Class Diagrams

Exercises

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University

- In a university there are different classrooms, offices and departments. A department has a name and it contains many offices. A person working at the university has a unique ID and can be a professor or an employee.

- A professor can be a full, associate or assistant professor and he/she is enrolled in one department.

- Offices and classrooms have a number ID, and a classroom has a number of seats.

- Every employee works in an office.

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University: solution

Diagram made with Omondo UML tool
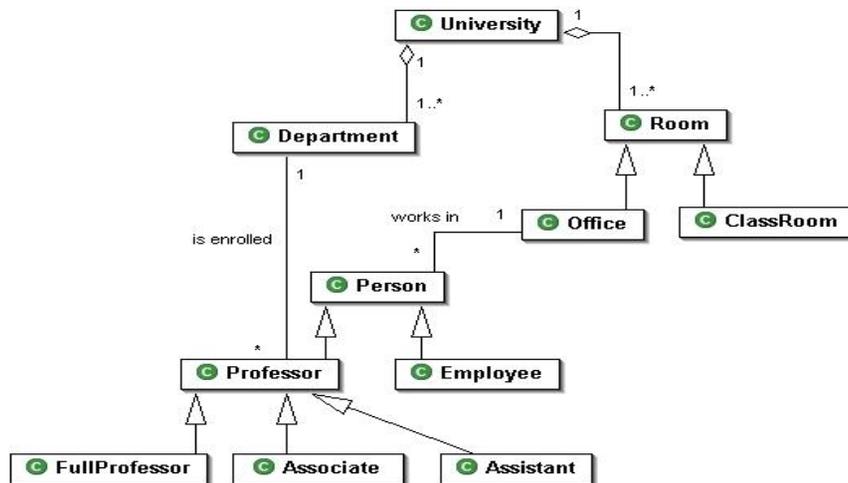
Movie- Shop

- Design a system for a movie-shop, in order to handle ordering of movies and browsing of the catalogue of the store, and user subscriptions with rechargeable cards.
- Only subscribers are allowed hiring movies with their own card.
- Credit is updated on the card during rent operations.
- Both users and subscribers can buy a movie and their data are saved in the related order.
- When a movie is not available it is ordered .

Movie-Shop: solution
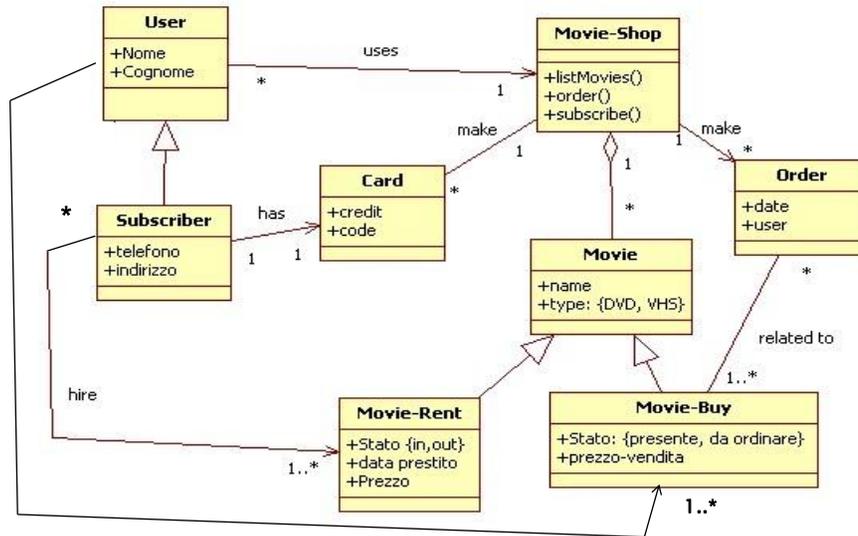
Flights

We want to model a system for management of flights and pilots.
An airline operates flights. Each airline has an ID.
Each flight has an ID a departure airport and an arrival airport: an airport as a unique identifier.
Each flight has a pilot and a co-pilot, and it uses an aircraft of a certain type; a flight has also a departure time and an arrival time.
An airline owns a set of aircrafts of different types.
An aircraft can be in a working state or it can be under repair.
In a particular moment an aircraft can be landed or airborne.
A company has a set of pilots: each pilot has an experience level: 1 is minimum, 3 is maximum.
A type of aeroplane may need a particular number of pilots, with a different role (e.g.: captain, co-pilot, navigator): there must be at least one captain and one co-pilot, and a captain must have a level 3.

