Design of the SEP web pages

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keywords: *web*

ABSTRACT

Ideally, the SEP web pages should be rich in content, free of clutter, and quick to download. We suggest two basic types of web pages: table-of-contents pages that contain lists of annotated links, and content pages that contain mostly text and figures. The author of an SEP web page should attract search engines, maintain a consistent layout for related pages, and include a simple, universal navigation button that returns the reader to the SEP home page. Finally, the SEP source that corresponds to a web page should be equipped with a simple makefile target `www` that exports the software to the web site.

INTRODUCTION

Last Spring we rewrote the SEP home page (Figure 1). We added all SEP reports (Figure 3) from 70 through 92 to SEP's world wide web site. We also added a set of pages that offer the various components of the SEP software environment. In this paper, we present our design decisions, point out some technical details that we learned, and suggest some possible future projects.

WEB PAGE STYLE

The SEP web pages should contain geophysical articles, processing software and seismic images. Thus the pages offer a forum for collaboration and publication to its readership. Who is the readership of SEP's web pages?

- **SEP:** The researchers at SEP use the SEP pages to read seminar schedules or to get access to other SEP members' collections of links. Instead of roaming the site, SEP researchers frequently jump to a few, specific pages. Their access is fast, since it is local and from powerful workstations.
- **Sponsors, prospective students, colleagues:** Many outside readers are curious to learn about SEP. They may roam the site extensively. Sponsors and colleagues may

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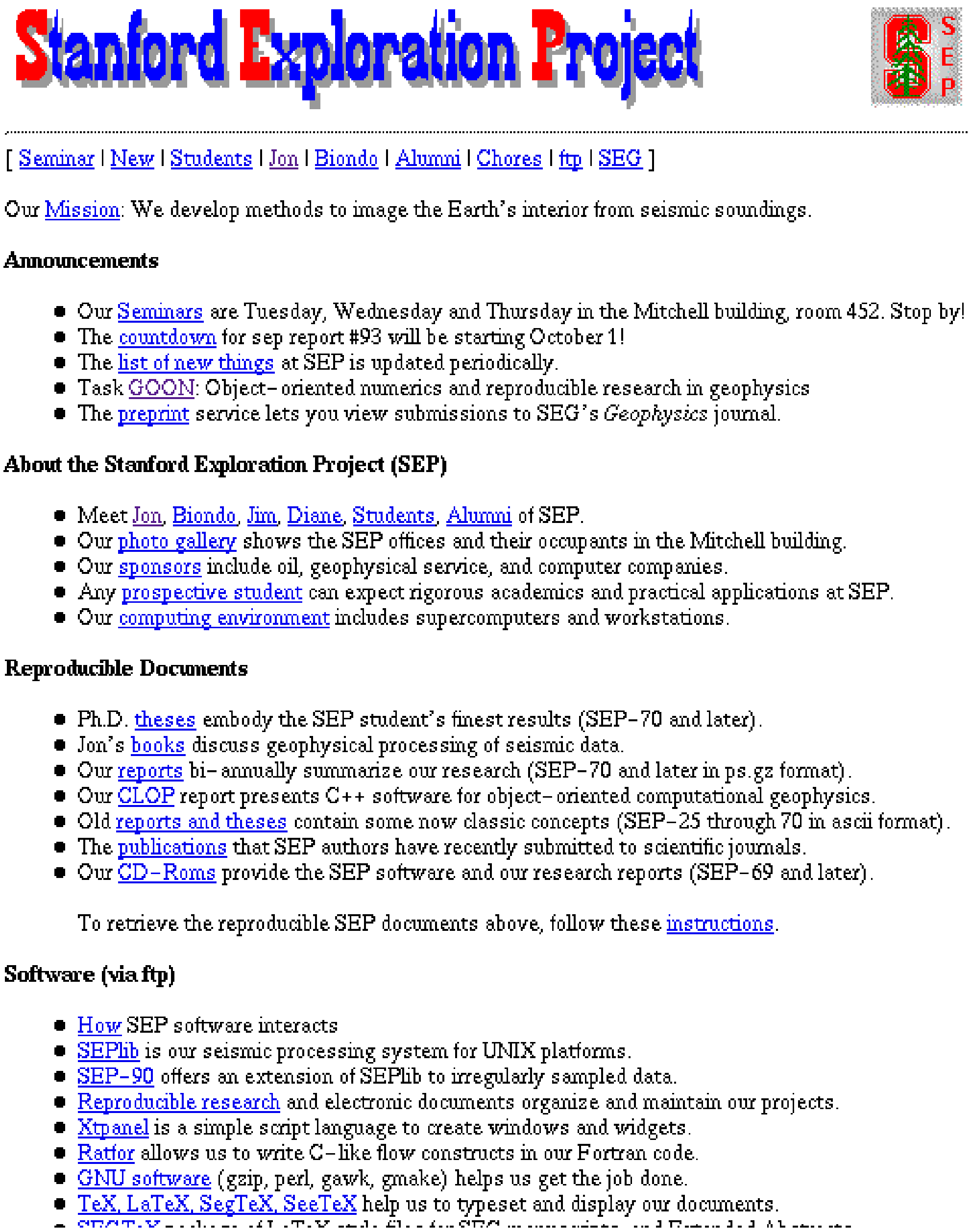


