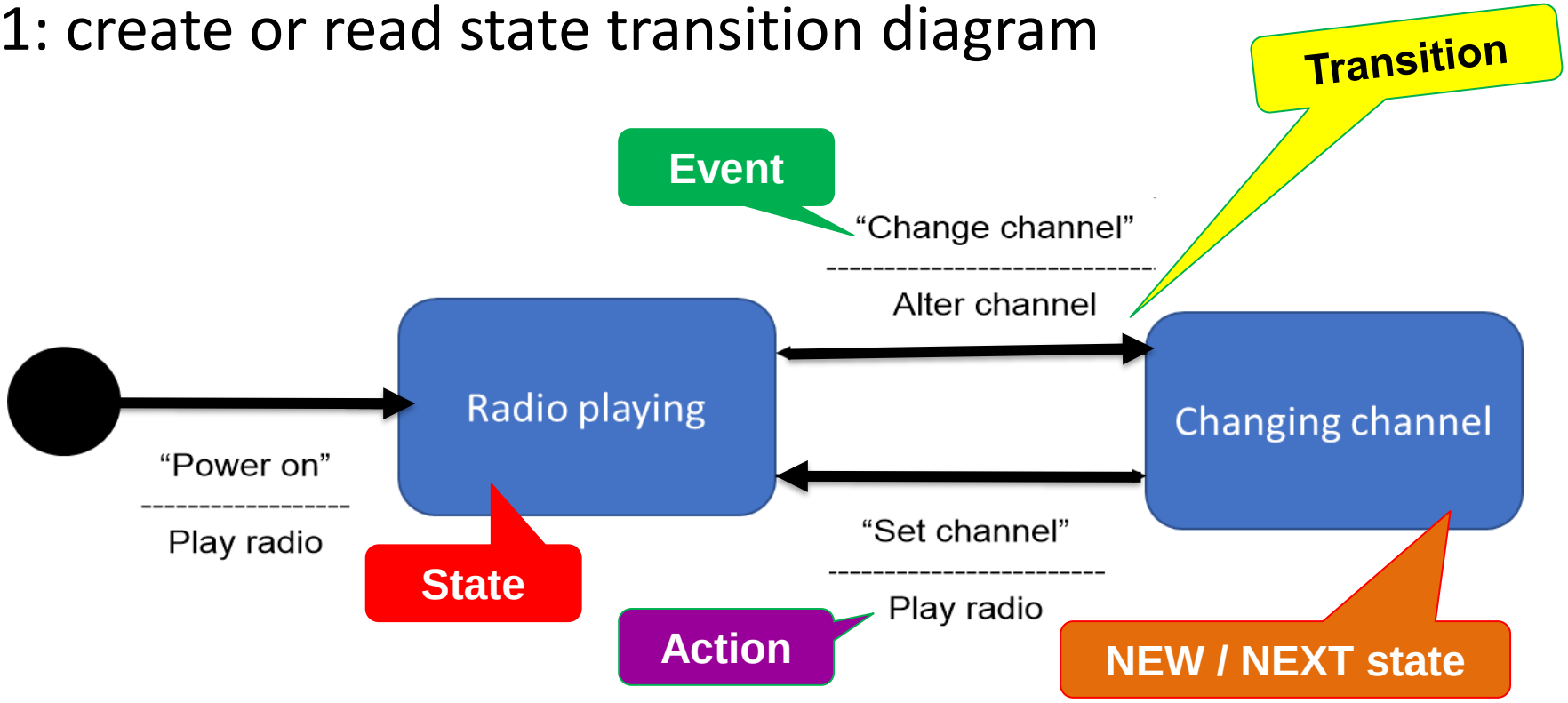
- Goal models
- System use case models (+ descriptions)
- **Three perspectives on requirements**
  - Data perspective
    - ERM, Class models (UML)
  - Functional perspective
    - Data flow diagrams, Activity diagrams (UML)
  - **Behavioral perspective**
    - State charts
- Sequence diagrams

Behavioral Requirements Models

- For modeling the dynamic behavior of a system
- Focus is on system states and events that can change that state
- Behavioral models
- UML State diagrams
  - Based on principles of finite state machines
  - Modeling elements: state, start- and end states, state transition, concurrency

State Transition Diagram (STD) – steps (1)

- Step 1: create or read state transition diagram



- **Remark**: a transition is only executed when its guard (event) is true

State Transition Diagram (STD) – steps (1)

