Toward Adaptive Presentations of Student Models in eLearning Environments

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Abstract. In this paper we report our work on introducing adaptations of the learner model's presentation in adaptive educational systems, in order to bring a healthy balance between the understanding of Open Learner Models (OLM) and the cognitive load on the student for its interpretation. We believe that enhancing this aspect is useful to empower the learner's metacognitive processes.

Keywords. eLearning, Adaptation, User Model, Graphic User Interfaces.

Introduction

This paper aims to describe the ongoing research we have been carrying out in the field of profiling users' in the domain of Technology Enhanced Learning (TEL). The starting point is the already existing research on Open Learner Models [1]. Our research approach is to explore adaptive representation of open learner models, in order to provide the most suitable presentation of the student model. Two main categories of adaptation could be used: adaptation of contents and adaptation of interfaces. We concentrate on the latter, exploring how the visualization of students' profile could be personalized. We believe that emphazising this aspect could be useful to enhance the metacognitive aspects of learning processes [2].

1. The problem, some open issues and extensions

The existing literature on TEL reports quite a large amount of experience in profiling users, normally devoted to supporting adaptation in adaptive systems and achieving a real personalized learning experience. This process focuses on opening the profile of students for inspection by learners, peers, tutors, and instructors [3].

While there have been studies on different interfaces or ways of presenting open learner models to learners, there has not yet been any substantial research into adapting the learner model interface to the user. In this field, our main attention is devoted to the adaptation of visual presentations to the user's knowledge, preferences and goals. The aim of this adaption is to minimize the cognitive effort needed by learners for the interpretation of the open learner model. This could help to encourage the learner to inspect

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his/her model, and promote reflection as learning.

At this very initial stage we are developing the ideas and proposing some possible directions and dimensions of adaptations, based on a quite extensive literature review. The more interesting directions of adaptation that emerged are: learner's knowledge, user's expertise on the particular system, and the cognitive styles of the student. These characteristics are stored in a user model. Some dimensions of adaptation could be: level of data aggregation, quantity of information provided to the user, and intensive versus extensive representation [4]. Our proposal operates on the data processing chain that generates visualizations from the data stored in the User Model. This process in composed of the following steps: data source and preprocessing collects user model data and converts it into a well-defined format, the filtering phase selects a subset of the available data, the aggregating phase groups several pieces of data into a single data item, the mapping phase encodes the data elements in visual attributes to generate the view.

We suggest adopting some form of adaptation in each phase of the chain. In this way it is possible to filter, aggregate and map the variables coming from the data source, through the aggregation, into some visual "smart" indicators [5]. Smart indicators are a compact and intuitive way to represent complex data in visual format that can be understood without much effort. For instance, the fuel needle of a car is an indicator that summarizes how full the tank is and how far one can drive.

Some still open issues to investigate are the following:

- How to adapt the visual representation to the knowledge, the level of expertise and the cognitive style of the student;
- Which graphical indicators are suitable to represent the user's status;
- How to develop aggregating policies that give a suitable balance between detailed and general information to the visual presentation.

The expected output of this work is some general guidelines for adapting student's representations in the field of eLearning. A working prototype that implements these guidelines will be provided within the GRAPPLE project, funded by the EU-FP7 program. The validation will be carried out with empirical studies and focus groups based on the output of the Isometrics questionnaire [6]. This should develop a well-balanced output between efficacy and efficiency, without imposing a too high cognitive load on the user.

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