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Flights – solution
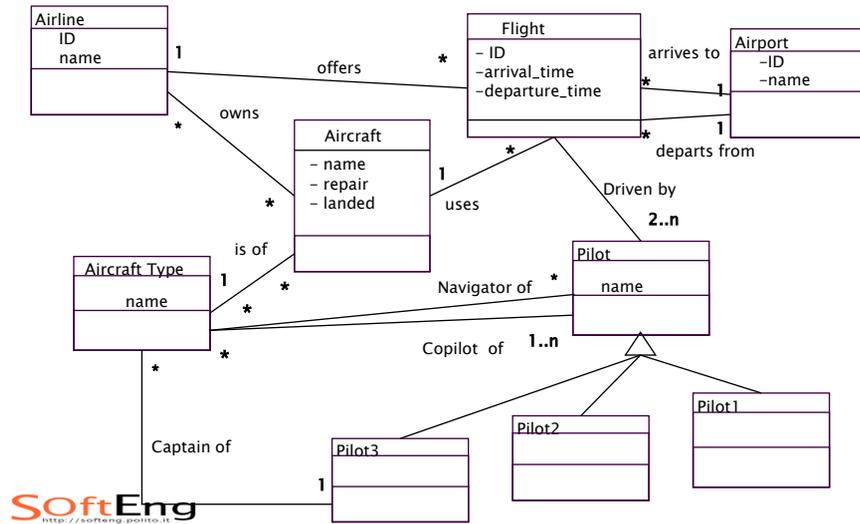
Bank system

A bank system contains data on customers (identified by name and address) and their accounts.

Each account has a balance and there are 2 type of accounts: one for savings which offers an interest rate, the other for investments, used to buy stocks.

Stocks are bought at a certain quantity for a certain price (ticker) and the bank applies commission on stock orders.

Bank solution
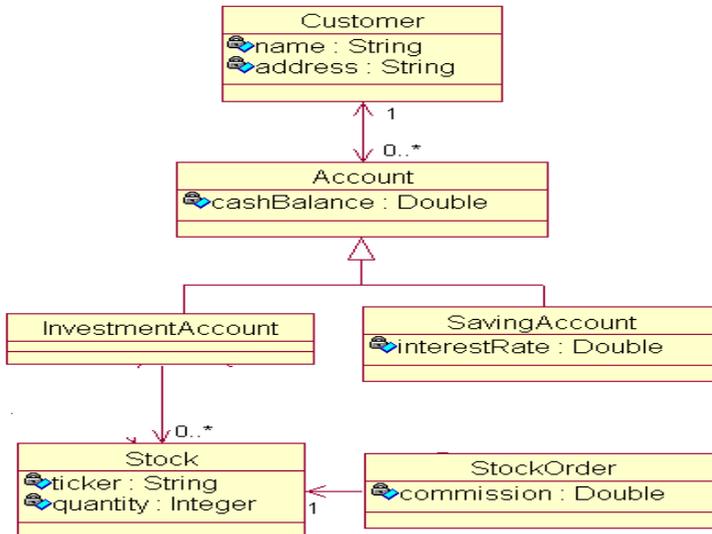
Statecharts

Exercises

Digital Pet

- 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

- Identify the states and transitions of the digital pet and draw a state diagram.