- Step 2: create state transition table

EVENT / STATE	Power on	Change channel	Set channel
NULL	**A:** Play radio **S_{new}:** Radio playing	n.a.	n.a.
Radio playing	n.a.	**A:** Alter channel **S_{new}:** Channel changing	n.a.
Channel changing	n.a.	n.a.	**A:** Play radio **S_{new}:** Radio playing

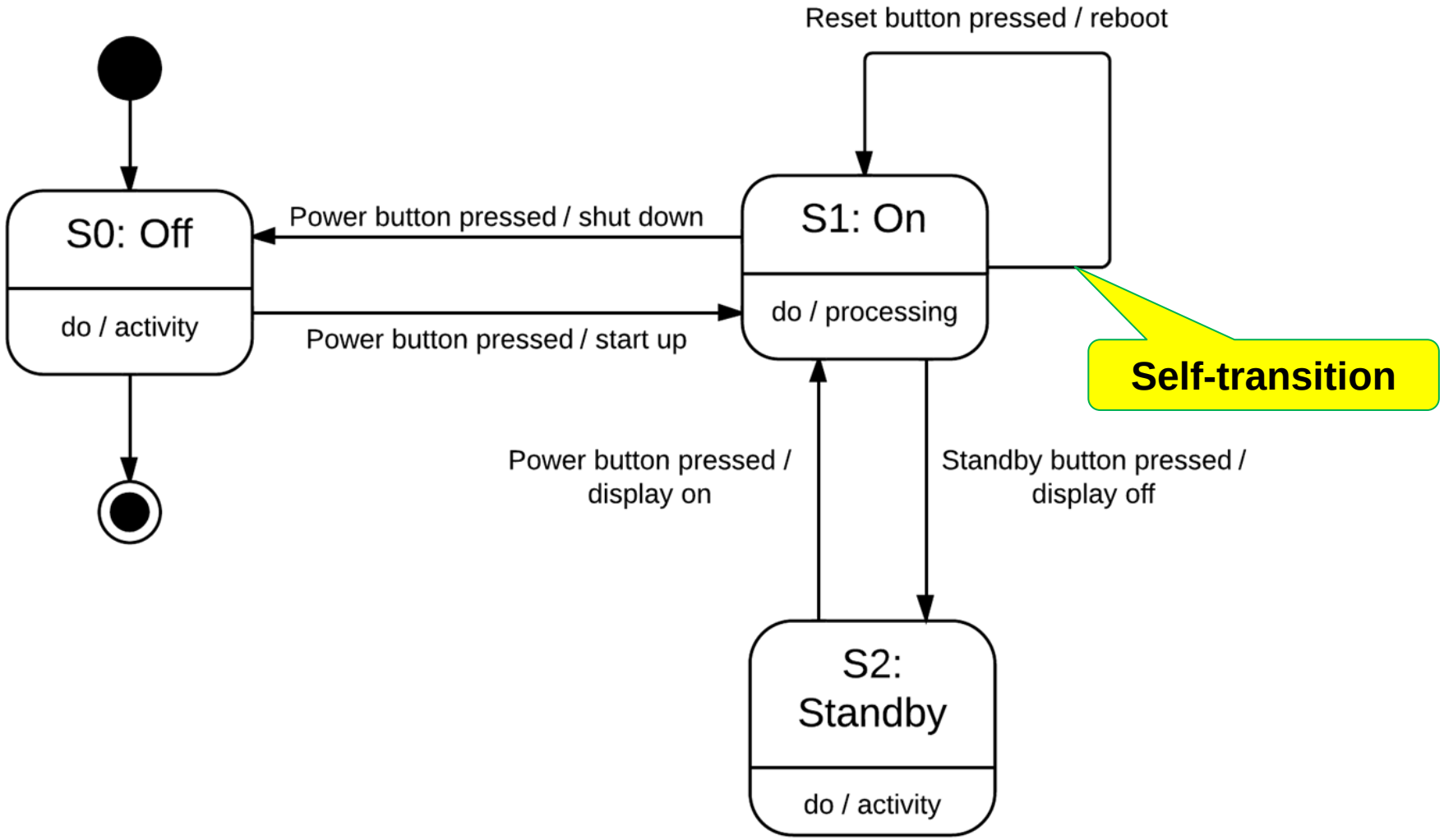
Events

States

Action

NEW / NEXT state

STD – example laptop



STD - how to draw?