Stanford Exploration Project

[Seminar | New | Students | Jon | Biondo | Alumni | Chores | ftp | SEG]

Our Mission: We develop methods to image the Earth's interior from seismic soundings.

Announcements

- Our Seminars are Tuesday, Wednesday and Thursday in the Mitchell building, room 452. Stop by!
- The countdown for sep report #93 will be starting October 1!
- The list of new things at SEP is updated periodically.
- Task GOON: Object-oriented numerics and reproducible research in geophysics
- The preprint service lets you view submissions to SEG's *Geophysics* journal.

About the Stanford Exploration Project (SEP)

- Meet Jon, Biondo, Jim, Diane, Students, Alumni of SEP.
- Our photo gallery shows the SEP offices and their occupants in the Mitchell building.
- Our sponsors include oil, geophysical service, and computer companies.
- Any prospective student can expect rigorous academics and practical applications at SEP.
- Our computing environment includes supercomputers and workstations.

Reproducible Documents

- Ph.D. theses embody the SEP student's finest results (SEP-70 and later).
- Jon's books discuss geophysical processing of seismic data.
- Our reports bi-annually summarize our research (SEP-70 and later in ps.gz format).
- Our CLOP report presents C++ software for object-oriented computational geophysics.
- Old reports and theses contain some now classic concepts (SEP-25 through 70 in ascii format).
- The publications that SEP authors have recently submitted to scientific journals.
- Our CD-Roms provide the SEP software and our research reports (SEP-69 and later).

To retrieve the reproducible SEP documents above, follow these instructions.

Software (via ftp)

- How SEP software interacts
- SEPlib is our seismic processing system for UNIX platforms.
- SEP-90 offers an extension of SEPlib to irregularly sampled data.
- Reproducible research and electronic documents organize and maintain our projects.
- Xtpanel is a simple script language to create windows and widgets.
- Ratfor allows us to write C-like flow constructs in our Fortran code.
- GNU software (gzip, perl, gawk, gmake) helps us get the job done.
- TeX, LaTeX, SegTeX, SeeTeX help us to typeset and display our documents.

Figure 1: The SEP home page: `<http://sepwww.stanford.edu>` sepwww [NR]

search for information on an SEP research effort, a software tool, or a document. However, most of these readers visit infrequently and need clear guidance to the pages they seek. Unfortunately, the quality of the internet connection between SEP and some of its readers is poor. Readers at sites overseas or behind local fire walls can experience frustratingly slow data transfer.

Fat, Functional, and Fast

How should we design the SEP web pages? We decided that a fat, functional, and fast web page would serve our professional readership best. We chose to build a sleek and powerful tool, rather than a sluggish *objet d'art*. Only SEP pages that are rich in content will maintain their readership's interest. Any visitor, but especially readers who visit repeatedly and who seek specific items, will appreciate a consistent, clear, and functional structure of the SEP web pages. Finally, the fast access will make the page available to a wide range of readers independent of the quality of their internet connection.

Table-of-contents pages

To implement fast, functional, and fat web pages, we use two types of pages: table-of-contents pages and content pages.

