Software design of control system

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# Introduction

The following report contains analysis work for a software system of a control system.

A specification in addition to some generated problem details, given in Figure 1‑1, are used as the basis for the report. The system in question will control input pumps to a buffer tank, as seen in Figure 1‑2, to steer the volume to a set value. The system also has information available from the existing control system #2 about the output pumps, but no level sensor is available in the buffer tank itself. Requirements will be gathered to analyze the system and then a series of UML diagrams will be created along a fully dressed use case document. Performing such analysis can be very useful as communication tools between the developers and the product owner to understand the needs better.

Graphical user interface, application

Description automatically generated

Figure 1‑1 Generated details about the assignment.

Diagram

Description automatically generated

Figure 1‑2 System sketch of the control system in its integrated setting. The sub-system concerned by this document are made up of the components with white backgrounds.

# Level Control system

The following chapters contain both analysis and design segments of the level control system.

## Analysis

The most important use case of the system, see Figure 2‑1, is the “Control the level” use case as, in theory, this is the only use case serving a purpose on its own. It will, although probably be poorly tuned without the configuration handling. If the relation between the level and the volume of the vessel is non-linear, then a function of this relation should be provided in the vessel’s specification sheet. And with this non-linear relation, the relation between change in level and the output flow will also be non-linear, so this formula would have to be applied

Diagram

Description automatically generated

Figure 2‑1 Given use case diagram for the level control system.

Figure 2‑2 shows a system sequence diagram of the “Control the level” use case. It is assumed that it is configured by the “Handle Configuration” use case which is why this use case does not include it. The level control is very simple, it will merely check if the level is correct and increase/decrease the input capacity depending on whether the level is lower or higher than desired.

Diagram, schematic

Description automatically generated

Figure 2‑2 System sequence diagram of the level control.

## Design

Create a FDUCD somewhere

GRASP are nine categories of problems and solutions used in object-oriented programming. They are used in Table 2‑1 to determine relations between responsibilities and classes.

Table 2‑1 Design patterns.

|  |  |  |  |
| --- | --- | --- | --- |
| Step | Description | Design pattern | Class Name |
| 1 | Read level sensor, a sensor responsibility | Information Expert | LevelSensor |
| 2 | Calculating level error from setpoint | Information Expert | LevelControl |
| 3 | Update capacity of pump | Controller | Pump |
| 4 | Wait | Controller | Timer |

Make a design class diagram

### Difference between SSD and the design SSD

The design SSD describes the main success scenario from the FDUCD which includes classes from other use cases. Actors from earlier should be represented as classes and the chosen design patterns like GRASP should be used to allocate which classes that should take the different responsibility.

### Difference between interaction diagram and class diagram

The interaction diagram explains the flow of the program (order of execution) and responsibility of functionality. The class diagram displays the responsibility of functionality, relation of objects, and data storage (variables).

### How UP can be used to develop this specific software

I would systematically use UP to fulfill tasks related to phases and iterations like planned. Analysis and design documents can be used to both communicate what we are making with the costumer and other developers.

# Temperature system

The following chapters contain both analysis and design segments of the temperature control system.

## Analysis

## Design

# Conclusion

# References