- In 5 steps
  - Define states
  - Describe states (for others to understand)
  - Draw transitions
  - Define events / guard conditions
  - Define actions
  - Create state transition table

STD - pros and cons

- Describes the behaviour of a system
- All possible states a system can get into
- State changes as result of events
- Actions are short effects of transitions

☺ Suitable for modelling interfaces

☺ Suitable for simulation and testing

☹ May be difficult to read for outsiders

STD - Case - Website

- A website has a homepage, by choosing the button contact ‘ contact information’ is provided.
- By choosing the button ‘services’ an overview is provided of the services.
- The ‘services’ page also has a hyperlink to the contact information page.
- The home button will bring you back to the homepage.

- Draw the state transition diagram
- Create the state transition table
- You are allowed to ask questions!

STD - Case - Digital pet program

- You're creating a digital pet program. What happens to the pet when he receives different stimuli is determined by the state he's in, so you decide to model the digital pet with a state diagram.
- The behavior of the digital pet program is as follows:
  - When the pet is turned on, it starts out happy
  - If the pet is happy and receives punishment, then he becomes sad
  - If the pet is sad and receives praise, it becomes happy
  - If the pet is sad and receives punishment, it is heart-broken
  - Create also the state transition table

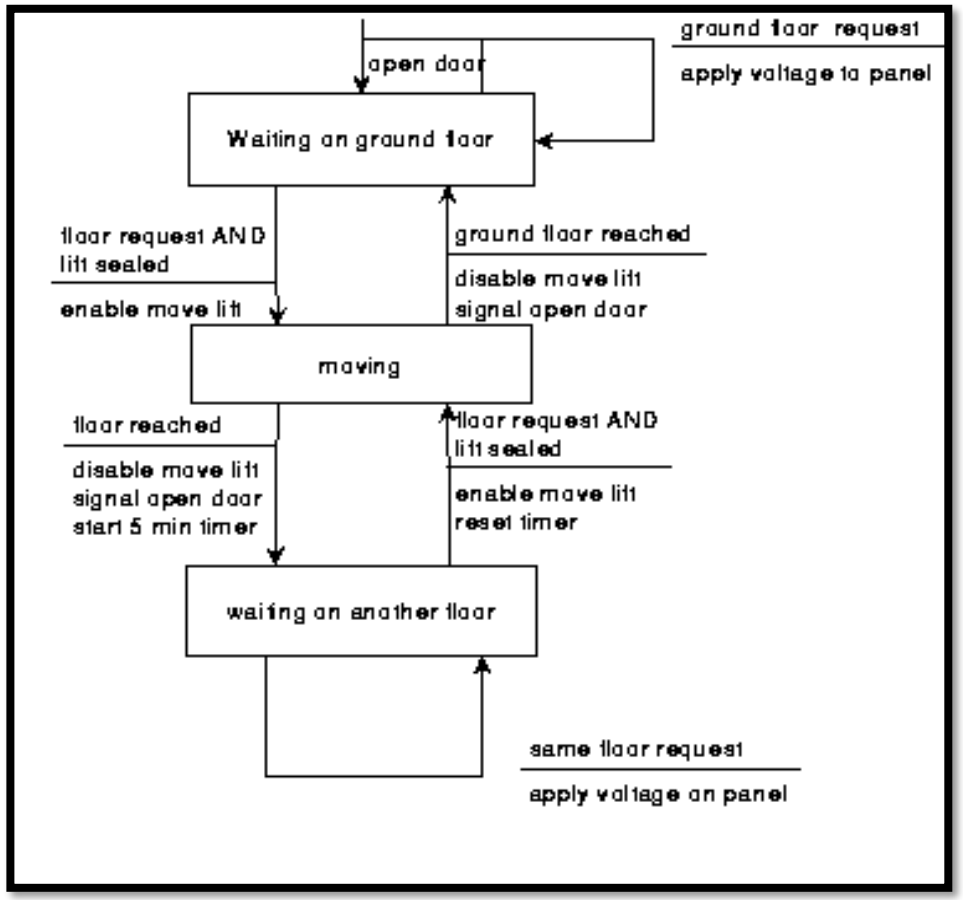
STD - Case - Fuel pump

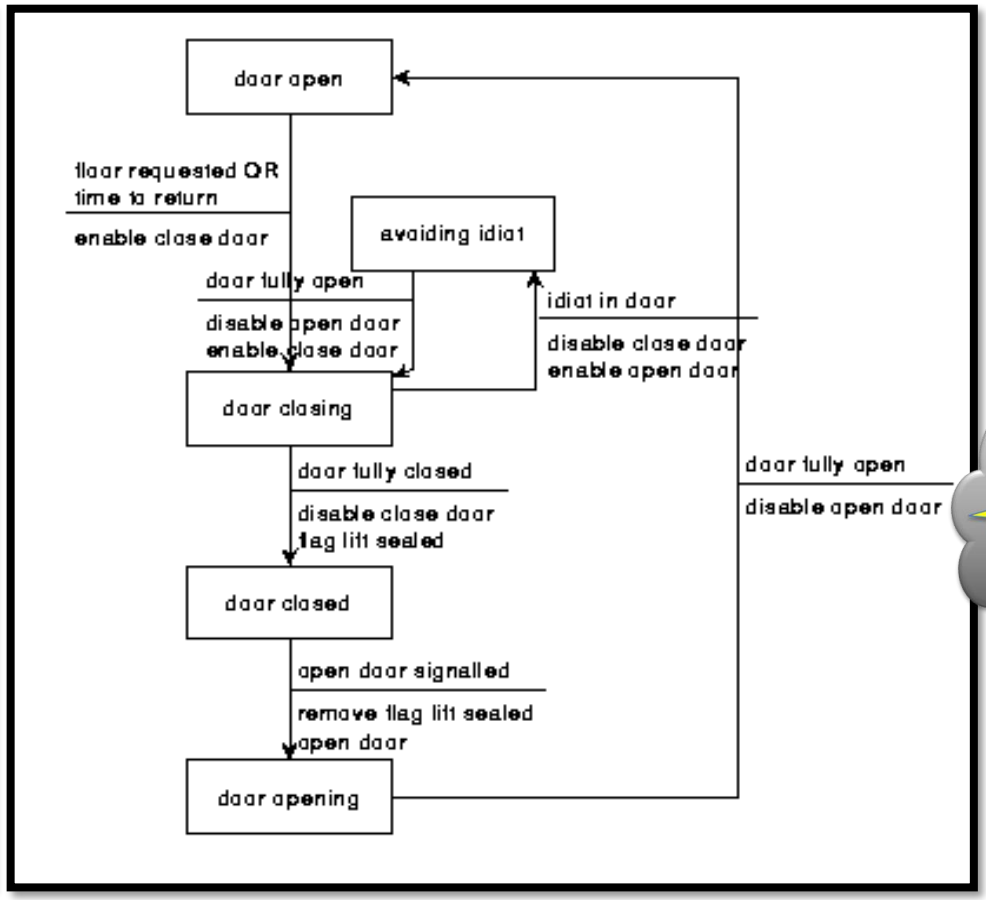
- Model the behavior of a fuel pump controller
  - User can buy fuel after inserting a credit card, which is read and validated by the controller
  - Then the user takes the hose out of the holster, and pushes the nozzle trigger, to fuel his car
  - When the nozzle is off, the fuel flow is stopped and the price is charged on the credit card
  - If invalid card or timeout the system returns to the initial waiting state

