

WEB SUPPORTED LEARNING IN HEALTH AND MEDICAL INFORMATICS - AN AUTHORWARE TOOL FOR BAYESIAN DECISION SUPPORT

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ABSTRACT

Learning and teaching of health and medical Informatics is currently supported by web based material, which has been mostly derived from traditional texts. We investigate the appropriateness of the Authorware approach to provide more complex simulations and interactive tutorials. The area of quantitative decision support has been used as an example, to demonstrate the utility of this approach.

Keywords

Decision support, Authorware, web tutorial.

1. INTRODUCTION

Health and medical informatics (HMI) is a multidisciplinary subject at the interface between information technology and the various disciplines of medicine and health care. In their decision making process, many health care professionals lack the skills for the systematic processing of data, information and knowledge. Medical informatics education seeks to remedy this deficiency. HMI is appearing on the curriculum of a number of courses, including undergraduate medical degrees, biomedical engineering courses, advanced postgraduate courses and continued professional development courses.

Learning and teaching support has to take account of student needs. With HMI, it is possible to identify the following difficulties.

- Students may be from diverse backgrounds;
- Academic level may range from early undergraduate to postgraduate and specialists;

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- Delivery mode may be conventional lectures to full-time students, but is also likely to involve at least a proportion of open and distance learning.

The International Medical Informatics Association (IMIA) has recognized these difficulties and its Working Group on Health and Medical Informatics Education (www.imia.org/wg1) has provided recommendations on education in health and medical informatics [1]. Learning outcomes appropriate to a range of courses, have been defined in terms of knowledge and more practical skills for health care professionals in their role as a user or as a specialist in the field.

2. LEARNING RESOURCES IN HMI

Jenders et al [2] from the University of Columbia have provided a web based course with access to on-line notes and sample assessments. Coiera [3] has produced a text with additional web based study material. IT Eductra [4] has developed comprehensive notes and some simulations as part of a European Union Framework 4 Telematics application project. Van Bommel and Musen have produced a Handbook of Medical Informatics [5], and provided web access to the material (www.mieur.nl/mihandbook/r_3_3/handbook/home.htm). The standard text has been augmented by

- Questions and answers for most chapters;
- Sample demos and videos;
- A sample interactive exercise, which permits the sampling parameters of physiological, signals to be altered interactively across the web, written in JAVA.

The aim of this work is to investigate an alternative approach to JAVA coding, by using Macromedia Authorware 5 (www.macromedia.com) to produce sample content, and to assess its suitability for providing the instructional material. Initial tutorials developed for Electronic Medical Records (in Dutch [Duisterhout J. and Moorman P.W., personal

communication]), indicate that the medium should be more appropriate to developers, who are competent with Informatics but who are not expert programmers. The key HMI topic of *quantitative decision support* was chosen as an example.

3. BAYESIAN DECISION SUPPORT

The use of data and information processing to assist in the decision process is a key area for HMI education, as it is fundamental to a number of clinical areas. Bayes theorem has contributed to many of the decision support software products in use in clinical and research environments. The theorem requires some mathematical understanding and is covered in detail in [5, chapter 15]. Experience with students suggest that learning this material benefits from interacting with probability distributions, changing model parameters, exercises which provide feedback.

4. IMPLEMENTATION

Authorware was chosen for implementation as it provides rapid prototype development of screens, methods for interactivity using intuitive Windows techniques, tools for animation, and easy porting of software to the web. The methodology for producing an Authorware "piece" is to initially storyboard, using a simple word processor. The multimedia piece is then configured using a timeline, which allows for the sequential build up of the story, as in a cartoon. Interactions with the user are the key design issue as the user should always be in control. These may be achieved with intuitive Windows techniques, such as clicking on "hot text", clicking on "hot spots" or inputting text from the keyboard. Simple animation techniques may be easily implemented by building up a piece as a number of separate display elements and then erasing or moving these elements at a later time. The piece was developed within a framework comprising pages within subsections. Standard navigation buttons permitted the user to move from page to page, skip forward to the next section or to retrace steps.

5. DISCUSSION AND CONCLUSION

The web is increasingly used as a medium for the presentation of instructional material providing

- a platform for flexible delivery of resources to the HMI community;
- the opportunity to facilitate the organization of courses between collaborating institutions.

This approach can assist both students and teachers but is dependent upon an efficient method for the production of suitable content. As Authorware has limited computational structures, we decided to compute Bayesian distributions in Microsoft Excel and pre-plot the curves. This

means that the Authorware piece deals primarily with clickable images, which limits versatility, but increases the performance. Performance is an important issue, as it is intended to use the tutorial across the web. As such, the piece has been broken into 10 subsections, which are integral units. In a web based scenario, the web client can be loading the next subsection, while the user is working on the current sub section.

Creating an Authorware piece does not require the same computing rigor as a true programming language. Variables should however be used to provide more efficient re-usable visual coding elements. Interactivity is good, but requires a good initial design and use of appropriate human computer interaction guidelines. The framework developed here could be used as a template for additional material, provided by the website. Simulation with the package is relatively straightforward, but time consuming as elements to be erased must be separately specified. Overall the approach is preferable to the JAVA based method, as it permits material to be supplied by experts who are competent with IT but who have not been trained as programmers. However, development time may not be substantially reduced.

6. REFERENCES

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