Analysis and design of the SI-simulator software system for the VHTR-SI process by using the object-oriented analysis and object-oriented design methodology

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1. Introduction

The SI-simulator is an application software system that simulates the dynamic behavior of the VHTR-SI process by the use of mathematical models.

Object-oriented analysis (OOA) and object-oriented design (OOD) methodologies were employed for the SI-simulator system development. OOA is concerned with developing software engineering requirements and specifications that are expressed as a system's object model (which is composed of a population of interacting objects), as opposed to the traditional data or functional views of systems.[1] OOD techniques are useful for the development of large complex systems. Also, OOA/OOD methodology is usually employed to maximize the reusability and extensibility of a software system.[2]

In this paper, we present a design feature for the SI-simulator software system by the using methodologies of OOA and OOD.

2. Methods and Results

Design of the SI-simulator was carried out using OOA/OOD methodology and is described as the use case model, user interface design, implementation view, and process view. For OOA/OOD, the standard UML notation was used as a common language to specify, construct, visualize, and document the design of the object-oriented software system using the StarUML.[3]

The SI-simulator supports a user friendly graphical user interface (GUI) for user input/out. Figure 1 shows the functional architecture of the SI-simulator.

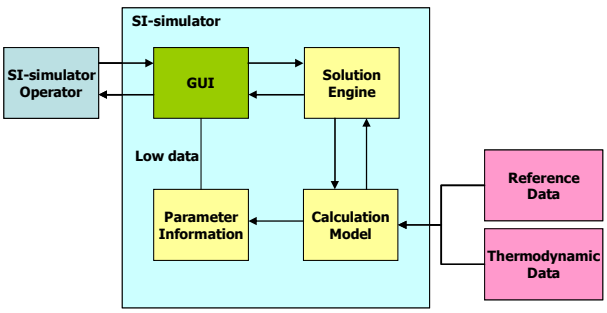

Fig. 1. Functional architecture of the SI-simulator.

As shown figure 1, the SI-simulator provides various simulated results for the VHTR-SI process by using an internal calculation model and a solution engine based on external reference data.

2.1 Use case Model

Design of the SI-simulator was carried out using OOA/OOD methodology and is described as the use case model. Use case modeling is expressed as a use case diagram, which describes a system requirement from the view point of a user.

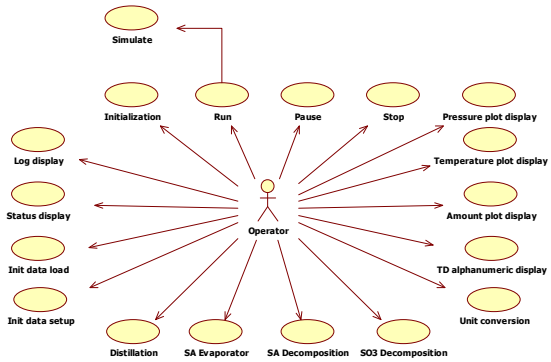

Fig. 2. Use case diagram of the SI-Simulator.

2.3 User Interface (UI) Design

The navigational structure of the UI based on a use case modeling is partially presented in the form of three diagrams in Figure 3. As an example, figure 4 shows a distillation window derived from a main window.[4]

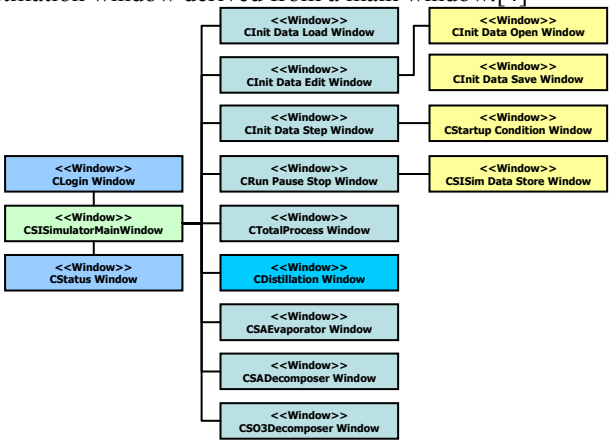

Fig. 3. User interface structure of the SI-simulator.

Fig. 4. An example of navigation structure of the UI.

2.3 Implementation View and Process View Design

The implementation view describes the actual software modules, their relations, and contents along with a consideration of a requirement. Figure 5 shows a main implementation view diagram of the SI-simulator software system.

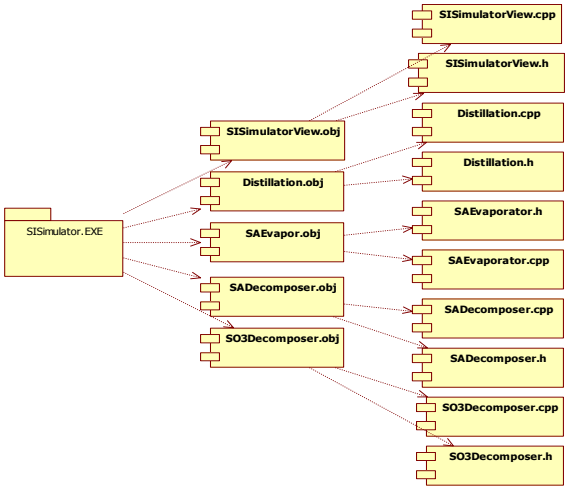

Fig. 5. Implementation view of the SI-simulator.

The process view describes the execution structure of the SI-simulation software system along with a consideration of the requirements related to a performance, reliability, expandability, and system management. The SI-simulator has only one executable file and a number of process files for the unit equipment, as shown in Figure 6.

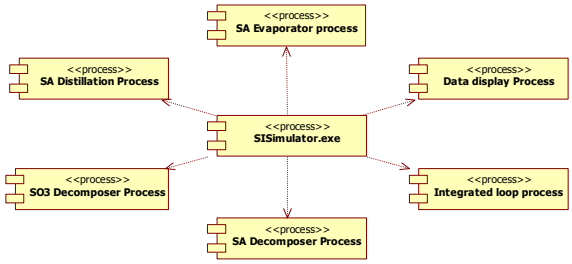

Fig. 6. Process view of the SI-simulator

3. Conclusion

The analysis and design of the SI-simulator has been done. OOA/OOD methodology was used to improve the reusability and expandability of the software system.
For the design of the SI-simulator, various design notations were used such as a use case diagram, user interface design, implementation view, and process view.

Acknowledgments

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