Weir, G. R. S. and Ni, X. Q. (1993) Second language user support. In: Human Computer Interaction.

http://eprints.cdlr.strath.ac.uk/2282/

Second Language User Support

George R. S. Weir
Ni, Xiao Qing

Department of Computer Science
University of Strathclyde
Richmond Street
Glasgow G1 1XH
UK

Abstract

Computer users rarely experience entirely trouble-free interaction. The natural variety of individuals ensures that no software systems yield constantly fluent interaction for all users. In consequence, software designers often strive to ameliorate this situation by building 'user support' into their systems. User support can take different forms but, conventionally, each aims to assist the needy end-user by means of facilities directly supporting the performance of certain operations, or through supply of information that advises the user on available system functionality.

The present paper briefly characterises a range of user support facilities before describing one requirement in greater detail. This aspect considers the needs of users whose mother-tongue is not English, but who are obliged to use English-based information systems. In this context, 'helping the user' must reasonably extend beyond mere advice on system operation to selective elucidation of information content. We regard this move as a logical extension of the user support concept, by seeking to address specific interaction needs in a target user population. An example of this approach is described through an information system, in the domain of civil engineering, for native Chinese speakers of English.

1. Introduction

Designers of interactive software systems face the challenge of usability. This ideal requires the creation of designs that allow a broad target user population to make ready use of full system potential. Of course, there are numerous alternative responses to this challenge. At one extreme, the designer may aim to produce software of such intuitive immediacy that every possible user encounters no difficulties in system use (the 'naive designer' approach). To date, no system designer has attained this objective.[1] At the other extreme of design response, there is no presumption of infallibility but a simple disregard for the inevitable variety of skills and information needs present in the target user population. This attitude (the 'insensitive designer') may be expressed tendentiously in the slogan 'there are no bad designs, only ignorant users'.

[1] We hold this truth to be self evident!.

Thankfully, these extremes of attitude are rare. The more usual standpoint (a middle position) acknowledges that perceived usability will be affected by the diversity of individual users and accepts that one cannot hope to anticipate all possible user-interaction scenarios any more than one can completely share the thoughts of another (cf. Carroll & Rosson, 1987). With this acknowledgement it becomes reasonable to include facilities within the system software that seek to address the needs of users who experience difficulties during interaction. Such facilities constitute 'user support' and may take several forms, as described below.

2. Varieties of user support

User support is made available to interactive system users in a variety of forms. Most commonly, the support addresses 'information needs', by giving users access to on-line documentation which describes available system facilities and their operation. Additionally, tools may be provided to reduce the burden of user interaction, e.g., by easing the execution of repetitive tasks. Each of these varieties of user support is described below.

2.1 On-line help

On-line help has come to be regarded as an essential feature of interactive systems. Sommerville characterises two types of help system:

> When users are presented with an error message they do not understand, they turn to the help system for information on what they should have done. This is an example of *Help!* meaning 'help. I'm in trouble'. Another form of help request is *help?* which means 'help, I want information'. (Sommerville, 1992, p.280; Author's italix)

The first of these is a variety of 'remedial' assistance, provided to aid the user in recovery from procedural errors. Ideally, such help is sensitive to the context of user interaction[2] and anticipates specific information needs when they arise for the user. The second form of on-line help anticipated by Sommerville, is a general purpose query facility that provides information on system facilities at user request.[3] Such on-line help addresses a need for 'tutorial' assistance.

Each of these help facilities covers aspects of system operation and seeks to inform the user both about the interactive system's capabilities and the interactional steps required in using such facilities. Given their similarity in scope the essential difference between these two modes of help may not be immediately apparent. Put simply, the former (remedial help) is directed toward satisfying the information needs of a user currently engaged in accomplishing specific tasks within the scope of the interactive system. The latter (tutorial help) normally addresses the user's need to learn more about the possibilities of system use. Hence, tutorial help is apt to be more wide-ranging in its coverage and often explicitly seeks to assist novice users.

In Sommerville's terms, these varieties of user support are aspects of 'user guidance', which also embraces the documentation provided with the system and the messages produced by the system in response to user actions (op. cit., p. 277). Note, however, that user support extends beyond the

[2] This, in turn, necessitates system monitoring of user actions and an appropriate level of representation ('conceptual granularity') with which to express the help information. Plan recognition is occasionally employed to underpin such interpretative assistance (cf. Weir & Davenport 1986; Weir & Hollnagel, 1990).

[3] An interesting alternative strategy is described by Owen (1986), whereby the on-line help system spontaneously delivers insights on system operation which are neither context-sensitive nor user initiated.

bounds of such guidance. In particular, systems often incorporate features intended to support user interaction directly. Such facilities constitute a variety of tool for interaction-support.

