Foundations of Software Engineering (SS19)
Problem Set 2

Task 1: CRC card method

CRC stands for:

> **Class:** Collection of similar objects
> **Responsibility**: Something the class knows or does
> **Collaborator**: Another class that the class interacts with

The company RentOut gives you the contract to develop a software for the administration of its rental objects and tenants. Your team has had conversations with the employees and made some notes:

RentOut employees should be able to manage the company's rental properties centrally via the system. The company buys buildings and then rents them out. A building is entered in the system for the first time after the purchase has been completed. A distinction must be made as to whether a rental object is an apartment or an entire house. The system must be able to uniquely identify apartments in the same building. Prospective tenants contact the company by telephone. The telephone employee should be able to call up a list of rental objects in a particular postal code area in the system. The most important data that is of interest to potential tenants is the living space, rental price, and number of rooms. In the case of houses, the property area must also be saved. The system must also be able to enter additional characteristics for a rental object, for example, if an apartment is handicapped-accessible. When a RentOut employee reaches a rental agreement, the system should also have the ability to save the tenant contact info for future correspondence.

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a) In the above requirement description, find possible candidates for classes and list the classes with their respective upper and lower classes, responsibilities and assistants in the given table.
   1. Find nouns
   2. Delete everything without a clear area of responsibility
   3. Are there several areas of responsibility?
   4. Check if something is missing

Class	Upper Class	Lower Class	Responsibility	Assistants
Rentout Employee			-Record Buildings	-Rental object
			-Knows rental object	-Apartment
			-Knows tenants	-House
				-Tenant
Tenant			-Knows rental objects	-Rental object
Rental Object		-Apartment	-Knows tenant	
			-Knows PLZ	
			-Knows Rooms	
		-House	-Knows Address	
			-Knows Price	
			-Knows living space	
Apartment	Rental object		-Knows floor	
			-Knows apartment number	
House	Rental object		-Knows area	

b) Go through the system with the following scenarios. Create CRC cards according to the scheme presented in the lecture. Add classes if needed or remove unnecessary classes that were not used.

    a. An employee has completed the purchase of a building. It has two floors, each with two apartments. All apartments are identically cut, have 3 rooms and a floor space of 78m². The rent per apartment is fixed at 500€.

Class Name	
Upper-Class: Sub-Class:	
Responsibility	Collaboration

Rentout Employee	
Upper-Class: - Sub-Class: -	
- Managing Building - Save apartment	- Apartment - RentOut object

Apartment	
Upper-Class: Rental Object Sub-Class: -	
- Space - Room number - Floor number - Price	Rentout Employee

b. A **prospective customer** announces itself on the telephone and looks for possible **renting objects** in the postal zip code range, which begins with 67. The dwelling needs at least two rooms, a surface area of 50m² and the cold rent should amount to at most 400€.

Rental Object	
Upper-Class:	
Sub-Class: Apartment	
- Number of rooms - Zip Code - Space - Rental Price	Rentout Employee

Prospective Customer	
Upper-Class:	
Sub-Class:	
-Knows rental object	Rentout Employee

c. Because of damages a **tenant** must leave his/her accommodation and needs information to comparable accommodation in the same area.

Tennant	
Upper-Class: -	
Sub-Class: -	
- Knows Rental Object	Rentout Employee

Task 2: Quality assessment of requirements

Quality Criteria of requirements;
- Understandable (user/developer)
- Unambiguous (have exactly one interpretation)
- Consistent
- Minimal
- Verifiable and implementable

Evaluate the following requirements with regard to the quality criteria mentioned in the lecture. For each requirement, note the violated characteristics and make a suggestion for an improved formulation.

1. The user must not wear gloves when using the fingerprint scanner.
   o Not verifiable, not practicable
   o No system requirement
2. the movement of the robot arm shall not exceed a maximum rotational speed of two meters per second about the vertical axis in order to allow sufficient time for persons in the safety area to operate the emergency stop.
   o Unambiguous: The rotation speed must be an angular speed (rad/s)
   o Minimal: additional information and assumptions about the context.
3. The sprinkler system shall not allow water to pass when the smoke detector signals an alarm.
   o Consistent: logical contradiction between cause and result.
4. Passengers must not think of falling during their stay in the lift.
   o Not verifiable: not practicable
   o No system requirement

Task 3: Differences between customer requirement specifications – functional requirements specification

Answer the following questions about the specifications: Which of these documents?

1. … contains the requirements from the customer's point of view? ==== CS
2. … serves as the basis for the acceptance test? ==== RS
3. … contains the quality requirements for the product? ==== CS, RS
4. … precedes the requirements analysis? ====
5. … serves as contract basis? ==== RS CS
6. … contains the first draft of the solution to be implemented? ====
7. … summarizes the development priorities from the client's point of view? ==== RS
8. … serves as a basis for examining the feasibility of the project? ==== CS
9. … defines a vocabulary shared by the client and the contractor? ==== CS RS
10. … should contain unclearly formulated specifications? ====
11. … is typically included in a tender? ==== CS
12. … determines the financial scope of the project? ====

*CS – Customer Specification   *RS – Requirement Specification

Task 4: Customer requirements specifications – functional requirements specification

The central library of Happy Town would like to automate its library catalogue. It has asked HappyTownSoft & Co. to develop a library system. The system will contain information about all the books in the library and will be usable by library staff and by book borrowers and readers. The system should support catalogue browsing and querying. HappyTownSoft & Co. are now starting with the creation of the specifications and ask the product manager to present his unfortunately rather disordered lubrication notes from customer discussions.

Enter the requirements you read from the notes in the prepared specifications form (keywords!). Fill the product function, product data and product services tables bellow. You may have to make plausible assumptions yourself where customer requirements are incomplete. Also indicate from which statement you have read the requirements.

PS. Table size is not an indicator of the of the requirements count.

Collection of customer quotes:

Nr.	Statement
1	I want to be able to preview the book catalogue anytime anywhere.
2	When I used to live in Clumsy Town, I was able to reserve any book with a single click! I like to do that now but so far every system I have encountered is over complicated. I can't understand why!
3	Sometimes I forgot to collect a book I already have reserved, it would be helpful to be notified when the reserved book is available.
4	As a librarian, I get many requests about locating a book in the library. The system should show clear location information of the books we have. That would be a big relief for me.
5	The system should be fast. The borrower should not wait more than 2 seconds.
6	What I hate the most when I work with computers, is to re-type all the information if I mistakenly pressed proceed before filling all the mandatory fields. Can you imagine entering a book title like: "*You Are Not So Smart: Why You Have Too Many Friends on Facebook, Why Your Memory Is Mostly Fiction, and 46 Other Ways You're Deluding Yourself*" again and again.

Product Functionality

PF 1	Responsive design (compatibility with laptop, desktop, tablets, PCs and mobile phones) (from 1)
PF 2	Simple book reservation workflow / functionality (from 2)
PF 3	User notification functionality for available reservation (from 3)
PF 4	Add book information within the library to the system (from 4)

Product Data

PD 1	Books information should be stored (from 1)
PD 2	Book information should be cashed during the entry process (from 6)

Product Services

PS 1	Response time not more than 2 seconds (from 5)