

An Intelligent Learning Environment with an Open Learner Model for the Desktop PC and Pocket PC

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Abstract. This paper introduces an intelligent learning environment for use on a desktop PC and a Pocket PC. The aim of the Pocket PC version is to provide additional learning opportunities at times when users are away from the main PC version. The system requires an open learner model to enable the learner to update the model contents if they use different versions of the system without having synchronised their learner model. Updating the learner model is also designed to encourage learners to reflect on their knowledge and discover their misconceptions, and to help them better understand their learning needs.

1 Introduction

Mobile technologies allow a range of learning opportunities at times additional to a learner's main computer session. This paper presents C-POLMILE, an intelligent learning environment (ILE) for C programming that can be used on a desktop PC, with a mobile version for use on a Pocket PC, to take advantage of this situation. The user can engage in the kind of interaction most appropriate for the location and device. This includes browsing information; adaptive tutoring; multiple choice questions; viewing the learner model and editing its contents. The latter is crucial in C-POLMILE as the learner may use different versions of the system before having the opportunity to synchronise their learner model.

In the desktop PC context it has been suggested that opening the student model to the user can provide them with an additional learning resource [1,2,3]. Thus, in addition to an essential component of a joint desktop PC / Pocket PC ILE, it may be used to help learners gain a better understanding of their learning needs. Furthermore, learners have indicated that they would welcome a mobile open learner model related to their courses [4].

2 The C-POLMILE Open Learner Model

Obvious information to include in an open learner model is a statement of the learner's knowledge, and an indication of areas in which they are having difficulties. Knowledge level can be displayed quite easily with a skill meter such as used in the ELM-ART Lisp Course [5], where a student's knowledge is represented as a subset of the total topic knowledge in the system, as illustrated in Figure 1a. This approach was developed further in the SQL Tutor [3], which displays a student's knowledge as a subset of the material covered which, in turn, is a subset of the topic. This is portrayed in Figure 1b.

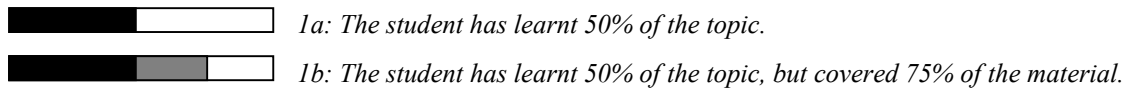


Figure 1: Types of skill meter

Each of these is useful in raising learner awareness of developing knowledge. However, 1a allows only a representation of knowledge level, with no indication of difficulties. 1b addresses this problem to some extent, as the problematic or misconception area is explicit. Nevertheless, it is still unclear whether this represents difficulties in knowledge acquisition or misconceptions. Figure 2 shows C-POLMILE's solution (desktop PC version), where the area relating to material covered but not known is a different colour, depending on whether aspects of the topic are not yet learnt, or the learner has some misconception.¹

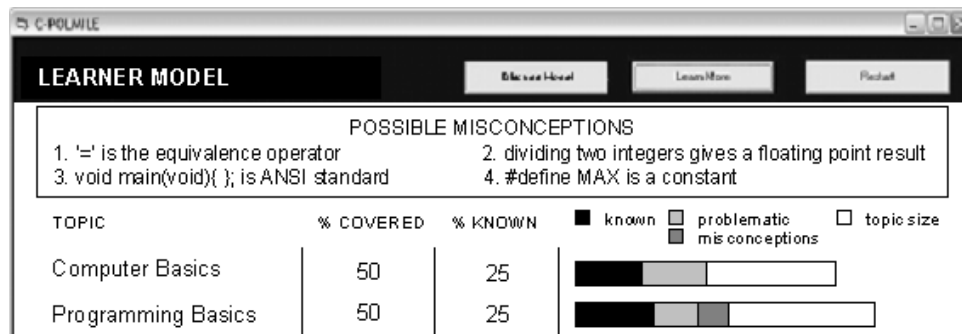


Figure 2: C-POLMILE's skill meter, illustrating knowledge level, areas of difficulty, misconceptions and size of the domain.