A table-of-contents page presents the user with a simple list of hyperlinks. Such a list allows a reader to visit all web pages systematically. We group list items into sections and add section headlines. We place important items at the top of the list, even if that violates a more logical ordering of the items. Finally, a bar of hyperlinks at the top of the page offers short cuts to frequently visited links.

Furthermore, we accompany every hyperlink with a descriptive sentence. Such an annotation helps a reader to decide if he wants to commit to a possibly lengthy down-load. In the case of unusual files, we add the size and the format of the file. For example, a compressed (gzip) postscript figure of 12 K-Bytes may carry a hyperlink, such as `Great Paper (ps.gz 12K)`.

To facilitate quick access and uniform organization, we consistently place every item's hyperlink at the beginning of its annotating sentence. The link itself is a descriptive short phrase. We follow the recommendations of Ian S. Graham (1996) and strictly avoid long phrases for hyperlinks or unstructured paragraphs with scattered hyperlinks.

Content pages

While table-of-contents pages help a reader navigate, content pages convey the author's message. For content pages, the standard rules for good expository writing hold.

We avoid placing hyperlinks at the top of a content page. We feel that such a hyperlink poses a potentially difficult decision to a reader: to continue to read the page or to follow the hyperlink. We prefer to include such links in the corresponding table-of-contents page or at the bottom of the content page itself (maybe as a bibliography section).

Related pages

We attempt to give pages of similar function the same general outline: a consistent "touch-and-feel". For example, each section has a corresponding hyperlink at the top of the page and most software pages have the same sections: Down-loading, Description, Installation, and Bibliography. Such a consistent interface helps a reader to navigate, since a reader's experience with one page helps him with the next page.

An alternative Style

We considered alternative web page styles. A simple list of hyperlinks without annotating sentences is more compact than our annotated links. However, we felt that some of our links were a bit esoteric and needed explanation. Alternatively, a Netscape frame combines navigational tools and content pages into a single window. However, frames tend to mangle their pages. Sometimes the contents area is too small and sometimes the navigational links are hidden by the frame. Frames, while being good for simple tables, generally challenge the what-you-get-is-what-you-meant concept. Furthermore, frames are not part of HTML 2.0 and a web page designed for Netscape frames might be rendered terribly by other browsers.

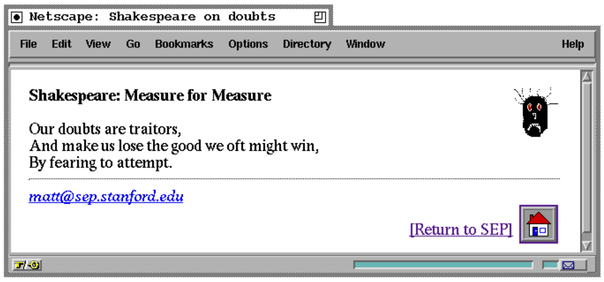
HTML PAGE ENHANCEMENTS

A good on-line source for tips on authoring web pages is the section *Authoring web pages, images and scripts* at `<http://www.boutell.com/faq>`. The following example (See Figure 2) demonstrates the HTML constructs we typically choose when writing the SEP web pages:

```
<HTML>
   <HEAD>
      <TITLE>Shakespeare on doubts</TITLE>
      <META NAME="keywords" CONTENTS="Shakespeare measure doubt">
   </HEAD>
   <BODY bgcolor="white">



      <IMG ALIGN=right SRC="angst.gif" HEIGHT=56 WIDTH=50 ALT="[Fearful face]">

      <H4>Shakespeare: Measure for Measure</H4>

      Our doubts are traitors, <BR>
      And make us lose the good we oft might win, <BR>
      By fearing to attempt.
```

```
   <HR>
   <ADDRESS>
      <A HREF="mailto:matt@sep.stanford.edu">matt@sep.stanford.edu</A>
   </ADDRESS>
   <!--#include virtual="/return2sep"-->
   </BODY>
</HTML>
```

Figure 2: This example corresponds to the HTML skeleton that is discussed in the text. The HTML page contains a few invisible features. For example, the image is accompanied by a short statement that is displayed by text-only browsers. A keyword statement helps web search engines to catalog the page. angst [NR]



A browser may successfully render web pages even if the pages ignore some of the discussed HTML elements. Such negligence may, however, cause difficulties for web search engines, other browsers, or book-marks. Therefore, we recommend modeling new web pages on the above example.