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Digital pet: statechart

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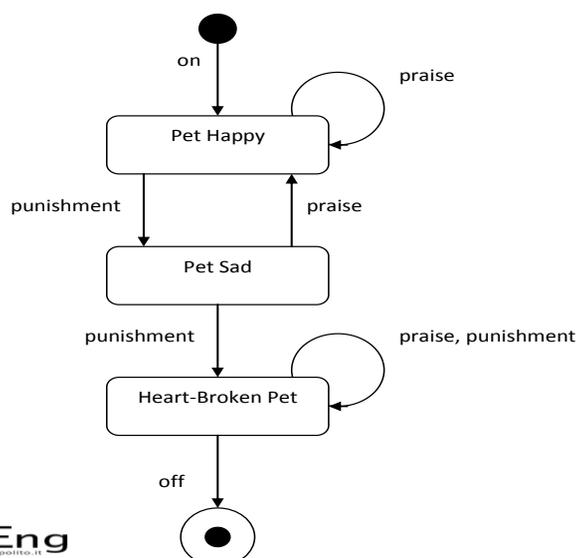
Calculator

- Draw a statechart of a simple calculator
- The interface of the calculator is composed of 10 buttons with digits, and 4 buttons with the basic operations (+, −, *, /)
- The button "C" resets the display
- The button "=" displays the result
- Buttons "On" and "OFF":

  try to guess.

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Calculator
display
op1
op2
operator
− click(char key)

Calculator: solution

'C' / display=0   [digit] / update display

on   **NO_OP**   'C' / display = 0

'C' / display=0

[digit] / update display

[digit] /
update display   [sign] / op1 = display   **ONE_OP**

'=' / op2 = display   [sign] / op1 = display

TWO_OP
do: update display with result   [sign] / op1=result

[sign] means '+' , '-' , '*' , '/'
[digit] means '0' .. '9'

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ALL STATES   off

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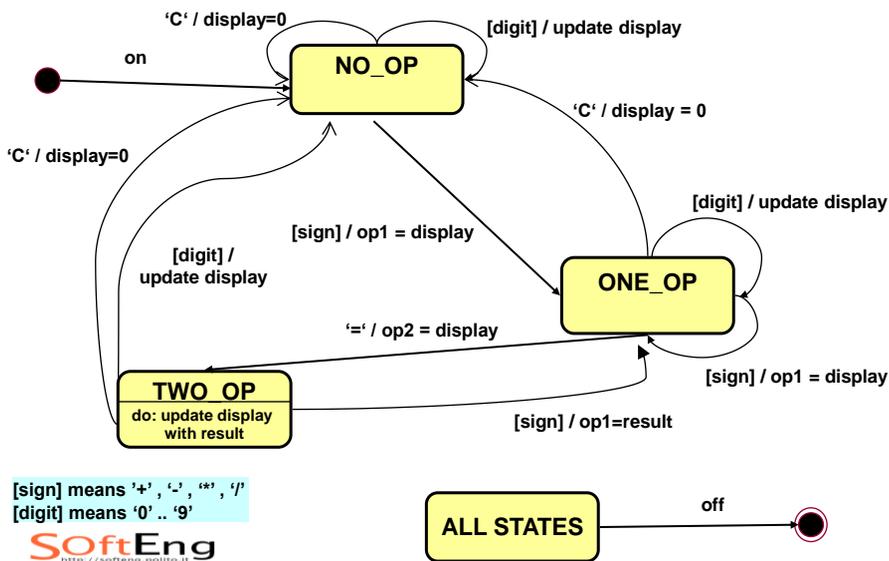
Fuel pump

- 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.

