Universidad de Puerto Rico
Recinto de Mayagüez
Department of Computer Science and Engineering
INSO 4101: Introduction to Software Engineering

Homework 1

Domain: Beach Quality Report

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Exercise 1.1: Domain Entities

For the fixed topic, selected by you, list some dozen or so domain entities. Give suitably short names for their types and describe these, whether simple or composite, and if composite, describe their composition.

- Atomic Entities
    - Water quality report: report of the water quality for the user's specified beach.
- Composite Entities
    - Beaches: Beaches who receive regular water quality reports from the Department of Natural Resources and the Blue Water Task Force.
        - Name: Full name of the beach
        - Image: Image of the beach that most accurately highlights the beach's most defining qualities.
        - Location: GPS Location of the beach on a map (Satellite view).
        - Water Quality: Description of the beach's most recent water quality parameters.
        - Date of report: Date of most recent publication of water quality report.

Exercise 1.2: Domain Functions

For the fixed topic, selected by you, list some half dozen or so domain functions: Give suitably short names to these functions and describe their signatures, that is, which arguments they "take", and what results they in the "yield".

- Search for a beach
    - search: List x Position on the Screen = Beach name x List
- Look Image of the Beach
    - look: Image x Position on the Screen = Image x Beach name
- Look Location of the Beach
    - look: GPS location x Position on the Screen = GPS location x Beach name
- Read "about" section'

    - read: Information origin x Position on the Screen = Information origin x Beach Name
- Function Definition:
    - The search function:
        - When applied to:
            - Beaches
        - Yields:
            - The specified beach
    - The look function:
        - When applied to:
            - Image
            - GPS location
        - Yields:
            - Image of the beach
            - GPS map of Puerto Rico detailing the location of the specified beach.
    - The read function:
        - When applied to:
            - About section
        - Yields:
            - Information regarding the sources of water quality reports used in this application, as well as the names of the developers who worked on the application.

Exercise 1.3: Domain Events

For the fixed topic, selected by you, list some half dozen or so domain events. Give suitably short names to these events, and describe them briefly.

- Internal Events:
    - User finds beach of interest: event that marks the completion of searching for a beach of interest.

    - User finds the beach's location: event that marks the end of the user's beach search activity and review of the water quality report. The user is then shown the beach's location by using the GPS map.
    - User inspects sources for water quality reports: event that marks the completion of the user verifying the "about" section.
- External Events:
    - New water quality report is published by organizations for any given beach: event that marks the publishing of a new water quality report for any given beach.

Exercise 1.4: Domain Behaviours

For the fixed topic, selected by you, list, say, three behaviours. Give suitably short names to these behaviours, and describe them briefly.

- End users will glance over beaches and will search for the water quality of the beach that will be visited.
- End users can find the location of the beach by using the GPS map.

Exercise 1.5: Domain Requirements

For the fixed topic, selected by you, list, say three or four, domain requirements. Describe them briefly and informally.

- Searching beaches: the application must allow the user to search for a beach and show a list of beaches.
- See the map of the beaches: the application must allow the user to see a map of Puerto Rico with all the beaches that have the water quality report.
- See "about" section: the application must allow the user to access a section where they will have information regarding the sources for the water quality reports.

Exercise 1.6: Interface Requirements

For the fixed topic, selected by you, list two or three interface requirements. Describe them briefly and informally.

- The application should display screen to the user with multiple UI components:
    - A search box: let the user input the name of the beach.
    - A map: let the user access a GPS location of the beach.
    - An about link: let the user view information regarding the source of water quality reports.
- The main application page will display the search bar in which the user will search for the desired beach.
- When the user interacts with the search bar it will display the beaches with the same keywords used.
- When the user interacts with the selected beach there will be information presented like:
    - Name of the beach
    - Map with the GPS location
    - About section.

Exercise 1.7: Machine Requirements

For the fixed topic, selected by you, list one machine requirement for each of the "standard" areas: performance, dependability, maintenance, platform, and documentation. Describe them briefly and informally.

Performance:

- The application must be able to load up and display the information rapidly assuming a stable internet connection.
- The application must be able to handle multiple users at once.

Dependability:

- In the case of an application crash the system will try to correct it or quit the application and report a bug crash.

Maintenance:

- The application must be constantly updated to maintain usability and have minimal issues and crashes.