- Draw the state transition diagram
- Create the state transition table

STD - Case - Elevator

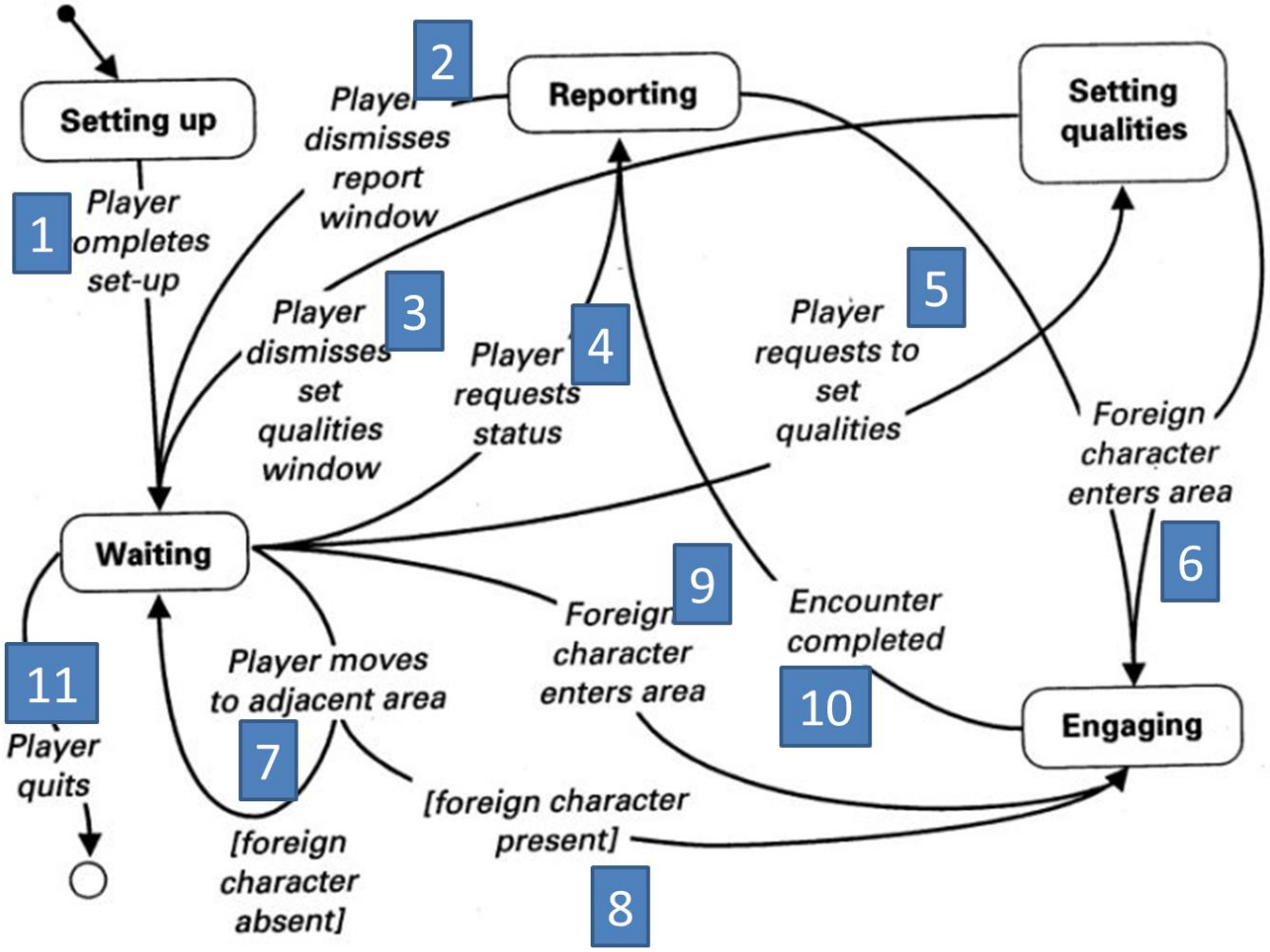
- Create the state transition table