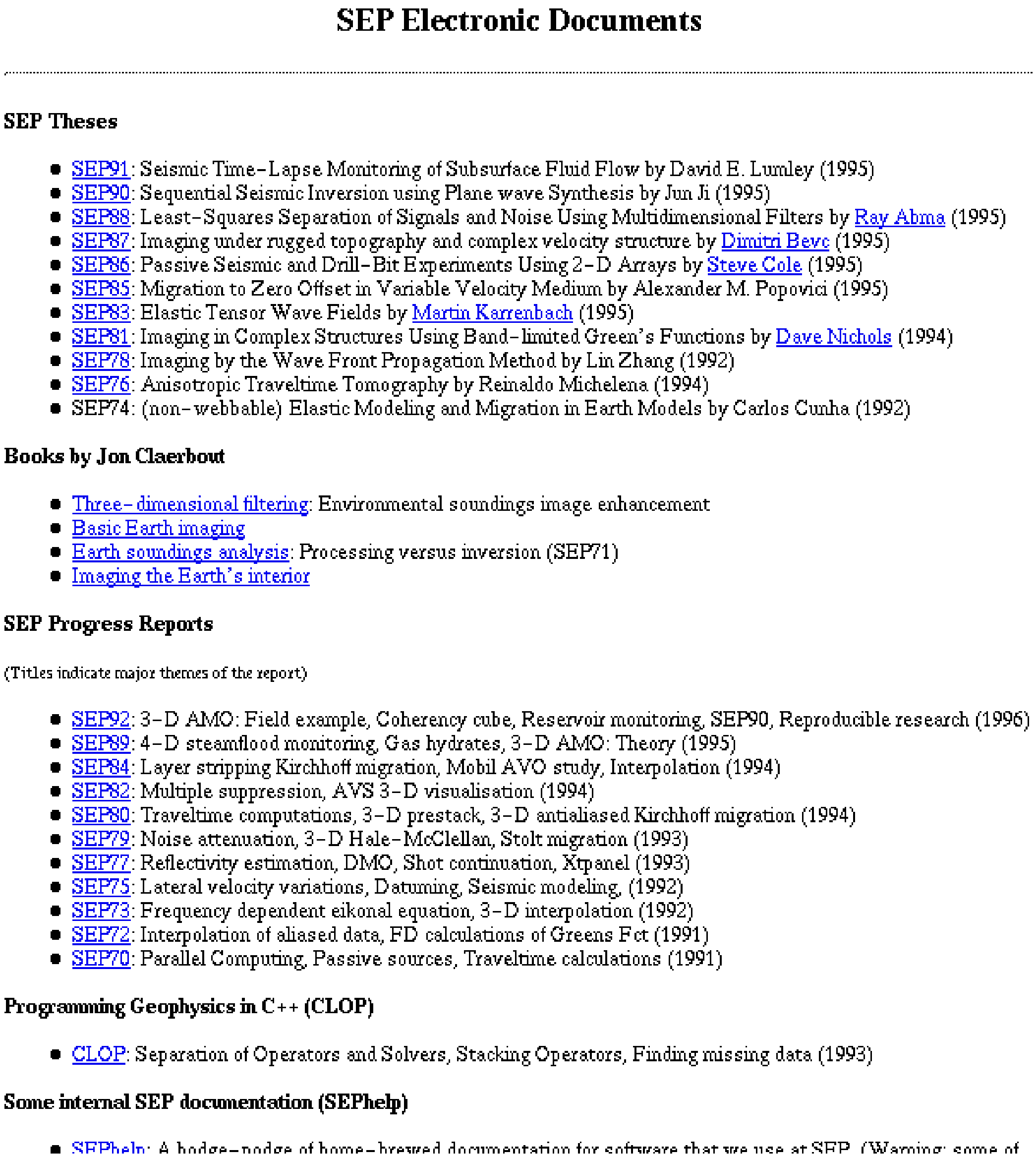
The file head

A web page's `TITLE` is usually used as the name in book-marks: we suggest choosing a short descriptive term. Note that this title is distinct from the first headline in the body of a page. Netscape displays the title in the window's title-bar.

