REDEVELOPING A MULTIMEDIA TRAINING MODULE AS PART OF A WWW-BASED EUROPEAN SATELLITE METEOROLOGY COURSE

[1]Kate Wright, [2]Will Wright and [3]Ian Bell

[1 and 3]Bureau of Meteorology Training Centre, Bureau of Meteorology. Australia
email: k.wright@bom.gov.au
email: i.bell@bom.gov.au

[2]National Climate Centre, Bureau of Meteorology. Australia
email: w.wright@bom.gov.au

ABSTRACT

The WWW is increasingly being used as a platform for the presentation of distance education courses. Such a medium has a number of important advantages, among them easy world-wide access to the courses, and ease and flexibility in updating course materials. The Australian Bureau of Meteorology's Training Centre is participating in a European-based project known as EuroMET (the European Meteorological Education and Training project), the aim of which is to meet the training needs of professional meteorologists and tertiary students using Web-based training modules. This paper describes Australian involvement in EuroMET, in particular the development of a module for training meteorologists in interpreting satellite imagery. The design of this module is discussed, including a brief description of the various tools developed by the EuroMET consortium to assist in the rapid development of modules, and of procedures to ensure that modules developed by different partners have a common appearance and functionality. The advantages and disadvantages of conducting a course like satellite imagery interpretation – which requires extensive use of images and video files over the WWW are also described.

KEY WORDS

WWW, EuroMET, Satellite Meteorology, on-line training, module.

1. INTRODUCTION AND BACKGROUND

1.1 SATELLITE METEOROLOGY AND TRAINING

The science of meteorology is concerned with understanding the atmospheric patterns that produce our weather, and applying fundamental physical laws to the atmosphere in its current state to predict its future evolution. One of the most critical advances in meteorology over the past 30 years has been the development of remote sensing techniques, including the use of satellites, to observe cloud patterns over the earth, along with interpretation techniques to yield information about current weather patterns from satellite cloud images.

Satellite meteorology now forms a fundamental part of meteorology training courses throughout the world. In fact a recent user needs survey of the European National Meteorological Services (about 13000 professional meteorologists) identified this, along with Numerical Weather Prediction, as the two highest priorities for meteorological training (HREF1). The same survey identified that greater use of computer-based learning techniques was desirable.

1.2 WHAT IS EUROMET?

To meet these needs, the EuroMET (for European Meteorological Education and Training) Project was established, consisting of a consortium of specialist meteorological training institutions (i.e., national meteorological services and university meteorology departments), most of them Europe-based. The principal aims of the EuroMET Project were 1) to demonstrate the efficiency, effectiveness, and cost-effectiveness of telematic training for meteorology, and 2) to establish an organisational structure to enable the continued development of on-line training courses in meteorology. Each participating institution puts up resources, and/or contributes to preparing course materials, in return for access to all the materials developed by the other participants. The European Commission has also provided resources for the project, having estimated a likely Benefit-Cost ratio for the Commission of 8:1 to 10:1 (HREF1). It was anticipated that more than 1,000 learners from the constituent nations would use the materials.

The courses developed as part of the EuroMET project are presented as a series of modules on the World Wide Web (WWW), which is now well established as a suitable medium for delivering training courses in meteorology, as in other subjects. In the United States, for instance, several meteorological training organisations are similarly collaborating to produce WWW-based training modules on severe weather (the Meted project; HREF2).

Materials prepared for the project form part of a wider meteorology training curriculum offered by each of the participating institutions, in most cases leading to a degree or other formal qualification. It is intended that the individual modules be combined into an integrated course on satellite meteorology, which could serve as a 'stand-alone' educational resource, but which in practise would be supplemented by lectures, tutorials, and other elements of existing satellite meteorology courses by the individual institutions. Assessment of the course would be at the discretion of the individual institutions, but is not, in general, carried out within the modules themselves.

1.3 AUSTRALIAN BUREAU OF METEOROLOGY INVOLVEMENT

The Australian Bureau of Meteorology Training Centre (BMTC) routinely conducts training courses for pre-service meteorologists in interpreting satellite imagery, and provides 'follow-up' training for in-service meteorological personnel. Their CAL Development and Ongoing Education unit has been active over the past several years in developing computer assisted learning (CAL) training modules. For BMTC, participation in EuroMET provides the opportunity to tap into the considerable resources available from other EuroMET participants, and to supplement existing courseware with materials developed elsewhere. In turn, BMTC's contribution as a partner in the project was to conduct module evaluations, and to develop a number of satellite meteorology training modules.