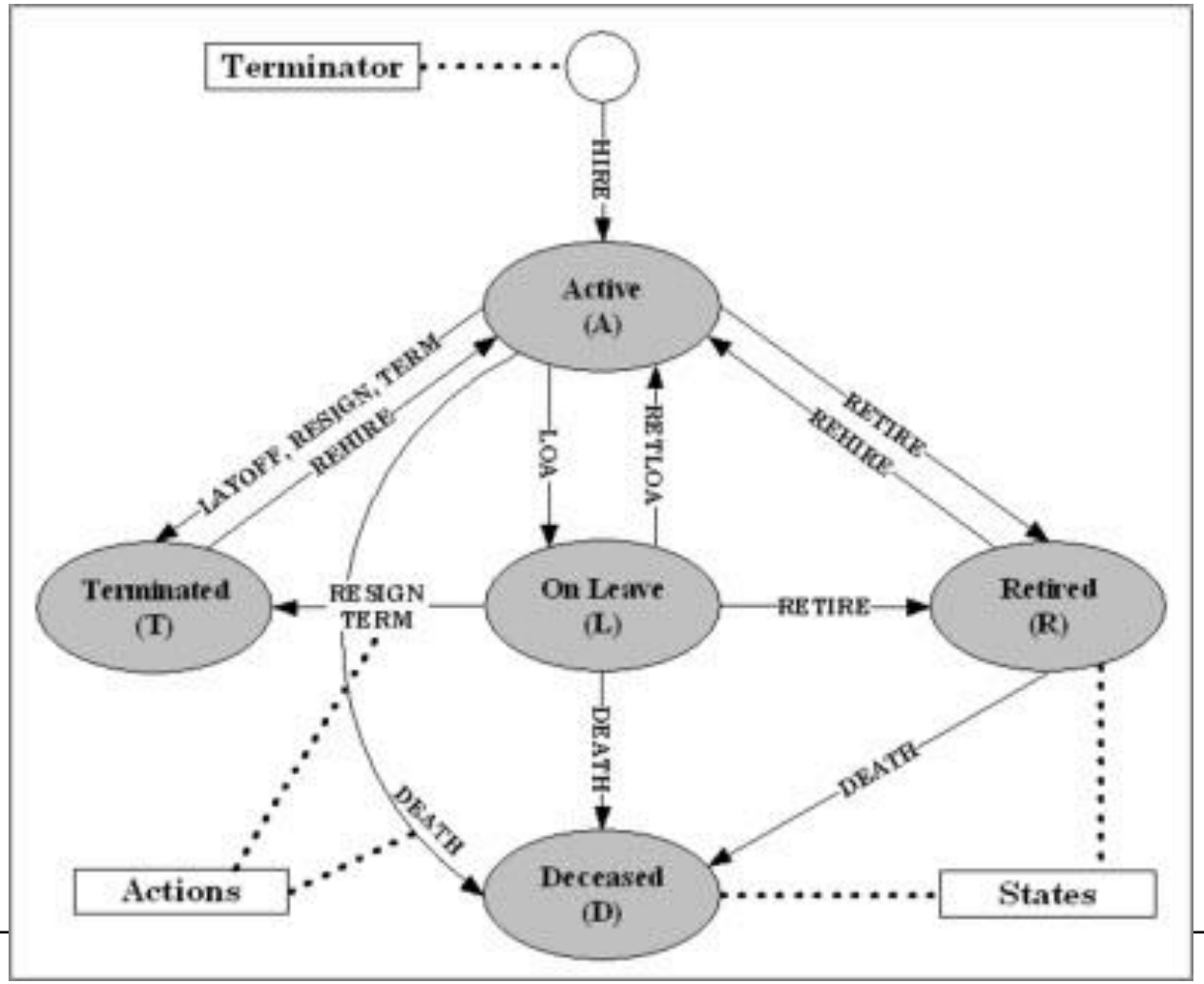
STD - Case - Game

- Create the state transition table



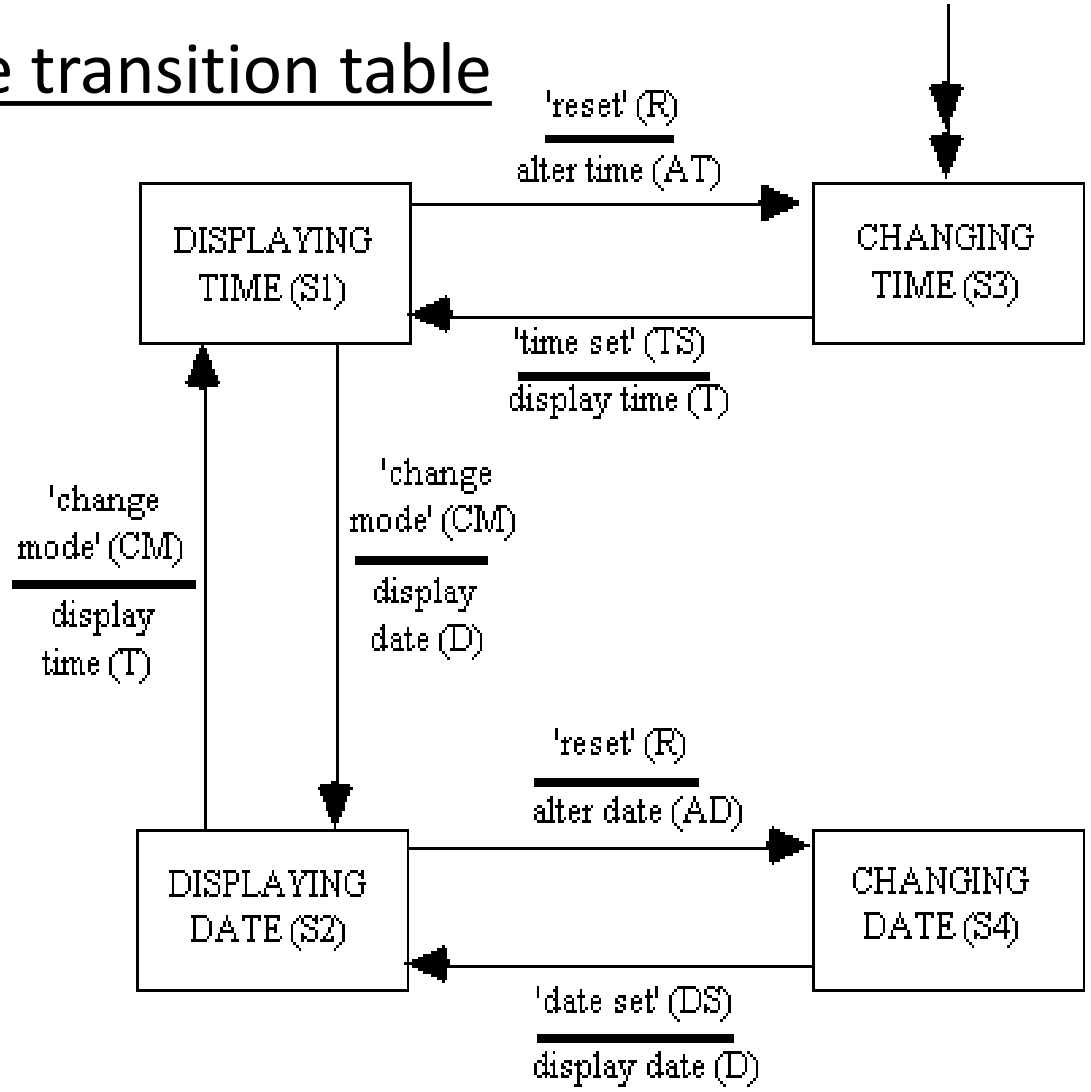
STD - Case - Person's status

