Data & Information – Test 1: Solutions
4 May 2018, 13:45–15:15

Question 1 (Requirements) (30 points)

Most important categories and quality characteristics could be:
- *Usability – Learnability or Operability*. It goes without saying that the app should be easy to understand and easy to handle, as it is intended for a general audience who will not receive training.
- *Reliability – Availability*. If there would be a technical problem (e.g. the app doesn't work because the central system is down), the rent cannot start…
- *Functional suitability – any characteristic*. The app should do what it's specified to do and not contain flaws or make errors.

Other characteristics could be considered most important as well, depending on the argumentation that is given. For example:
- *Security – Confidentiality*. In light of recent discussions about social media (we don't know who owns NeigborhoodCar), it can be argued data about users is not shared with or sold to other parties.

For examples of quality requirements, see the leture slides.

Question 2 (Database queries) (40 points)

a) Give a list of names and postal codes of owners of cars that never got damaged during a NeighborhoodCar rental.

```
SELECT DISTINCT p.name, p.postal_code
FROM Person p, Car c
WHERE p.pid = c.pid
AND NOT EXISTS (
     SELECT *
     FROM Rental r, Damage d
     WHERE r.cid = c.cid
       AND r.rid = d.rid)
```

b) Give a list of names and first names of persons who caused damage to at least two different cars during a NeighborhoodCar rental.

```
SELECT DISTINCT p.name, p.first_name
FROM Person p, Rental r1, Rental r2, Damage d1, Damage d2
WHERE r1.pid = p.pid
  AND r2.pid = p.pid
  AND d1.rid = r1.rid
  AND d2.rid = r2.rid
  AND r1.cid <> r2.cid
```

An alternative solution for b) is the following – but it more tricky and thus more error-prone…
```
SELECT p.name, p.first_name
FROM Person p, Rental r, Damage d
WHERE p.pid=r.pid
  AND r.rid=d.rid
GROUP BY p.rid
HAVING COUNT(DISTINCT r.cid)>=2
```

c) Give a list of cars owned by persons in Enschede, sorted by how many times they were rented
    (highest number of rentals first). Only include cars that were rented at least 5 times.
    For each car, give licence plate; brand; model; name of the owner; number of rentals.
    A car is located in enschede if the postal code is between 7500AA and 7549ZZ.

```
SELECT c.licence_plate, c.brand, c.model, p.name, COUNT(r.rid)
FROM Car c, Person p, Rental r
WHERE c.pid = p.pid
  AND c.cid = r.cid
  AND p.postal_code >= '7500AA'
  AND p.postal_code <= '7549ZZ'
GROUP BY c.licence_plate, c.brand, c.model, p.name
HAVING COUNT(r.rid) >= 5
ORDER BY COUNT(r.rid) DESC
```

Question 3 (Web Programming) (30 points)

a) (10 points) How is a Web Servlet (HttpServlet object) capable of inspecting the HTTP request
    message and setting values of the HTTP response message when processing an HTTP request
    message at the server-side?

The complete answer should refer to the application server calling the doX() method (X is the HTTP
method) when the HTTP request arrives, and that the request and response messages are actually
parameters of this method. This makes it possible to inspect the HTTP request message contents and set
the HTTP response message values (header and body) in the code of the doX() method.

b)   (10 points) What is the main benefit of using JavaScript for developing the client-side of web
    applications if compared with using only HTML and Servlets?

The main benefit is actually that if we use only HTML and Servlets we need to send a message to the
server and wait for an answer, while in some cases a JavaScript can handle user input completely at the
client. Furthermore, HTML and Servlets require the whole page to be update (after communicating with
the server), while JavaScript allows only parts of the page to be refreshed.

c) How is it possible for an HTML page with a JavaScript script to invoke a RESTful service and show the
result of this invocation to the end user? Which capabilities of JavaScript are normally used for that?

This is possible because in JavaScript we can define an XMLHttpRequest object that invokes a RESTful
service and handles the response with a function. This function uses then the JavaScript capabilities of
modifying the page in which the script is embedded.