Platform:

- The system at first will be exclusive to up to date android models with possible ios integration later on.

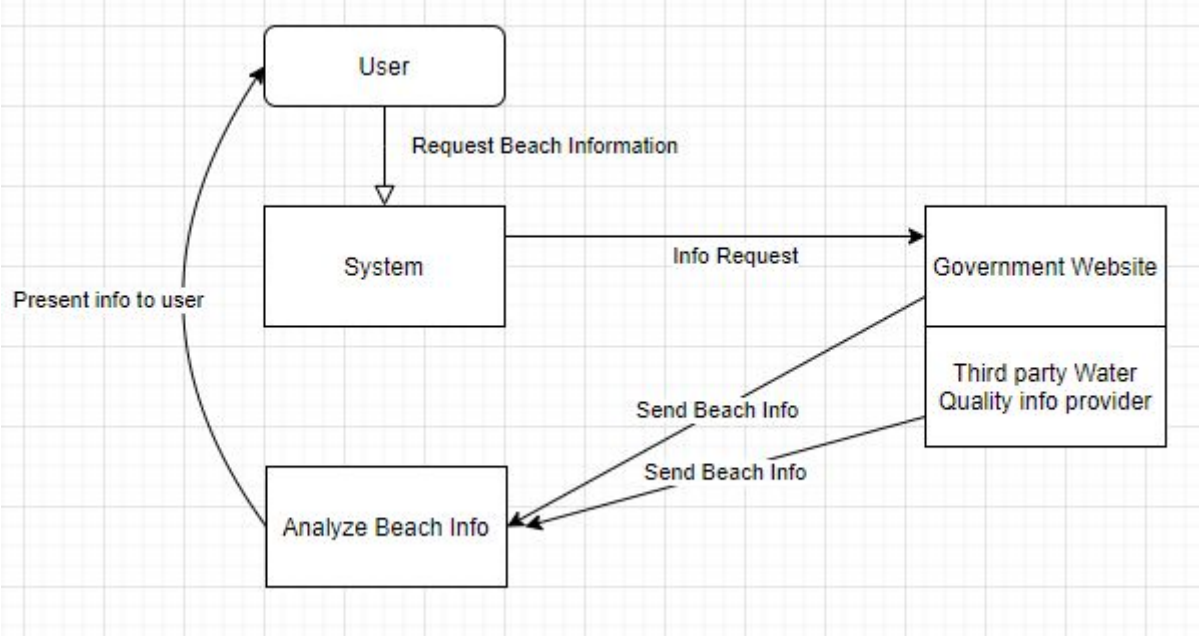
Documentation:

The following documents shall be provided:

- Application update logs: provide a summary of the most recent changes to the application.
- Development logbook: provide detailed log of all changes and activities being worked on the application.
- Water quality documentation: documentation regarding sources for the water quality reports being used in this application.

Exercise 1.8: Software Architecture Design

For the fixed topic, selected by you, attempt, admittedly rather prematurely, to sketch a software architecture - say in terms of (briefly specified) boxes and (briefly specified) arrows, where boxes denote single-thread processes and arrows denote interactions (messages) between processes. Do this only informally.



Exercise 1.9: Software Component Design

This exercise is a continuation of Exercise 1.8. For the architecture sketch given, by you, in answer to Exercise 1.8, single out one or two "boxes" and specify their data structures and functions. Do this only informally.

Data Structure that will be used for Analyzing Beach information is:

- Hashmap containing nodes that contain an object with all the information regarding a particular beach.
- The object will contain all the numbers and statistics from all sources that will be digested by the system and presented to the user.

Exercise 2.1: Informative Domain Development Documents

For the fixed topic, selected by you, draft a set of informative documents for a project which is to develop a description of the domain. Set aside one quarter page, at most, for most of the part answers, and maybe up to one half page for some others (synopsis, design).

For this informative domain development document we have many topics to present. The current situation is that a huge amount of people attend the beaches while being uninformed about the state of the quality water. Also, obtaining a trustworthy and reliable water quality report is cumbersome and not straightforward. Beachgoers have to navigate and dig through clunky UIs in order to obtain a report. On the other side, there is a need to improve the delivery and presentation of water quality reports to beachgoers faster and easily accessible. The main idea for this project was to promote the importance of water quality testing and how this can directly impact beachgoers. To improve a healthy and safe life for the user, the app simplifies the presentation of the water quality data so that users can quickly verify if it is safe to take a dip in the beach or beaches of their choice. The concepts are to provide a friendly user interface in which the user will have the option to select the beach of their preference to obtain the water quality report.