For the topic 'computer basics' the learner has attempted 50% of the material, but so far learnt only 25%. For 'programming basics' the learner has also covered 50% and acquired 25%, but their responses indicate the existence of misconceptions, as well as difficulties that are not misconception-based. The fact that misconceptions are depicted separately from other areas which have been covered but not yet acquired, will help increase learner awareness of the existence of misconceptions also in cases where they had perhaps been aware of having difficulties, but had not realised that these were due to misconceptions.

At the top of the learner model screen, a brief statement of the main specific misconceptions is given. The full misconception list including further details and explanations of why certain concepts might be causing difficulties, can be accessed from this screen. Similarly, a list of problematic areas that do not appear to relate to misconceptions, can be accessed. A direct comparison of the learner model and domain model can also be viewed.

Another difference between the C-POLMILE skill meter and others is that the size of the topic is indicated by the length of the skill meter (usually skill meters are the same length). This enables learners to better appreciate the amount of effort required to master each area. The skill meters are combined with numerical values indicating the proportion of known and covered topics, to facilitate direct comparisons between the level of understanding of different concepts or topics, which otherwise becomes less clear when the length of the skill meter is used to illustrate the size of the topic.

Presentation of the mobile open learner model is similar to the desktop PC version, though the small screen necessarily imposes restrictions on the display. Figure 3 shows some of the screens. The first gives a textual description of the percentage of material covered and proportion learnt. The next screen shows the skill meters. The misconception list, problematic areas list and the domain comparison are on separate screens.

¹ Screen shots have been edited to aid readability in black and white reproduction.

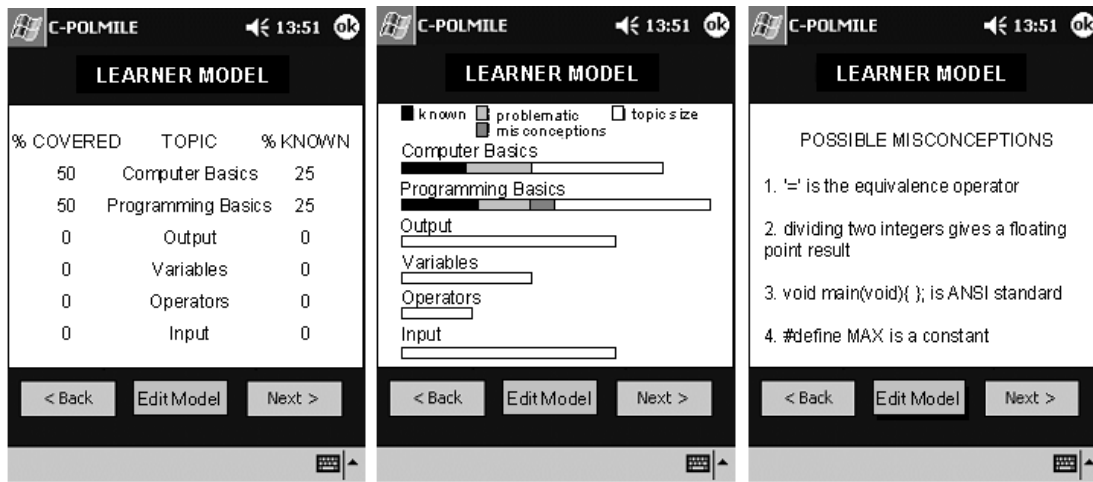


Figure 3: The mobile open learner model

C-POLMILE is designed for use across two contexts. Therefore the two learner models may not be consistent. The two versions will be united only when the user synchronises the Pocket PC. Therefore, there will often be occasions when learners will need to update their learner model. Students can directly edit the percentages in their model and delete misconceptions and problematic topics from the respective lists. If, during an interaction, a student's input indicates their previous amendments to their model to be inaccurate, the model will be updated accordingly. Confronting students directly with their misconceptions can also be a useful method of increasing their understanding of their problems, an important additional reason for having an open learner model.

3 Summary

This paper has introduced C-POLMILE, an ILE for C programming for use on a desktop PC and a Pocket PC, as is convenient to the user at the time. Because the learner may use either version of the system, it is possible that they may commence an interaction without having synchronised their learner model. Therefore an open learner model is used which allows users to update their model easily when this is required. It uses a new method of presenting skill meters to distinguish between problematic areas and misconceptions, and combines the graphical overview with a more detailed textual description. In addition to offering a means to update the model, the open learner model is designed to serve as a learning resource to promote learner reflection on their knowledge and misconceptions.

References

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