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Fuel pump: solution

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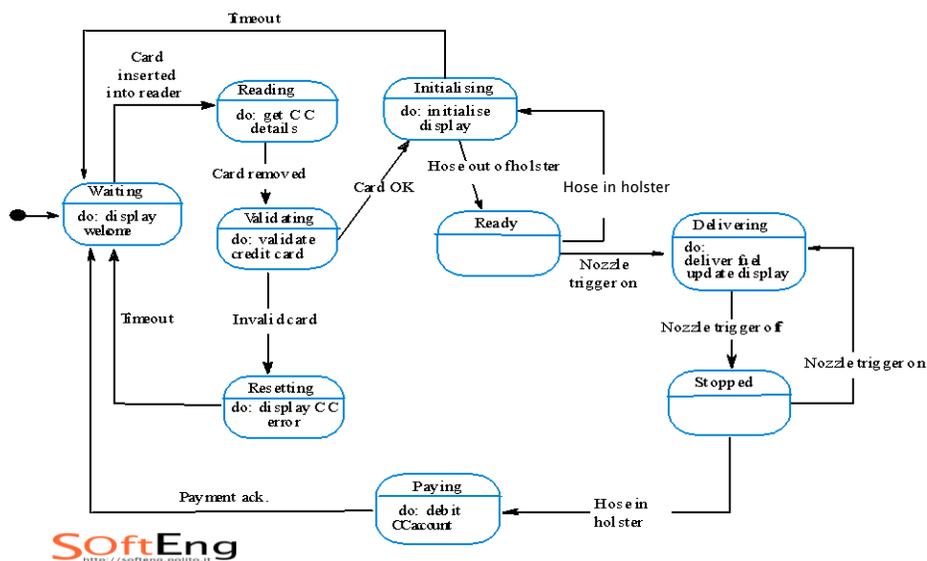
Activity Diagrams

Exercises

Model processes with activity diagram

Booking a Room in a hotel

When customer requests a room, the hotel employee looks for room availability, then he insert customer's data and verifies if the provided credit card number has enough credit to pay the room: in this case the booking is confirmed and we wait customer arrival.

The Hotel information system allows customer to modify or cancel his/her reservation. If customer arrives he uses the room and then he pays, in case of no-show a penalty is accounted on his credit card and the booking is canceled.

Solution
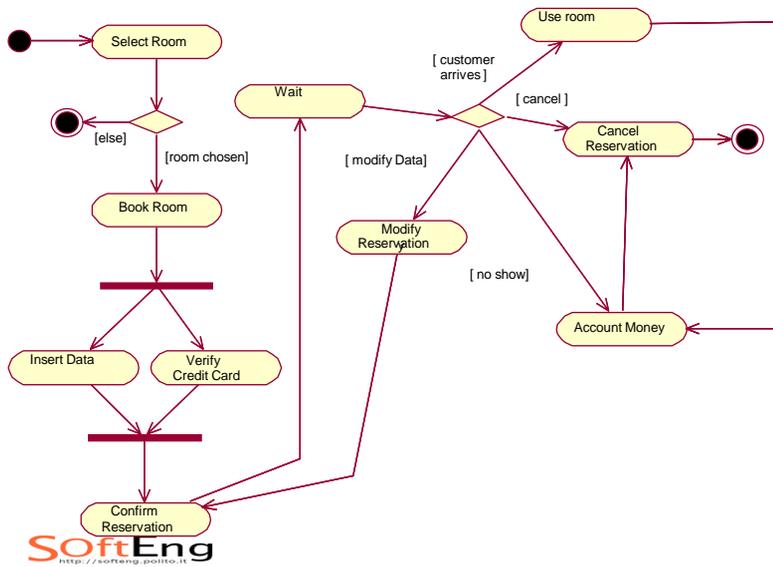
Voting

Once arrived at the polling station, elector gives the own electoral card to station president who checks if the polling station number is right .

Then he checks the identity document and if ok he gives the ballot paper to the elector.

Then the president waits for a cabin to get free and he gives the pencil to the elector and a secretary who signs the registry and put a print on the elector certificate.

Once elector has voted, he/she inserts the ballot paper in the urn, giving back the pencil and taking back the own ID document.

Voting: solution

Give certificate

[new elector]

[wrong polling station number]

Give back certificate

Right number

Check Document

[Document not valid

Give Ballot paper

Give back Document

Assign free cabin

Sign Registry

Give pencil

Print on card

Vow

Insert ballot paper

Give back Pencil

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Products Management

When an order is received , check client data and availbility in the inventory.If credit card data are enough to pay products, wait for payment and then send receipt. Once payment is registered in archive, client is notified of payment received

If credit card data are ok, we verify if product is present in inventory, if not we have to fill order to buy it or , if the product is internally produced, we have start a production process, then the inventory is updated.

Once product is ready to be sent and payment is ok, we can send product to client.

Solution