2.2 Interaction-support tools[4]

Beyond on-line help, a number of support facilities have been devised to assist users in their computer-based interaction. Such tools are contrived to simplify the execution of repetitive tasks or to retract the execution of aspects of user interaction. The first of these is exemplified by history lists which allow easy recall and repeat of earlier items of interaction (cf. Lee, 1992). History facilities, supporting 'redo' of user actions, are often present in command-line operating systems but may be limited in their application to so-called 'recurrent systems', *viz*.: "open-ended system[s] in which users predominantly repeat activities they have invoked previously" (Greenberg, 1993, p.65). Such systems usually contain a high degree of 'incremental' activity, e.g.,

> Entering command lines, querying databases, and locating and selecting items in a menu hierarchy are some examples. Copy typing is not: it is continuous rather than incremental... (loc. cit.)

Variations on earlier actions may be supported through a combination of history recall with command-line editing (as in various Unix shells). This allows users to re-invoke earlier actions with selected modifications.

User fallibility is recognised explicitly in the provision of undo facilities, where "an 'undo' capability is an interactive recovery facility provided by interfaces to enable users to reverse the effects of previously issued commands" (Yang, 1992, p.23). Undo-able systems tolerate errors by allowing users to 'withdraw' the effects of their actions, often in an incremental fashion, with progressive recovery of earlier system states (cf. Yang, 1988). Although desirable, undo is not an unequivocal success:

> Despite the general agreement of the importance of undo, few systems supply more than the simplest single-step undo command and, even then, the effect of the command and when it can be applied is often far from obvious. (Abowd & Dix, 1992, p.318)

As techniques for lending user support both of the varieties of on-line help and each of the interaction-support tools described above addresses aspects of system functionality. Their role in support is centred on 'what' the user can do with the system, or 'how' such possibilities can be achieved. To this end, on-line help conventionally yields information on the subject of system control while interaction-support tools facilitate the easy redo or undo of user interaction. In what follows, we describe a significant area of user-support that does not merely address aspects of system functionality. This is an approach to the provision of 'bilingual support' for information systems whose primary delivery language differs from the local mother-tongue.

[4] These facilities are briefly described here for the sake of completeness. For full discussion on the strengths and weaknesses of interaction support tools we refer the reader to the authors cited in this section.

3. Bilingual Support

The need for support in a second language is evident wherever the mother-tongue of the user population differs from the delivery language of the computerised information system. In such cases, the locally available strategies may be very limited, e.g.,

(1) re-implement the system to provide solely mother-tongue delivery;

(2) employ users with adequate competence in the 'standard' delivery language;

(3) use a different (home-grown) system.

The first of these options may actually be the least feasible. Complete translation (or re-implementation) of such systems, to eliminate the foreign language presence, may be inappropriate on several grounds. In the first place, such a re-write may be out of the question where proprietary software systems are in use. Without recourse to the original software house, re-implementation may be too costly of time and effort. This may also be in breach of software copyright.

Employing linguistically competent users is perhaps the more frequent approach to the problem. Clearly, this places a premium on the skills required of computer system operators, and will inevitably add to the overall labour costs.

In some cases, home-grown software, using mother-tongue delivery, may be a viable alternative. However, for many languages the level of software development available locally cannot create systems to compare in sophistication with 'international' brand leaders. In consequence, though the language problem may be partially resolved, the local regime remains at a disadvantage. The problem may be addressed by means of a fourth alternative:

(4) supplement existing systems with mother-tongue support.

With this approach, mother-tongue information is additional to the primary source of information. This affords a number of potential benefits. In the first place, the software technology required to implement such on-line secondary support does not require re-implementation of the original information system. Since the mother-tongue resource serves to 'comment upon' the primary system, it will suffice to provide an accompanying information facility containing appropriate correspondence to the primary system.

This adjacent mother-tongue system resembles an on-line help facility since it serves to comment upon, or to explain aspects of the primary (foreign language) information source. Additionally, this technique can address the more conventional help requirement of yielding information on how to operate the primary system. What is more, this 'how to use it' information can be made available in the local language, either as a replacement or as a supplement to any in-built on-line help available with the original application software.

3.1 Simple character handling

The facility to handle non-Roman scripts is essential when developing second language support for Chinese, Japanese, Arabic, Urdu, Greek, etc. A number of sophisticated techniques exist for integrating foreign language fonts with English (cf. Lau, 1988). Principally, these entail significant software additions or alterations to the 'standard' operating system. Thus, e.g., Archer, et. al (1988) describe their conversion of an English-based ASCII microcomputer

> by inserting a software interface between the operating system and the input/output control system so that Chinese characters are detected and managed in a special way. With the appropriate system software, the modified system can support programs for input, display, print and communication of both types of characters... (p.977)

A similar strategy is described by Tayli & Al-Salamah (1990) in the design of a bilingual system for Arabic and English.