2. THE WWW AS A LEARNING TOOL

The WWW provides easy world-wide access to a large quantity of information in a range of formats, making it well suited to the presentation of distance education courses. Its ability to enable equal and timely access to all member countries of the European Union was a major reason why the WWW was selected by EuroMET as its preferred platform for the presentation of course modules. WWW-based training has a number of other advantages over 'classical' modes of material presentation in a course like satellite meteorology, including:

- new material and extra examples can be easily incorporated into the modules;
- improvements can be made, and bugs fixed, 'on line', without the inefficiencies of having to disseminate updated versions of the materials;
- rapid interaction is possible between users and content experts;
- course materials are readily accessible by Australian participants;

- the WWW supports many different platforms, as well as multimedia (pertinent here because workstations used by forecasters within the Bureau of Meteorology, one of the main intended user groups for the satellite meteorology training materials, are UNIX based); and
- electronic formats generally enable better quality displays and enhancements (especially useful for satellite imagery interpretation).

On the other hand, some potential disadvantages of the WWW for a course like satellite meteorology are:

- simulation and interaction on the WWW is not always as easy to produce or as effective as on other platforms; and
- the length of time required to download animated sequences of satellite cloud images (i.e. videos) – often important in satellite meteorology because such sequences show significant processes such as development, movement and decay of weather systems.

The latter problem could be overcome by pre-loading large files or videos onto a local server (which would function as a 'mirror' site), or onto a CD-ROM. However the latter option, in particular, would reduce many of the advantages mentioned above, and in any case such arrangements were beyond the scope of the current Project. In addition, continued advancements in WWW technology would in the future be expected to reduce these disadvantages.

3. MODULE DEVELOPMENT

The EuroMET Project imposed various structures on material developed by participants, in order to ensure that modules developed in different locations met common standards for such things as: hardware/software needed to run the modules; delivery times throughout Europe; the pedagogy and structure of modules; the appearance of the pages within each module; and the navigational interface presented to the user. The following basic design principles were imposed (HREF3):

- *Language flexibility*. Since many European countries are participating in EuroMET, it was essential that the modules be designed in such a way that they could readily be converted to different languages. This required certain restrictions to be imposed, e.g., icons to be used instead of text on buttons, etc; no labelling to appear on individual images.
- *Linear navigation.* Can only navigate forwards or backwards, and cannot link to other pages outside the module (except certain basic information resources, such as a glossary, course contents, etc). However, access to other modules is easily achieved via the top level menus. Links to pages outside EuroMET were not permitted within modules, due in part to the maintenance problems associated with multiple language versions of the modules.
- *Display size*. Displays to be presented on a standard 800 x 600 screen.
- *Software*. Software to be compatible with Netscape Version 3.0 or higher, or Internet Explorer Version 3 or higher. Javascript editing was therefore essential.
- *Basic information*. Help, Glossary, Index, and Course Outline to be accessible at all times.

In addition to the above general design requirements, EuroMET developed page-formatting macros to ensure that each module conformed to a common style. For example, the macros insert headers and footers, standard graphic icons, etc. The software used to effect the replacements is a PERL 5 script called esr2htm (HREF4), derived by EuroMET from a similar tool freely available from WebTechs Corporation (HREF5). This script automatically replaces any macro names it finds within the source files with a corresponding block of HTML (stored as a separate file, and therefore easily changed when necessary, as for example when the module is translated into another language).

The basic procedure was for the source files and graphics for individual modules to be developed separately, then sent to Edinburgh University, where modules would be converted to HTML and formatted appropriately, as described above. The modules were then mounted on the University's web server for evaluation. Module development was mostly done on UNIX systems, but BMTC used Windows 95, as this was the platform on which a pre-existing CAL module, used as the basis for this module, had been developed. Although only the source files are sent to EuroMET, it was necessary for the scripting tool, macro files, etc. to be installed in each developer's location so that the developer can process and view the files in their final form (i.e. on the WWW) prior to submission.

On completion, each module is then subject to an evaluation by other member institutions. Following this evaluation, the designers of the module are then encouraged to implement suggested amendments and improvements to their module.

4. EXAMPLE

As mentioned earlier, BMTC is developing several satellite meteorology training modules. One such module is for identifying different cloud types using satellite imagery, a crucial skill for operational meteorologists. Sensors aboard the satellite receive radiation emitted from clouds (and other surfaces) below, and in this way the satellite 'senses' or 'sees' the cloud. Radiation in different wavelength bands, or 'channels', shows up different properties of the cloud, and taken in combination, the trained user can then identify the type and characteristics of the cloud. The three most commonly used 'channels' for satellite imagery are the ***Visible*** (shows general appearance of the cloud), the ***Infrared*** (shows the temperature of the cloud top, and therefore allows the height and possibly thickness of the cloud to be deduced), and ***Water Vapour*** (provides information on the moisture content of the air). Figure 1 shows stratocumulus clouds as they appear on satellite imagery in each of these three channels: the Visible channel suggests a lumpy cloud deck of varying thickness, but the Infrared and Water Vapour Channels indicate that the cloud is low (grey appearance), and that the atmosphere above it is dry.