- Create the state transition table



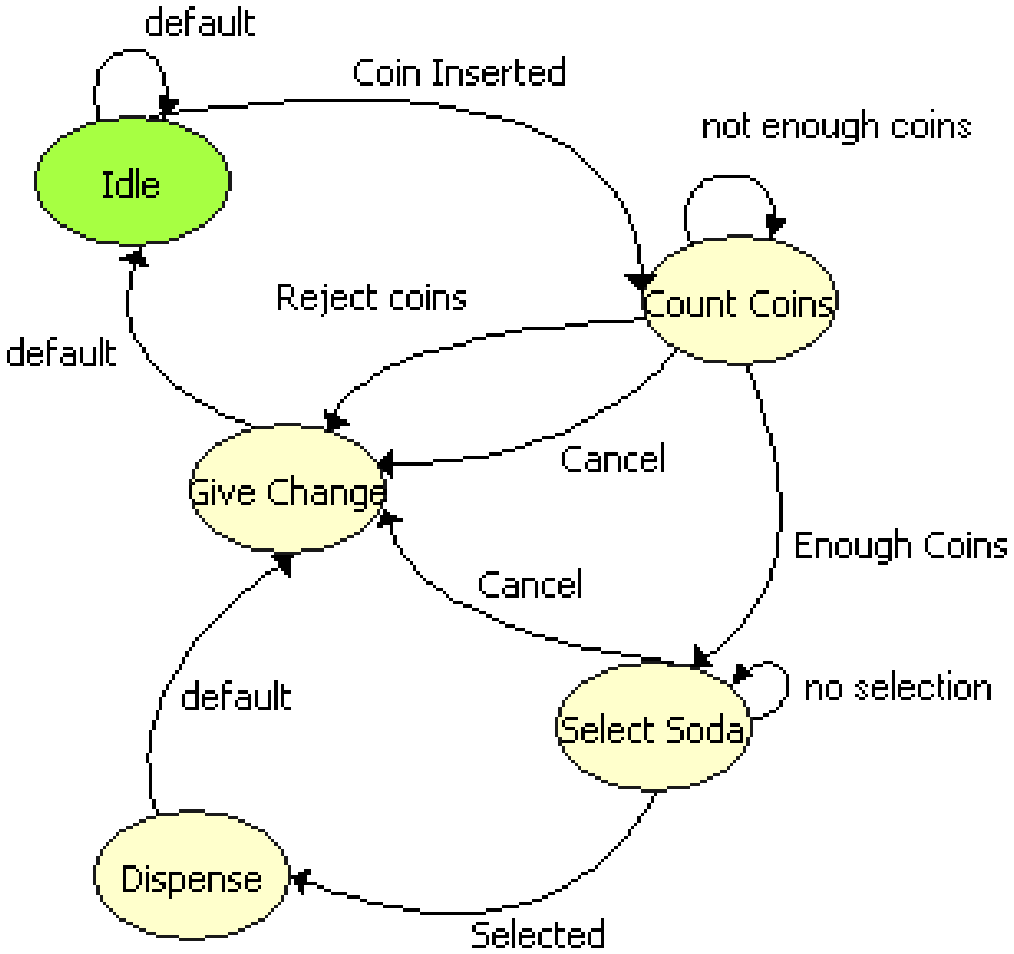
STD - Case - Clock

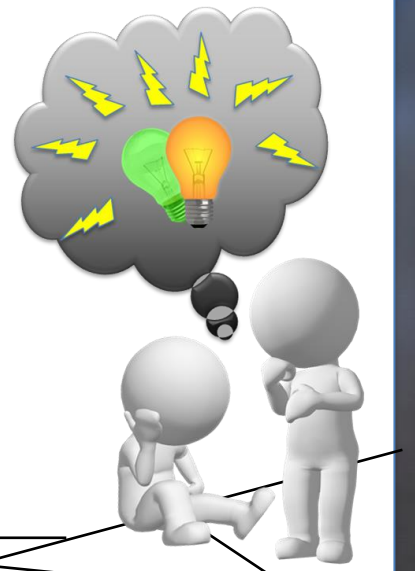
- Create the state transition table