The major source of complexity in handling foreign fonts is the requirement to 'process' characters from either language group. In our approach to second language support we are able to avoid the need to represent the Chinese characters within the operating system. Our second language facility is display-only and no scope is provided for end-users to enter Chinese text whilst operating the information system.

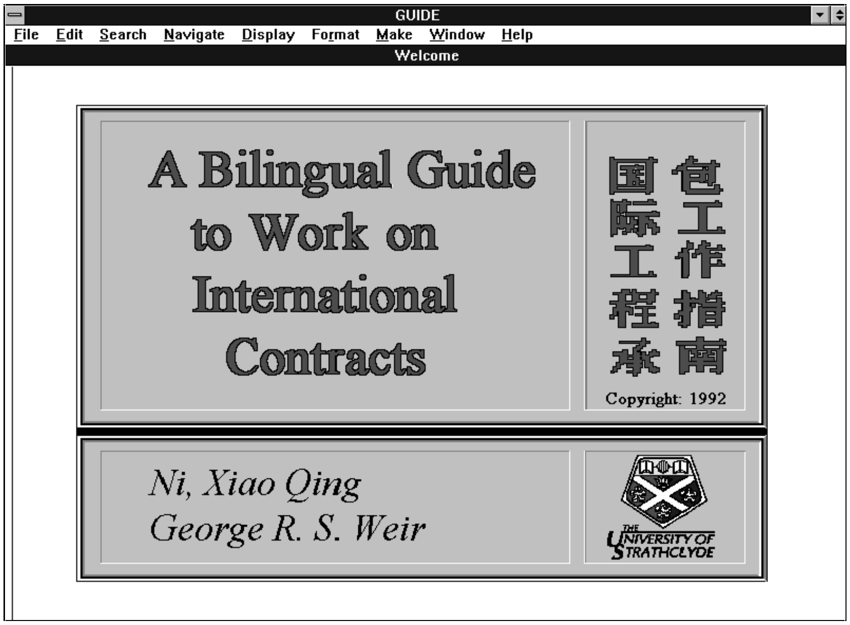
There are only two requirements for including second language characters. First of these is a convenient (standard DOS-based) word-processing facility for the foreign (non-English) language. Secondly, the text produced must be 'captured' in a form that can be imported into the help system. In our approach, a DOS-based word processor is used to produce Chinese text which is output as a PCX format file and thereafter imported directly into a GUIDE document. This approach has the major benefit of imposing no significant additional technological requirements; a major consideration when viewed from the perspective of developing countries.

4. GWIC: a bilingual system

By way of illustration for the concept of bilingual support (outlined above), we shall describe a system called 'Guide to Work on International Contract' (GWIC). GWIC is a conventional hypertext information system of significant scale[5], implemented on a PC using the proprietary software 'GUIDE' (from OWL International). As originally conceived (Ni, 1992), GWIC provided information on aspects of international contracting in civil engineering from a principally Chinese perspective. Despite the Chinese orientation of the contained information, GWIC was originally implemented solely in English. Subsequently, this first version of the information system provided a vehicle through which to explore the possibilities of second language support. The current version embodies a supplement that supports native Chinese speakers who are bilingual with respect to English but whose facility with English is less than perfect (figure 1).

Since the content of such an information system is often technical or legalistic there is a strong likelihood that English forms of delivery may be poorly understood by a Chinese audience. In addition, much of the information is necessarily presented in English, since there are instances of rules and regulations whose application is legally expressed in the English form. These are further reasons why the use of Chinese language support is a desirable adjunct to the main system.

[5] Presently, GWIC comprises twelve megabytes in nearly two hundred files.


GUIDE
File Edit Search Navigate Display Format Make Window Help
Welcome

A Bilingual Guide to Work on International Contracts

国际工程承包工作指南

Copyright: 1992

Ni, Xiao Qing
George R. S. Weir

THE UNIVERSITY OF STRATHCLYDE

Figure 1 : Title Screen for the Bilingual Version of GWIC

4.1 A brief outline of GWIC

Seven aspects of information are covered in GWIC:

(i) Information describing the history, trends and development of international tendering and contracting;

(ii) Information illustrating the organisations in charge of international tendering and contracting;

(iii) Information depicting rules and regulations that should be observed when an international project is called for tender and under construction;

(iv) