Moving the Psychological Soar Tutorial to HTML:
An example of using the Web to assist learning

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Abstract

This reports on updating and translating the Psychological Soar Tutorial into an online version based on the HTML mark-up language and viewable through the World Wide Web. There are several lessons for those who would like to move teaching documents onto the web. We note the ways in which it is not easy. The payoff should be carefully computed first. There are several tools that are likely to be useful. An extended version of this abstract may be available from the first author.

1 Background

Cognitive modelling, like the use of simulation in other sciences, consists of creating mathematical models implemented on a computer. Cognitive models simulate human cognition by duplicating the information processing.

Specialised computer languages, called cognitive architectures are used to implement this information processing. The idea is that the mechanisms, power, and limitations of the computer language duplicates the mechanisms, power, and limitations of human cognition. The programs represent the knowledge humans use to perform the same task. Programs in these languages should perform a task in the same way and the same pace as a human with the same program (or knowledge). These cognitive architectures are an important trend in psychology, one that advanced students should be exposed to if not converted by.

Soar is an example cognitive architecture. There are over fifty people around the world working with it to characterise human behaviour. It intentionally suffers under several known constraints of human behaviour, such that while memory access is rapid, learning facts is slow and must be deliberate.

Work with these cognitive architectures have been often limited by training materials. The best way to learn in the past was to visit an existing site and serve a two to 18 month apprenticeship. In 1993 we prepared a six to eight hour tutorial to teach workshop participants about Soar. Over the next two years we offered it five times at conferences and workshops (Ritter, Jones, & Young, 1996; Ritter & Young, 1994). In 1995 we received a grant to move the tutorial to the web to be used as a foundation for an advanced undergraduate / postgraduate class at Nottingham.

2 The teaching and learning environment

The initial tutorial consisted of about 30 overheads, two sample programs (models), printouts of sample runs, and thirteen exercises and answers. With a summer student's help, we translated the overheads from Word to HTML using a program called RTF2HTML. The 30 overheads were revised by us and the student, who had taken the tutorial, and additional textual and graphic material was included. Hypertext links were added to the overheads, including references to glossary items, to the exercises, and to other web-based help resources on Soar and cognitive modelling. The tutorial is at <http:// www.psychology.nottingham.ac.uk/staff/ritter/pst-ftp. html>.

3 Student Assessment

Ritter initially believed that students would quite willingly sit down in the first class meeting and read the tutorial while he sat quietly waiting in the background for questions. The first time he tried this at Nottingham, in 1996 the students rebelled and demanded lectures to be presented. (Although when the web version was introduced at a workshop, the audience clapped.) Since then, the online tutorial has only been used as an adjunct textbook for students' revision and use during programming exercises, a purpose it serves very well. Because the material appears more polished students appear to take the material more seriously, and they often print it. They appear to have less questions about programming in Soar, and also appear to have less misconceptions because they can review the explanations and rationale for this approach. The online tutorial appears to be mostly used for help and reminders while doing the exercises.

A key aspect of such a course is hands-on experience manipulating and extending cognitive models. The exercises are now well understood and have been adjusted to provide a reasonable but increasingly difficult series of tasks to teach the practical implementation of theoretical constructs. In earlier versions of this and other materials for teaching about programming cognitive architectures, there have been dishearteningly difficult problem sequences. Answers are available for most of the exercises, but some answers are not provided so that

as the exercises can serve as continuously accessed work. Having the material on the web supports revision by the students and continual updating by the instructor.

Students at Nottingham have a week between hourly lectures to complete the exercises. Those students who spend 30 to 60 minutes working will generally get full marks. People taking the tutorial at a workshop can see in ten minutes what working with Soar would be like, but do not have time to complete the exercises. While this seems somewhat odd, it works well. They can see what the question is, what types of knowledge would be necessary, and what the answer should be like. They just do not develop the full ability to answer the question. This approach allows a more complete story to be presented in limited time.

Completion of the tutorial leaves students ready to pursue independent work creating cognitive models. This level of sophistication is rarely achieved at an undergraduate level. While none of these projects have lead to fully published work, one of the models has ended up as an examples in the published Soar code, and several more have been archived as useful starting places for models.

The materials have been used at other universities for formal classes (Scotland, Japan, Australia, and Bulgaria) and for informal study (e.g. Brazil, Australia). Oddly enough, we have mostly found out about their use accidentally. Only one person has asked us or told us that they are using it.

4 Evaluation

This tutorial has been offered three times at Nottingham as part of an advanced class, and ten times at conferences and once as staff development at a university. This and associated work is mentioned as an important part of the Soar enterprise by the (US) National Research Council (Pew & Mavor, 1998).

The development of the Psychological Soar Tutorial, including the move to the web, would not be worth doing if there was just a single audience. However, it has been useful for us, teaching undergraduates, training post-graduates, and for the Soar community.

There were several resources that made this work possible. It was useful to have help with the translation to HTML. This amount of effort, about eight weeks of a summer student, can be done on your own, but it would have been hard to find this time.

It was useful to have technical support, people nearby who were familiar with HTML and the web. They were able to help us over some technical hurdles at crucial times. Without them, we would have had to spend an extra week of reading to find the answers, which were available but not simple.

If you are considering developing such online materials, you should keep your audiences in mind, and the costs and benefits should be carefully weighed. These particular materials did not recoup their cost from any single audience. The development was worthwhile because there were multiple audiences. For example, for only 10 students a year, it would not probably not be worth the effort to move material onto the web. It would be better value to photocopy the handouts each year. On the other hand, we now often prepare OHPs and teaching materials in HTML, which removes the need for translation.

Acknowledgements

References

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