The scope of this project is limited to the beaches of Puerto Rico that get tested regularly for their water quality parameters, as these would have the data available for display to the end user and would include the most commonly visited beaches. The span of this project is to facilitate beachgoers lives by providing the beach quality information in an ordered and on demand manner. This domain will need access to GPS in order to determine which beaches to query for quality information. The availability of water quality reports is essential for the proper use of the application. In the contracts there are the following two: User Agreement/Terms of Service where a set of rules must be followed by the user and User Access Information for the users access location. Moreover, users must agree with both requirements to be able to use the app and location data worked properly. Finally, this project came to be because we believed the lack of water quality awareness to be a real issue. This project will consist of a network of users within the area of Puerto

Rico. Crucial safety information will be afforded to anyone that downloads our app. This would allow for informed decisions on most commonly visited beach sites when the time to visit a beach comes along. The application will gather all the latest information available from the government studies and present it in a format that is neat and easy to digest by the everyday layman.

Exercise 2.2: Informative Requirements Development Documents

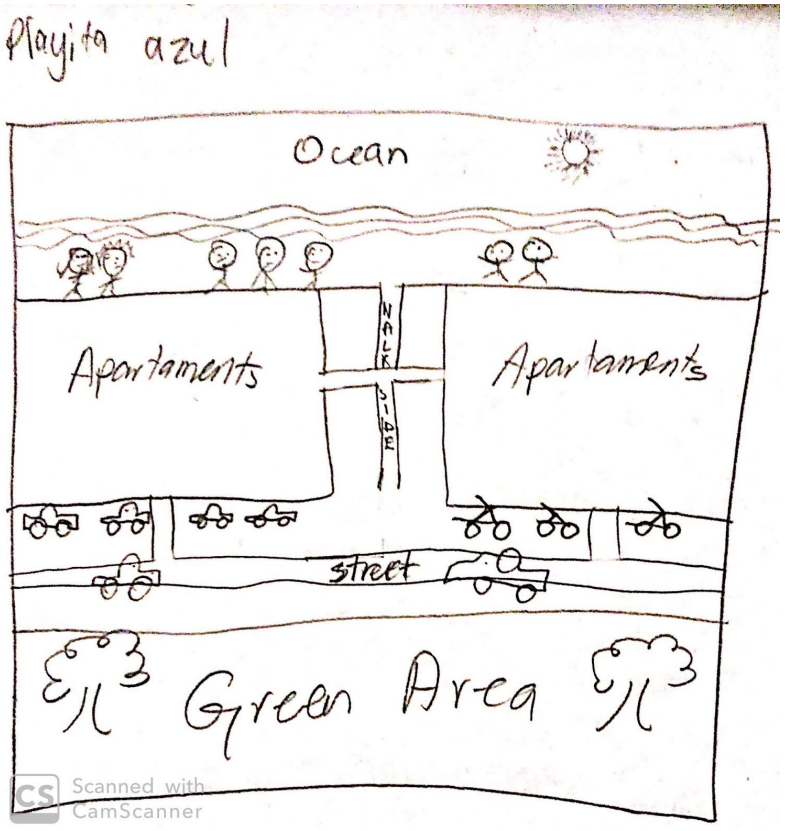
For the fixed topic, selected by you, draft a set of informative documents for a project which is to develop a requirements for some software to serve in the chosen domain. Reuse, as much as is possible, your answer to Exercise 2.1.

For this application to briefly explain what it should do, in short words, the system will extract the water quality information report from the government studies to our application, thus the beachgoers can have an accessible water report just by downloading the app and also accepting the 2 terms agreements. For the implementation we will use Scala.js for the front-end. To operate the system will need the government studies in order to be able to obtain the water report information.

Exercise 2.3: Descriptive Rough Domain Sketches

For the fixed topic, selected by you, attempt a rough sketch of some area of the chosen domain. Set aside no more than one page for this. In preparation for Exercise 2.4, try formulate your rough domain sketch such that it lends itself to some simplifying concept formation - in the style, for example, of Example 2.20.