Just having a web page is not sufficient for attracting a wide readership. To be highly visible on the web, a author needs to attract the attention of web search engines: crawlers, robots, worms, and spiders. Unfortunately, there are hardly any established rules on how to communicate with web engines.

The official HTML feature for communicating keywords to a search engine is the `META` element and its `CONTENTS` list. Unfortunately, we do not know how to define phrases in the `CONTENTS` list; consequently, many spectroscopists and ornithologists may be misled by the content list `''Kirchhoff Migration''`.

Additionally, many search engines scan a page for keywords. Therefore, some sites include a keyword list at the bottom of their page. We decided against such a list since it possibly distracts the reader, increases the pages volume, and is utterly inelegant. Finally, web pages can be registered in many search engines simultaneously by using the service at `http://www.submit-it.com/`.



SEP Electronic Documents

SEP Theses

- SEP91: Seismic Time-Lapse Monitoring of Subsurface Fluid Flow by David E. Lumley (1995)
- SEP90: Sequential Seismic Inversion using Plane wave Synthesis by Jun Ji (1995)
- SEP88: Least-Squares Separation of Signals and Noise Using Multidimensional Filters by Ray Abma (1995)
- SEP87: Imaging under rugged topography and complex velocity structure by Dimitri Bevc (1995)
- SEP86: Passive Seismic and Drill-Bit Experiments Using 2-D Arrays by Steve Cole (1995)
- SEP85: Migration to Zero Offset in Variable Velocity Medium by Alexander M. Popovici (1995)
- SEP83: Elastic Tensor Wave Fields by Martin Karrenbach (1995)
- SEP81: Imaging in Complex Structures Using Band-limited Green's Functions by Dave Nichols (1994)
- SEP78: Imaging by the Wave Front Propagation Method by Lin Zhang (1992)
- SEP76: Anisotropic Traveltime Tomography by Reinaldo Michelena (1994)
- SEP74: (non-webbable) Elastic Modeling and Migration in Earth Models by Carlos Cunha (1992)

Books by Jon Claerbout

- Three-dimensional filtering: Environmental soundings image enhancement
- Basic Earth imaging
- Earth soundings analysis: Processing versus inversion (SEP71)
- Imaging the Earth's interior

SEP Progress Reports

(Titles indicate major themes of the report)

- SEP92: 3-D AMO: Field example, Coherency cube, Reservoir monitoring, SEP90, Reproducible research (1996)
- SEP89: 4-D steamflood monitoring, Gas hydrates, 3-D AMO: Theory (1995)
- SEP84: Layer stripping Kirchhoff migration, Mobil AVO study, Interpolation (1994)
- SEP82: Multiple suppression, AVS 3-D visualisation (1994)
- SEP80: Traveltime computations, 3-D prestack, 3-D antialiased Kirchhoff migration (1994)
- SEP79: Noise attenuation, 3-D Hale-McClellan, Stolt migration (1993)
- SEP77: Reflectivity estimation, DMO, Shot continuation, Xtpanel (1993)
- SEP75: Lateral velocity variations, Datuming, Seismic modeling, (1992)
- SEP73: Frequency dependent eikonal equation, 3-D interpolation (1992)
- SEP72: Interpolation of aliased data, FD calculations of Greens Fct (1991)
- SEP70: Parallel Computing, Passive sources, Traveltime calculations (1991)

Programming Geophysics in C++ (CLOP)

- CLOP: Separation of Operators and Solvers, Stacking Operators, Finding missing data (1993)

Some internal SEP documentation (SEPhelp)

- SEPhelp: A hodge-podge of home-brewed documentation for software that we use at SEP. (Warning: some of

Figure 3: Table-of-contents page that lists SEP's reproducible publications (reports and books). Each hyperlink leads to a document specific table-of-contents page as shown in Figure 4. $\boxed{\text{docshtml}}$ [NR]

SEP92

Application of azimuth moveout to the coherent partial stacking of a 3-D marine data set (ps.gz 1181K) , (src 5328K)
by Biondo Biondi, Sergey Fomel, and Nizar Chemingui

The application of azimuth moveout (AMO) to a marine 3-D data set shows that by including AMO in the processing flow the high-frequency steeply-dipping energy can be better preserved during partial stacking over a range of offsets and azimuths. Since the test data set requires 3-D prestack depth migration to handle strong lateral velocity variations, the results of our tests support the applicability of AMO to prestack depth imaging problems.

