Chapter IV

Making Real Progress with the Requirements Defects Problem

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Abstract

Requirements defects remain a significant problem in the development of all software intensive systems including information systems. Progress with this fundamental problem is possible once we recognize that individual functional requirements represent fragments of behavior, while a design that satisfies a set of functional requirements represents integrated behavior. This perspective admits the prospect of constructing a design out of its requirements. A formal representation for individual functional requirements, called behavior trees makes this possible. Behavior trees of individual functional requirements may be composed, one at a time, to create an integrated design behavior tree (DBT). Different classes of defects are detected at each stage of the development process. Defects may be found at the translation to behavior trees, and then at the integration of behavior trees and when individual component behavior trees are projected from the DBT. Other defects may be found by inspection and model-checking of the DBT.
Introduction

There are seven well-known potential problems (Davis, 1988) with the functional requirements and their use in the development of modern software intensive systems:

- they may be incomplete, inconsistent, and/or contain redundancy
- they may not accurately convey the intent of the stakeholders
- in transitioning from the original requirements to the design, the original intention might not be accurately preserved
- over the course of the development of the system, the requirements may change
- the system the requirements imply may not be adequate to meet the needs of the intended application domain
- the number and complexity of the set of requirements may tax people’s short-term memory beyond its limits
- the alignment between the requirements for a system, its design, and the implementation may be not preserved

Confronted with these challenges, existing methods for requirements analysis, inspection, representation, and then design are often not up to the task — we end with multiple partial views of a system that have a degree of overlap that makes it difficult to see/detect many types of defects, particularly those that involve interactions between requirements (see Booch et al., 1999; Harel, 1987; Schlaer & Mellor, 1992).

Given all this, is there a more practical way forward? Our chief concerns are:

- to get the complexity of the requirements under control,
- to preserve the intention of the stakeholders, and where there are ambiguities or other problems, clarify the original intention,
- to detect requirements defects as early as possible, and
- to ease the consequences of needing to change requirements as development proceeds and our understanding of the problem at hand improves.

We suggest there is a way to deliver these benefits and consistently make real progress with the requirements problem. It demands that we use the require-
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