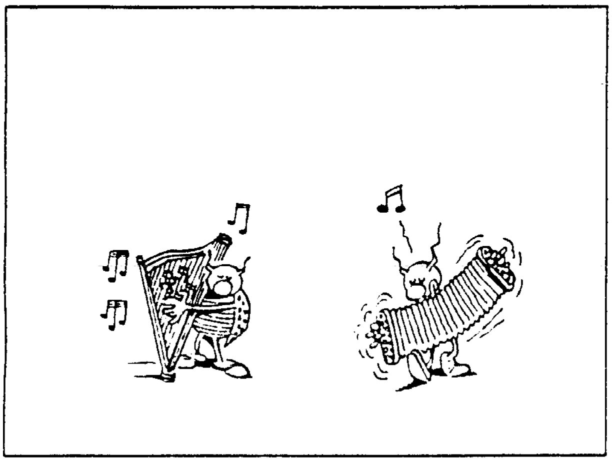

Figure 6: *Archiving and playing musical sequences.*

At last it is possible, on 80386-based machines, to run a computer program in a separate window from the document while displaying its code, as can be done on workstations or on Macintosh (this is impossible with Windows if the program output is graphical, as it is often the case in numerical simulations, studies about fractals etc. . .).

5.6 Electronic mail

Electronic mail is indispensable now for research. Messages related to a scientific document are part of it since they help creating it (even if they are not included into the final text in their raw form) and they must be managed by the Scientific Document Processor, as any other piece of text.

AsTeX's e-mail manager has been built by studying e-mail sent by a few selected discussion lists. Discussion lists can provide invaluable help. However, the back side of the medal is that you can be drowned into a flow of information and have no other possibility than reading your mail for the whole day and doing nothing else, or unsubscribe to interesting discussion lists and never see valuable information.

Moreover, if you decide to read mail and save it, you are very rapidly faced to the problem: "What is contained in such and such files" and the reverse one: "In which file did I store such and such information". Building a traditional database is too time-consuming, so you may once again have to choose between saving your mail (or at least the largest part of it) and being lost among thousands of files, and not saving it, so that useful informations may be irremediably lost.

AsTEX helps solving these problems in a very natural way by allowing to organize messages into a *hypertext database* inside the document. They are stored hierarchically, and organized as in a book. Information is retrieved either by navigating in the "book" by means of a hierarchy of titles or by using the "Search a String" function of Framework, over a subtree of messages (a "chapter" of the "book"). Any new message is archived at the most suitable place in the tree of messages, with a few keystrokes.

The advantage of this hypertext database is that you can add a new item in a blink of an eye, while it would be very time-consuming with a traditional database. Moreover, the hypertext database contains your expertise (you put the message at the correct place) and it can be queried efficiently by anybody. A traditional database requires no expertise to build (your secretary can do it), but the expertise has to be introduced at the questioning time (you must know what to ask, to get a pertinent information), so that it is useful mainly for experts.

AsTEX also provides a few functions to increase archiving speed: automatic *extraction of individual messages* from a file originating from a discussion list, and automatic *cleaning* of individual messages (only selected informations of the header are kept in the archived message).

A new function is under study, to help *regrouping related questions and answers* automatically, to optimize information extracted from discussion lists while minimizing the work (and time!) to do it. This could help solving the above-mentioned dilemma of receiving as much information as possible without being drowned into it.

5.7 Ftp and archie servers

Anonymous ftp provides an invaluable help to get various software and informations. However, using it must not overload the machines that provide this facility ("ftp is a privilege, not a right"). Moreover, international networks are very often overloaded and communications are very slow or impossible to get at rush hours.

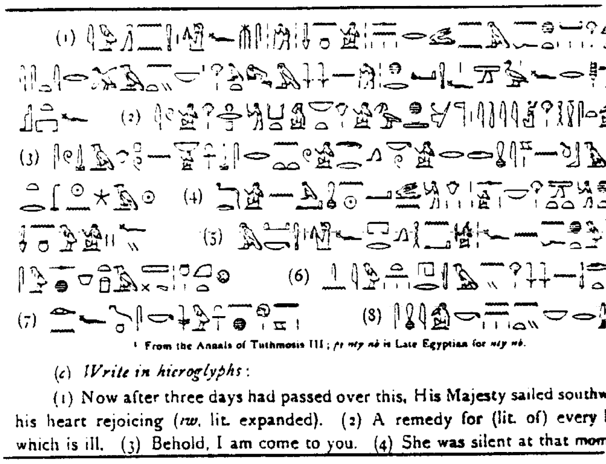

Figure 7: *A typical screen when creating large scientific documents with Windows 3 based programs. (Hummmm. . . did I mix some figures???)*

ASTEX relieves these servers by allowing to store customized information locally. Fast connections can be planned at slack hours and unsuccessful connections can be avoided. An *image* of the subtree of interesting directories of the ftp server is stored in a subtree of windows on the local machine. This local subtree can be consulted at any time, and enriched at each connection. These informations can be used, whenever needed, without having to reconnect to servers. For example, when a type of software is needed (e.g. graphics, network. . .), a list of possible programs can be obtained with the local "Search a String" function, and a list of servers where they are available.

