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Aspect oriented design for team learning management system

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ABSTRACT

A multi agent system (MAS) is a complex system composed of heterogeneous agents each has a number of concern that are cross-cutting such as mobility, learning, collaboration, adaptation, interaction and autonomy. MASs are currently designed to be superimposed on object oriented designs so that it can be possible to separate these concerns in order to improve reusability and maintainability. Hence, aspect-oriented software development (AOSD) exists to cope with complexity of software development for the purpose of separating functionality that are not handled by other software development. Following this line of thought, AOSD is considered for developing aspects for team learning management system; that allows recognizing learner's learning preferences and associated learning style in the learning environment. This paper presents an approach to move from object oriented eTutor to agent oriented software development. This transition is being deployed through the implementation level.

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1. Introduction

Object oriented (OO) software engineering provides standard modularity mechanisms, but they are unable to modularize all concerns of complex systems (Reis, Reis, Schlebbe, & Nunes, 2002). Agent oriented approaches provide unique and advanced program structuring and modularization techniques that explicitly capture the crosscutting system structure. Agent oriented software engineering enhance improving the modularity of software by focus on separation of concerns SOC into aspects and structuring system during system development (O'Riordan, 2001). Agent oriented software engineering approach is used to develop high complex system with highly modularity of all concerns. Currently existing OO approaches do not support early stage handling of the SOC (Garcia, Kulesza, Chavez, & De Lucena, 2006; Garcia, Kulesza, & Lucena, 2005). Moreover, the current OO software development approaches handle generally a limited number of agent types which are encapsulating the agent behavior and data an object. This results in lack of support for dealing with the interactive and overlapping nature of concerns.

Another approach is current well known; multi agent systems (MAS). MAS applications is composed of multiple types of agents, each of them having different concerns, properties and roles that might overlap and interact with each other accordingly, this requires scrutinizing a structured way for composition to be considered during an early stage of design that supports and handle

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http://dx.doi.org/10.1016/j.chb.2015.01.032 0747-5632/© 2015 Elsevier Ltd. All rights reserved. the separation of concerns in terms of each agent functionalities and role to support maintainability and reusability. Software engineering of MASs involves a number of concerns (Brichau, Chitchyan, Rashid, & D'Hondt, 2008; Cunha, Sobral, & Monteiro, 2006). There is some challenges appear in modeling, designing, and development of these concerns (aspects). This is because they are inherently crosscutting as the system complexity increases. Unfortunately, the existing modeling languages, design and implementation approaches are not able to provide explicit support for the separation of crosscutting MAS-related concerns.

For the purpose of overcoming the above mentioned problems, aspect oriented software development (AOSD) is considered. AOSD supports the developer in cleanly separating components (functionality) and aspects (concerns) from each other, by providing mechanisms that make it possible to abstract and compose them in complex MAS (Reis et al., 2002). ASOD has been proposed as a technique for improving SOC in software construction and support improved reusability and ease of evolution ate the implementation stage (Cunha et al., 2006). The aspect oriented techniques deal with crosscutting concerns that separate and compose the system (Garcia, Kulesza, Lucena, 2005).

This paper investigates how to integrate agents neatly involving the redesign and refactoring of an existing object oriented learning management system while maintain reusability. The following sections in the paper present AOSD which allows supporting SOC of MAS. The goals of our proposal is to achieve an improved adaptability in a learning management system to support the SOC and accordingly to improve reusability.