STD - Case - Soda vending

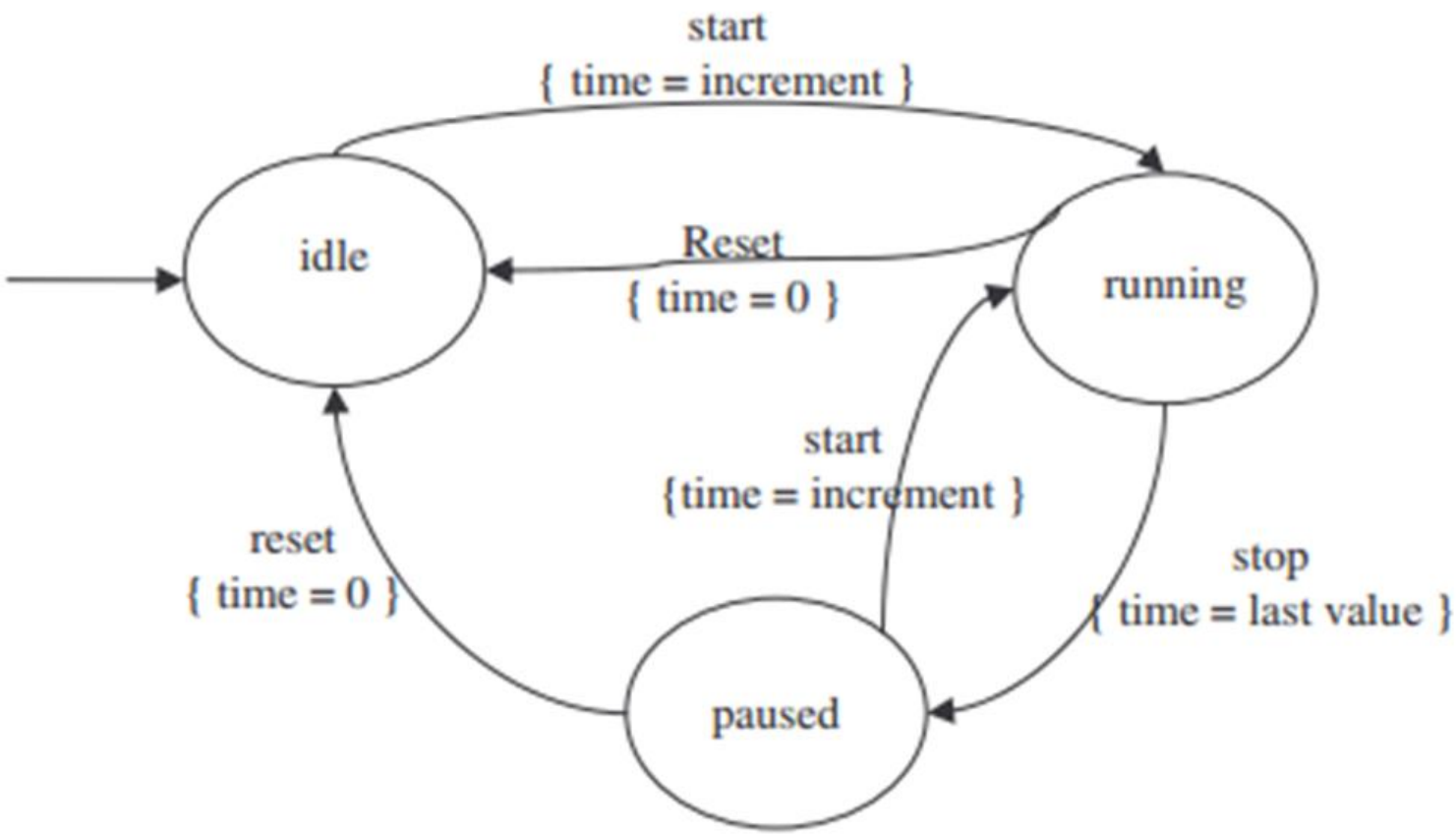
- Create the state transition table





STD - Case - Stopwatch

- Create the state transition table



Questions & answers