The burden on archie servers can also be relieved by storing general informations locally (users' guide, list of servers. . .) and by storing selected parts of their answers into a customized hierarchy.

5.8 Comparison with Windows-based solutions

The multiwindowing system used by ASTEX (Framework + Desqview or OS/2) is *much more powerful* than that of Windows 3.1: a Windows 3 session occupies the whole screen and graphical DOS applications can be run only in full screen.

Dynamic Data Exchange and Object Linking and Embedding (DDE and OLE) can be done very easily with ASTEX and are not limited to only one level. For example, the bookkeeping of a whole laboratory can be done straightforwardly by importing linked files created at any lower levels (director, team managers, researchers, students). It would be limited to the team managers level with Windows 3.1.

5.9 Ease of learning

At last, ASTEX is *easy to learn*:

Icons are not used (although a complete set could be implemented very easily, for pictogram fans) because too many would be needed, which would requiretoo big memory efforts (see Fig. 7). Icons simplify simple tasks but complicates complicated ones, and writing a multi-author scientific book or even performing everyday research work are very complicated tasks[9].

Once you have learned a module of Framework, it is very easy to learn its other modules and those of ASTEX, since most commands are common. With heterogeneous solutions, simple functions (e.g. "Search a string") are accessed differently in each module. This results in an extra learning that is as enormous as useless (see Fig. 8).

5.10 Why use Framework, not GNU emacs?

Although GNU `emacs` is extremely powerful and very popular, it has nevertheless some shortcomings that made us choose the commercial program Framework as the basis for our prototype ASTEX:

- It is not available on *all* PCs in its complete version (i.e. with its programming language).
- It cannot deal, in its present stage, with the data structure provided by Framework and that is central to ASTEX, i.e. a tree of objects of various nature, in particular *worksheets* and *databases*.

However, future versions of ASTEX might be developed with `emacs` if it turns out that the required data types can be implemented by programming without too many problems and if PD spreadsheets and database managers, programmable with the same language

[9]Hieroglyphs are very well adapted to describe simple concepts such as cow, leg, house: even analphabets can understand them. But they are inadapted to describe complex abstract concepts. This is why alphabets were created out of small subsets of hieroglyphs (the letter "A" for example originates from a pictogram that describes a cow, and "B" from a pictogram describing a leg or a house).

as emacs, can be coupled to it.

Figure 8: *A researcher having learned Windows 3 +Word +Mathdesign +Lotus123 +Rbase +Imageworks +...+... to create a scientific book.*

Conclusion

In this article, we sketched the type of programs that researchers will use, in the future, to write their documents. Then, we described version 2 of an experimental program of this type, ASTEX, that we have designed. It is intended for creating easily multi-author scientific documents on PCs. It has many advantages as compared to existing commercial Scientific Word-Processors:

- It is based on TEX and LATEX, so that it shares all the advantages resulting from their use, without having any of the inconveniences since assistance in typing is provided at various levels, and a previewer very simple to use is available;
- It is thoroughly adapted to the whole creation process of scientific documents. This allows to save time at many stages of the process and results at the end in a *considerable gain in time*. In particular:
  - TEX and LATEX are interfaced with the other software used to create the document (Fortran compiler, computer algebra program, spreadsheet, database manager...), so that most laborious and error-prone cut and paste operations are eliminated;
  - Files and informations related to the document are managed efficiently in hypertext mode, so that time-consuming archiving and retrieving procedures are avoided.
- It can run on *any PC*, even the oldest 8088-based models, contrary to Windows 3-based SWPs (such as Word + Mathdesign). Therefore, Scientific Document-Processing with the highest quality of output provided by TEX, is accessible to everybody, not only to the happy owners of the latest PC models. This can be especially interesting for researchers of East-european and Developing countries, for students and for teachers of scientific disciplines in high schools;
- It preserves investment in DOS hardware and software: you have not to upgrade to a more powerful machine, or to buy a larger disk or the latest versions of all your programs, to have them work with Windows 3.1;
- It requires only a few megabytes, with its companion programs, and they can be installed on almost all notebooks, for those who need a transportable PC because they travel a lot, work outdoors or very often at home;
- It allows to use Unix software from a PC without going into the complications of the Unix system and its various idioms.

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