Handling irregular geometry in wide-azimuth surveys (ps.gz 1442K) , (src 2489K)
by Nizar Chemingui and Biondo Biondi

The processing of seismic data for amplitude inversion often neglects an important issue which could be detrimental to amplitude preservation: the effect of sparse and irregular geometry. The problem is severe in wide-azimuth 3-D surveys acquired with the aim of studying the azimuthal variations in the AVO gradient. We present a new technique for processing wide-azimuth surveys that accurately images 3-D seismic data while preserving relative amplitudes describing the offset and azimuth-dependent reflectivity function. The method focuses on both algorithm accuracy and proper handling of irregular geometry and therefore allows for reliable AVO analysis on migrated data. The technique is based on organization of the data into common-azimuth (CA) and common-offset (CO) cubes and allows interpolation into a regular grid before imaging. The regular CA/CO cubes are then migrated using an efficient true-amplitude migration algorithm. We apply this technique in order to invert for a synthetic reflectivity model simulating a real 3-D wide-azimuth land survey over a fractured reservoir. Results show that, as expected, Kirchhoff migration is very sensitive to uneven sampling, which creates strong amplitude distortions. The azimuth moveout (AMO) transformation succeeded in organizing the data as regular gridded cubes while preserving its amplitude information for imaging. We conclude that interpolating seismic data prior to migration is effective in preserving amplitude information and that AMO can effectively correct for the irregular sampling in wide-azimuth surveys.

Revealing geological discontinuities by local plane wave suppression (ps.gz 1006K) , (src 26174K)
by Matthias Schwab, Curt Holden, and Jon Claerbout

Interpreters of migrated seismic image volumes need to delineate reflector discontinuities, such as faults or buried channels. To enhance these discontinuities we applied local, data-adaptive Prediction Error (PE) Filters to the migrated image. We restricted the PE Filters to local combinations of 2-D filters, which remove local planar events and reveal rapidly varying local features. Unfortunately, while the scheme successfully enhanced geological discontinuities in one field data case, it failed in two others. In these two cases, the PE Filters erroneously predicted (and consequently removed) the geological discontinuities of interest. We were unable to tune the PE Filters to forgo a specific target bandwidth. Such a tuning may be possible if we use a sequence of two PE filtering steps of which the first filter prewhitens the image. In another case, the PE filter enhanced the image's acquisition footprint and thereby obliterated any geological details. Moreover, we do not yet know how to combine optimally the various PE Filter residuals to produce a meaningful subsurface map.

Reservoir monitoring: A multi-disciplinary feasibility study (ps.gz 1347K) , (src 40237K)
by Biondo Biondi, David Lumley, Gary Mavko, Tapan Mukerji, James Rickett, Clayton Deutsch, Runar Gundes, and Marco Thiele

Monitoring reservoir changes with time-lapse seismic holds the promise to significantly improve reservoir characterization and reservoir management. To relate time-dependent changes in seismic to the underlying geological description and flow processes requires input from a number of disciplines: (1) geological modeling/geostatistics, (2) flow simulation, (3) rock physics, and (4) seismic imaging. This paper documents the start of a project that brings these disciplines together. In this initial model study we have considered the forward problem, i.e., create a detailed geological truth model, perform flow simulation, relate the dynamic rock properties to seismic properties, and, finally, image the reservoir at multiple times. We document this forward modeling exercise on a single geological relization and discuss opportunities for future work.

