Interactive PDF Documents

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The World Wide Web is now a firmly established feature of modern life. It was first constructed by a physicist, Tim Berners-Lee, at CERN, in Geneva, for the rapid, world-wide exchange of scientific information, but subsequent developments have meant that it has matured into a highly flexible instrument which is universally available, and very easy to access. The potential uses for this communications vehicle are almost unlimited and, as more and more people gain access to it, so its potential as a teaching tool becomes more attractive.

The marriage between the skills of the physics community, who were the originators of the World Wide Web, and the capacity of modern computer networks, would appear to make the web a natural medium for mathematics. However, HTML, which is the language of the web, is not ideally suited to mathematical formulae and loading new pages can also be very slow and frustrating. The challenge is then how best to use the web and its potential to help support the learning of mathematics and related technical material.

There is an alternative approach which has neither of these limitations. The research activities of the Particle Physics Theory Group at Plymouth have helped us develop an expertise in TeX, which is the world standard software for typesetting mathematics. We also have extensive experience of using the LaTeX macro collection (a variant of TeX), and this can now be used to produce PDF (portable document format) output which can be put on the web. Such PDF files can be read using the freely available and widely distributed Adobe Acrobat Reader. The output is of excellent quality and can be used to produce interactive files with features such as active links within the document, questions and quizzes.

We stress that using the packages does not require any purchase by students of special software or hardware. Students can either directly open a package from a machine linked to the web or download the file and then work through it on a PC at home in their own time. Academics who wish to use them in their teaching can either link to them or download them onto local machines. (We are happy to supply the original LaTeX files on request.) These files use the AcroTeX Education Bundle developed by D.P. Storey, a link to this is on our page (see below).

Our primary target audience has been Stage 1 students of disciplines requiring numerate skills. This is a very large audience with a particularly acute mathematics problem at the secondary/tertiary education interface. Transferability of the material across various disciplines is also easiest at Stage 1. Delivery is via our web site at the University of Plymouth and local PC's
http://www.tech.plym.ac.uk/maths/resources/PDFLaTeX/mathaid.html

An example of the appearance of a typical page is shown in Fig 1. Note that students can link to the solutions by clicking on the green letters in the exercise. The solutions link directly back to this page. At the end of each package there is a final quiz and an example of the appearance of such a quiz after marking is shown in Fig 2.

The red marks correspond to the answers selected by the student, while the green circles show the correct answers to any mistakes.

The packages have deliberately been structured to be relatively short to enable students to complete the package in a reasonable time. This gives students a feeling of satisfaction at having worked through something. Feedback from students shows that the lengths, structures and level of the material seem about right.

This project was first funded as an LTSN Physical Science Development Project, in collaboration with Simon Belt, and now forms part of the FDTL4 initiative PPLATO project. This support has been invaluable and we are grateful to the LTSN and HEFCE.

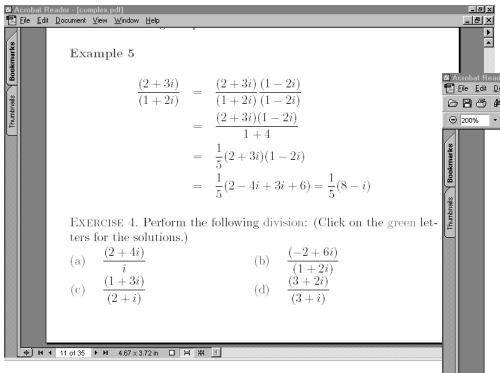

Fig 1 Typical page appearance

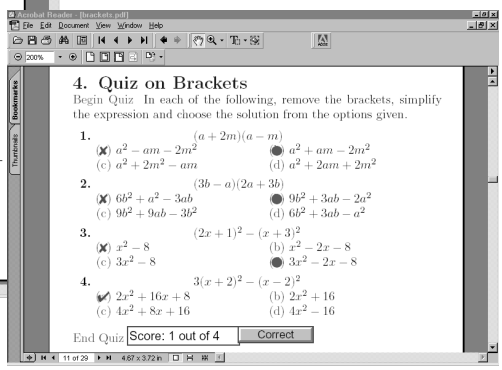

Fig 2 Example final quiz after marking