NOLE: an AOM Weaver for Aspect Oriented Modeling of Real-Time System

Naoufel Machta\textsuperscript{a,}\textsuperscript{*}, Mohamed Taha Bennani\textsuperscript{a}, Samir Benahmed\textsuperscript{a}

\textsuperscript{a}University of Tunis el Manar, University Campus, Tunis, Tunisia

Abstract

Legacy applications that are already designed and maintained could be reused by adding new features like security, temporal constraints, etc. Aspect oriented approaches are an emerging technique that allow separation between functional and non-functional mechanisms. Separation of concerns, in aspect oriented design, enhances productivity, reduces development costs and improves time to market delivery.

In this paper, we introduce AOMRTSYS an approach for weaving crosscutting concerns on UML and UML MARTE model. Then we focus on the NOLE weaver used by AOMRTSYS. We detail its operations and present the techniques used to implement it.

Keywords: Aspect Oriented Modeling, Software development, UML MARTE, Real-Time System, Weaver;

1. Introduction

Aspect Oriented Modeling (AOM) approaches aim to define transversal concerns separately. These are defined by functional and non-functional requirements. For example, billing or bank transaction systems represent functional
requirements. However, authentication or data encryption mechanisms are considered as non-functional requirements. Subsequently, every aspect oriented modeling approach comprises these transversal concerns according to its own weaving process. Within the implementation phase, aspects' weaving uses the following notions: "Joinpoint", "Pointcut", "Advice" and "Aspect". A Joinpoint describes the location where the advice is added. An advice is a fragment of code, which is inserted before, around or after the defined Pointcuts. A Pointcut consists of a set of Joinpoints. An Aspect is a module that defines the advice and their Pointcuts.

There is no consensus on the definition of these notions in the context of AOM. All the approaches dealing with this problem define their self-concepts. Usually, the non-functional requirements are defined using complex and elaborated models, which describe the whole process. The benefit of this choice is to reuse the components modeling the non-functional requirements (i.e. non-functional components). Nevertheless, weaving such components is relatively difficult. A component model could contain sub-models, for example, a structural and a behavioral one. Consequently, defining Joinpoint is difficult and potentially heterogeneous. Also, if the component provides many services, the weaving process will be more tedious. Aspect Oriented Modeling of Real-Time SYStem\(^1\) (AOMRTSYS) approach addresses the aspect oriented modeling problem using an elementary and incremental way. According to our approach, a non-functional component is formed by many atomic elements. Every element of the language or modeling formalism is a potential atomic element. In addition, the weaving of a complex functional requirement, using the NOLE weaver, will be done in several steps using an incremental way. This proposition permits the simplification of the weaving step. We only weave atomic elements instead of complex models. This proposition is the cornerstone of an aided modeling system.

This paper is structured as follows. A general overview of AOMRTSYS approach is presented in Section 2. In Section 3, details of the NOLE weaver and techniques for its implementation are given. Related works are discussed in Section 4, and the last section draws our conclusion.

2. Overview of AOMRTSYS

Aspect Oriented Modeling of Real-Time System\(^1\) (AOMRTSYS) is an AOM approach intended for the separation of concern in the modeling and design of real-time systems. AOMRTSYS aims at providing new ways of modularization in order to separate non functional requirement from traditional object-oriented units of decomposition during real-time system software development. Separation of real-time constraint has been the subject of many early research efforts\(^2,\ 3,\ 4\) proving its possibility. In fact, a real-time application can be decomposed into functional requirements and non-functional ones. Functional requirements define, as any other domain, application core design. However, non-functional requirements is a set real-time constraints like scheduling, timing, concurrency and resource sharing.

According to our approach, a non-functional component is formed by many atomic elements. Every element of the language or modeling formalism is a potential atomic element. In addition, the weaving of a complex functional requirement will be done in several steps using an incremental way. This new proposition simplifies weaving
دریافت فوری متن کامل مقاله

امکان دانلود نسخه تمام متن مقالات انگلیسی
امکان دانلود نسخه ترجمه شده مقالات
پذیرش سفارش ترجمه تخصصی
امکان جستجو در آرشیو جامعی از صدها موضوع و هزاران مقاله
امکان دانلود رایگان ۲ صفحه اول هر مقاله
امکان پرداخت اینترنتی با کلیه کارت های عضو شتاب
دانلود فوری مقاله پس از پرداخت آنلاین
پشتیبانی کامل خرید با بهره مندی از سیستم هوشمند رهگیری سفارشات