A SYSTEMATIC APPROACH FOR DESIGNING AGENT BASED ADAPTIVE INTELLIGENT TUTORING SYSTEM

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Abstract:

An adaptive system consists of interdependent set of entities that can adapt or respond automatically to environmental changes or any modification in the interacting parts. The important challenges in developing the adaptive systems are most of adaption are not known at earlier stages. Moving towards the purposeful engineering of this type of systems requires providing self–adaption as modeling and implementation concepts, which allows the non–expert development teams for their systematic development, reuse and exchange. Adaptive systems are developed in versatile domains. Intelligent Tutoring System (ITS) has been taken as a case study in this work. ITS are capable of providing adaptive support (tutoring) to the learners by adjusting its action according to their needs (environmental changes). Currently most of the ITS were developed in adhoc manner which are not suitable for long run, reuse and exchange. Hence it is imperative to investigate the systematic software engineering approach for the intelligent tutoring systems development. This work proposed to apply ADELFE(AOSE) methodology to develop the ITS in systematic way and exemplify how this proposed system realizes the emergent behavior and flexible for further enhancement. The performances of the proposed system are evaluated by team of Experts and Students. From student's perspective to identify that, proposed system helps the learners for finding out the adaptive courses, learning paths and able to afford suitable learning materials to satisfy individual students' requirements. Experts analyze the proposed system towards the design aspects and for content adaption.

Keywords: Adaptive system, Intelligent Tutoring System, Systematic approach, AOSE methodologies, ADELFE. Introduction

Adaptive systems are systems that are capable to evolve dynamically according to the modifications that happened in the environment [1].These systems can be developed in several domains for various purposes based on the requirements of stake holders. This work focuses on educational domain, specifically ITS. Real ITS should capable of adapting itself to the changing context (learner's interest) both in long term and in the short term [2]. Unfortunately current techniques that are applied for adaption in ITS are too static. Though agents have been widely used for ITS development, much of the supporting research follows adhoc approach [4-14]. More over these systems are developed to satisfy some specific purpose like intelligent solution analysis, problem solving support, curriculum sequencing , which leads adaptiviness only to certain extent and not able to response to emergent changes. When ITS is developed in adhoc manner, the main issues that occurs are given below

1) Agents are utilized only for the replacement of ITS modules,
2) The roles of the agents are static and fixed
3) It is not extensible and not reusable.

It is inferred that, an appropriate approach is needed for the development of ITS. Agent Oriented Software Engineering (AOSE) is a new emerging domain that is motivated by two main disciplines in computer science namely software engineering and artificial intelligence. AOSE provides an epistemological framework for effective communication and reasoning about complex system on the basis of mental qualities (agents) [26].

On one hand the growth of internet technology and the expectation from diversify learners makes the crucial development of ITS, which increases its complexity. Hence the ITS developers needs guidelines for systematic development. Moreover existing ITS constructed through systematic approach possess centralized control [19, 21]. Decentralization or emergent adaptations are not carried out. Hence this work proposed to apply AOSE methodology ADELFE to develop agent-based ITS. Research ideas can be outlined as follows, to demonstrate the fruitfulness of AOSE in educational domain. Tackling the design complexity of developing ITS in decentralized manner. This work has the following contributions.