

Homework 2

Students may work in pairs. Due date: September 20.

From Operations Concepts to Requirements

In this homework we will explore the pathway from tentative ideas on a design through to the development of preliminary design requirements.

Development of an Operations Concept. Let us assume that a detailed system description does not exist. The design process begins with the development of an operations concept, consisting of detailed scenarios of system functionality, together with simplified models (or fragments) of system behavior and structure. See Figure 1.

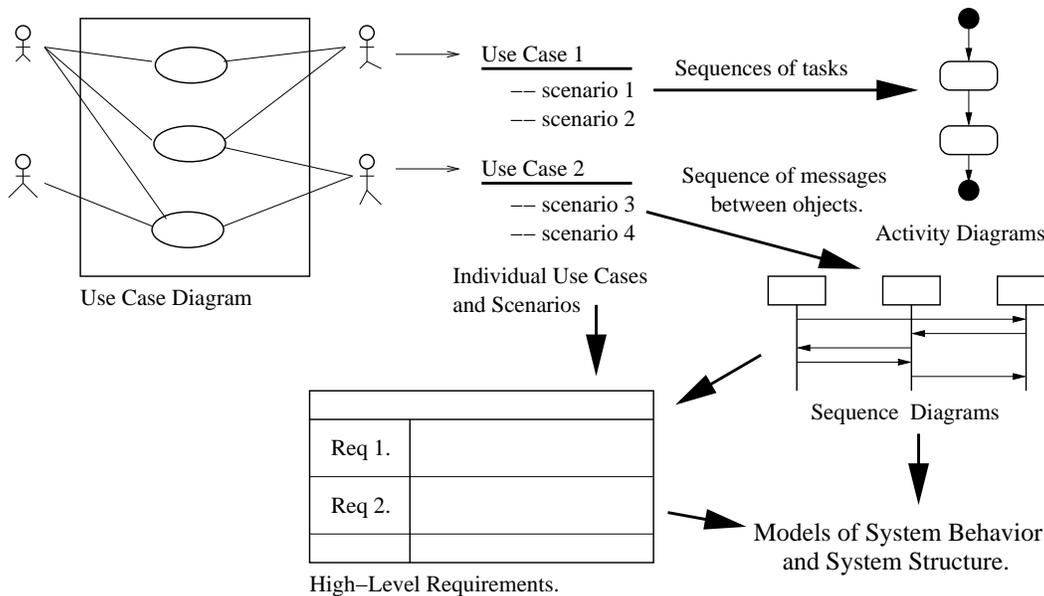


Figure 1: Pathway from operations concept to simplified models for behavior and structure, to requirements.

Points to note:

1. The functional description dictates what the system must do.

Here, we employ a combination of use cases (and use case diagrams), textual scenarios, and activity and sequence diagrams to elicit and represent the required system functionality.

2. A complete system description will also include statements on minimum levels of acceptable performance and maximum cost.

Since a system does not actually exist at this point, these aspects of the problem description will be written as design requirements/constraints.

3. Further design requirements/constraints will be obtained from the structure and communication of objects in the models for system functionality (e.g., required system interfaces).

The arrows in Figure 1 imply that system development will occur in one pass – in reality, iterations of development are required. A systems engineer may need to work closely with the stakeholders to define and re-define the operations concept. Textual scenarios and activity/sequence diagrams are useful because they provide a means for communicating ideas among the team members.

Things to Do

Question 1. Figure 2 is a schematic of the TEM 4500 Egg and Muffin Toaster, a do-it-all kitchen appliance that we looked at in homework 1.



Figure 2: TEM 4500 Egg-and-Muffin toaster. Source: <http://www.ohgizmo.com/2008/03/24/egg-muffin-toaster-part-of-this-balanced-breakfast/>

Things to do:

1. Develop a list of use cases for the toaster.
2. Develop a list of actors for the toaster.
3. Draw and label a use case diagram (you can do this either by hand, or use MagicDraw).
4. Develop textual scenarios for two use cases. Your scenarios should describe step-by-step what will happen during the required functionality. They should also describe alternative course of action when something goes wrong.
5. For the textual scenarios developed at step 3, develop either an activity diagram and/or a sequence diagram illustrating either the flows that will occur or interactions among objects.
6. Use your scenarios to develop a handful of requirements for the the TEM 4500 Egg and Muffin Toaster.

A Few Hints. The museum operations example on pages 222-226 of the lecture notes contains examples of use case development and simple activity diagrams for behavior. For examples on how to write requirements, see the home theater system example on pages 259-262.