Modeling heterogeneous reservoirs using the first order Born Approximation (ps.gz 135K) , (src 181K)
by James Rickett, Biondo Biondi, and David Lumley

Rickett, Biondi Lumley Modeling heterogeneous reservoirs SEP--92 Modeling heterogeneous reservoirs using the first order Born

Figure 4: The table-of-contents page of SEP sponsor report 92. Each chapter (article) is represented by an abstract, a link to a postscript file, and a tarred document directory. $\boxed{\text{sep92html}}$ [NR]

Images

Images are usually responsible for sluggish loading of web pages. We strongly recommend using the WIDTH and HEIGHT attributes with images. Specifying the image size in this way allows the browser to display the text first and down-load the images later. (Next time you down-load the SEP web page watch for the delayed display of the SEP headline.) To make our web pages readable even by text-only browsers, we added to each image an ALT statement that can be displayed in lieu of the image.

The file bottom

To enable readers to contact us, we include our email address in an ADDRESS element at the bottom of each page. To help a reader to navigate through the SEP web pages, we provide a return to SEP hyperlink to the SEP home page. Authors create that hyperlink by including the comment <!--#include virtual="/return2sep"--> in their page. The inclusion of a common file ensures the consistency of the provided navigational icon and will permit us later to improve the navigational mechanism by editing a single file.

We avoid using the #flastmod command, which displays the most recent modification time of a web page. This command requires the name of the HTML file that contains the command itself. A simple filename change without an update of the command will cause an error. Thus, we use #flastmod exclusively where the last modification time is essential information for the reader.

Some www experts complain about Netscape's brash introduction of new features: it seems that these features are not always painless for non-Netscape users. Furthermore, the O'Reilly book *Using HTML: The Definitive Guide*(Musciano and Kennedy, 1996) warns that HTML 3.0 may not be agreed on for the foreseeable future. We therefore exclusively use standard HTML 2.0. Finally, we feel that a blinking word is similar to a shouted word and should be used extremely sparingly.

WEB PAGE MAINTENANCE

A lot of material that is exposed on the SEP web site is needed at other locations of the SEP file system. For example, the SEPlib source code (SEP's seismic processing package) is offered as a tar file on the SEP web site. At the same time, SEPlib, including its source code, is installed on SEP's computers, so that SEP researchers can use and maintain the software package. Such a duplication of source code invites the divergence of the various duplicates and poses a serious software maintenance problem.

Ideally, we would prefer to have a single set of source files that is simultaneously offered at the web and used locally. A natural solution would be to make the entire SEP file system accessible to the web. Unfortunately, such an open file system raises serious security problems and is therefore unrealistic at this time.

To maintain a single location for software source code, we suggest keeping all files pertinent to a software package in a single source directory structure. In the case of the SEPlib source code, this directory includes the programs, documentation, makefiles, and even the corresponding HTML files. All maintenance and the local installations are based on this source directory.

Additionally, the top makefile includes a command `make www` that properly installs the software on the SEP web site. For example, `make www` in the SEPlib directory would tar the SEPlib files, move the tar file to the ftp site, and would copy the SEPlib HTML file to the web site[2]. If all source directories would contain rules on how to export themselves, a central make rule could routinely and automatically update the entire web site by visiting all necessary source code directories and executing `make www` in each of them.

The danger of diverging software versions also arises when software copies on the web are actually distributed. The traditional software maintenance concept asks software users to send error reports and patches to a central programmer who maintains the software. At SEP, however, local and remote users maintain the software together.

To facilitate easy remote software maintenance, SEP could extend a version control system to its web and ftp site. A simple solution could be a lock file that when it exists on our web page, signals to other developers that the software package is currently locked. The file could contain the email address of the developer who currently locks the package. We hope such a web CVS system will emerge in the public software domain soon.

ACKNOWLEDGEMENT

Bob Clapp urged us to use frames and Sergey Fomel wanted to see a set of navigational icons. Their friendly critiques led to the development of the list of *short cuts* at the top of the SEP home page.

REFERENCES

Graham, I. S., 1996, HTML source book: John Wiley & Sons Inc., New York.

Musciano, C., and Kennedy, B., 1996, Using HTML: the definitive guide: O'Reilly & Associates, Inc.

[2]Similar rules can export the software to other media. A makefile command `make cdrom` could copy the software to a CD-Rom assembly area and change file pathnames where necessary. A makefile command `make nomad` could copy the software to a stand-alone computer.