- There are the notions of street, sidewalk, footpath and beachside. There are the notions of snorkeling, swimming and surfing. There are the notions of shore and ocean.



Exercise 2.4: Concept Analysis of Rough Domain Sketch

Given your answer to Exercise 2.3, and "inspired", perhaps, by Example 2.20, analyse, with a view towards forming one or more concepts, the rough domain sketch of Exercise 2.3.

- Street, sidewalk, footpath and beachside can be abstracted into one concept: routes. Snorkeling, swimming and surfing can be abstracted into one concept: beach activities. Shore and ocean can be abstracted into one concept: parts of a beach. Water quality reports and their reviews can be abstracted into one concept: water quality reports.

Exercise 2.5: Descriptive Domain Terminology

On the basis of your answers to Exercises 2.3 and 2.4, establish a tiny terminology of some four to five terms - such that some terms rely on the definition of other terms.

1. water quality - Refers to the water's safety levels in terms of bacteria, pollution, and any other sort of outside contaminant which may be harmful to those interacting with it.
2. GPS - Refers to the Global Positioning System, which is used to determine the location of a device and can be utilized to provide relevant information about areas and businesses close to the user.
3. map - A representation of an area of land or sea. Modern devices utilize GPS in order to locate a user in the world and display an approximation to their location.
4. beach - A shore on the edge of the ocean where water transitions into land. It is commonly utilized as a site for recreational activities, a lot of which take place within the water. Water quality determines the safety of interacting with said water.

Exercise 2.6: Descriptive Domain Narrative

On the basis of your answers to Exercises 2.3-2.5, formulate, over two to three pages, a well-structured narrative.

The phenomena present in this topic are associated with the beach, as the topic has a very well-defined idea of communicating to the user the current contamination levels of the beach one would be swimming in. It is important to identify the phenomena which are involved in this endeavor, as anything that is present within a beach would most likely be affected by whether it is safe to swim in the ocean or if it's even safe to go to the beach at all. Note that while some phenomena is pointed out above, beaches vary greatly, and thus it is hard to pinpoint the exact nature of the beach which would be presented.

For the sake of the end user, having the capability to determine the safety of swimming in a beach or just determining water quality for any miscellaneous reason can be extremely important. It can aid in planning for activities such as swimming mentioned above, but can allow the user to make informed decisions regarding activities such as fishing or surfing. Having the information available at a moment's notice can aid the user in identifying efficient and safe trips to the beach, and allow for careful planning of trips to make sure the beach is clean before committing to the time and monetary cost of checking the water quality manually through the water quality indicator at the beach. By having access to such information, the likelihood of a user getting ill by interacting with contaminated water is surely to decrease.

Anything that is within or close to the beach is referred to as being beachside. Therefore, any phenomena can be described as a beachside object so long as it fits this description. A beachside restaurant or surfboard rental service may be very adversely affected by the current condition of the water, and thus it fits into our topic. If the water condition is harmful to visitors, people may decide not to come to the beach at all, which would be harmful for business as far as renting surfboards for surfing. Similarly, any sort of diving or snorkelling equipment rental service would also be adversely affected by the inability for customers to properly utilize it, thus being a hamper on the potential business which may have been carried out in any given day. Not to mention, it is possible that any rental services which are giving out equipment to customers to enjoy in the water despite its hazardous state may be opening themselves up to potential lawsuit by not paying attention to the warnings or

at the very least not passing them on to the customer and resuming business as usual. This particular topic matters because it would allow for smart business decisions by the business owners to prevent jeopardizing their establishments. While restaurants are not necessarily affected as adversely, since people may decide to go eat there despite the state of the water and just to enjoy the breeze or sights, it is important to consider that most of the time people who go discover beachside restaurants were already at the beach itself. By the water conditions not being great and not allowing for new customers to discover the restaurant, the discoverability of such an establishment could be affected.

Much like restaurants above, some attractions found on beaches are found on the shore and can be enjoyed without contact with the ocean. Any and every such attraction would feel the adverse effects of dwindling water quality, so making sure these business owners are aware of the quality of the ocean as well as properly identifying any trends in the water quality improvement or drop off would allow for smart business decisions regarding their livelihood.

Exercise 2.7: Table of Contents

Draft a possible table of contents of all the documents to be developed during a project that develops a domain description, a requirements prescription and a software design.

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