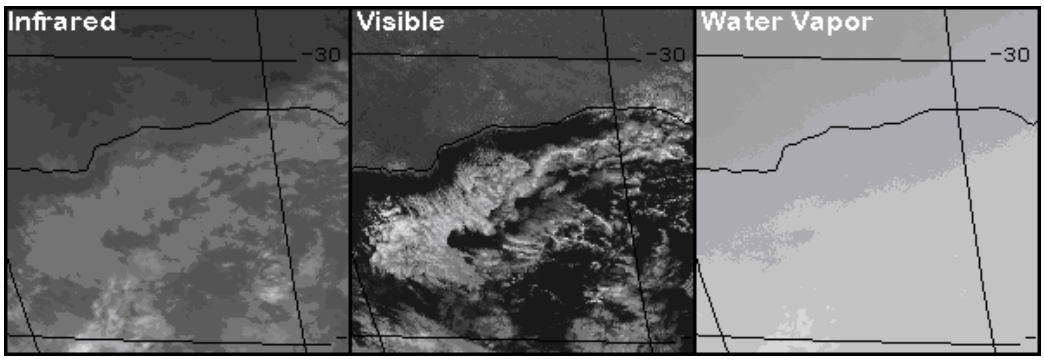

Figure 1: Stratocumulus cloud in the Infrared, Visible, and Water Vapor channels Note that the cloud looks different in each of the three images.

The main reasons why cloud identification was chosen as BMTC's initial subject for a EuroMET training module were because a) a PC-based version of this module already existed (developed using Asymetrix Multimedia Toolbook), and was being successfully used as part of BMTC's in-house satellite meteorology training courses; and b) this particular module, unlike many others, was not reliant on satellite image loops. Our experience was that the existing module did indeed provide a useful basis for constructing the EuroMET module, although considerable reworking was required to put it into the appropriate format for esr2htm conversion (the appearance of the module had to comply with the EuroMET structure, and also methods had to be found to retain key parts of the interactivity that existed in the original module). On the other hand, redesigning the module for the WWW allowed us the opportunity and incentive to make some non-essential but useful improvements to the interface design, thereby enhancing the overall product; for example, displaying all three satellite channels simultaneously.

5. CONCLUDING REMARKS

Participation by the Australian Bureau of Meteorology in the European-based EuroMET Project has been described, and an example given of one of the modules developed. Further modules are planned on extratropical cyclones, thunderstorms, and clear air circulations. Although the current phase of the EuroMET project is nearing the end of its designated life, there has been in-principle agreement among the participating institutions to maintain the arrangements developed, so that collaboration that currently exists between the meteorological agencies of Europe and the Bureau of Meteorology should continue. Similar collaboration in the production of meteorological training materials is taking place elsewhere in the world, notably in the United States (HREF2).

The example described in this paper demonstrates the potential of the WWW as a platform for the presentation of training courses in some aspects of satellite meteorology. Modules that rely heavily on image sequences, which is the case for many topics in satellite meteorology, would currently appear to be less suitable as subjects for purely WWW-based distance learning, because of the time taken to download the image loops. However, possible ways around this, which would retain most of the advantages of the WWW as a training platform, would be to access the larger files from a mirror site on a local server, or from a CD-ROM, activated from within the web-based module. Using these approaches, the flexibility and convenience of the WWW could still be used to access 'recent updates' of material, such as extra examples, but with the bulk of the material read from a higher-speed source.

Finally, this paper has shown the value of collaborative arrangements in producing high quality training materials, which would otherwise be beyond the scope of individual organisations.

6. ACKNOWLEDGEMENTS

The authors wish to thank Peter Douglas of the University of Edinburgh for his invaluable assistance in getting the EuroMET authoring tools working within BMTC, writing Java APPLETS, and overcoming the technical problems encountered along the way. Thanks also to Heleen ter Pelkwijk for her considerable contribution to the authoring of the original module.

7. REFERENCES

EuroMET. Project Programme (and Contract) Ref Number ET 1011/1022, European Meteorology Education and Training. URL: http://euromet.meteo.fr/internal/admin/eu/program/contents.html. 31 July 1998.

Meted. 1997. Meteorological Education and Training Home Page, University Corporation for Atmospheric Research. URL: http://www.meted.ucar.edu/. 11 August 1998.

Duncan, C. Presentation of the Development Task February 1997. Charles Duncan. URL: http://euromet.meteo.fr/internal/presentation/darmstdt.ppt. 30 July 1998.

Bond, S. Developing EuroMET Pages with esr2htm. EuroMET. URL: http://www.euromet.met.ed.ac.uk/development/edinburgh/bond/e2h_guide.shtml. 18 February 1998.

WebTechs. 10 June 1998. Tools, WebTechs. URL: http://www.webtechs.com/tools/. 10 August 1998.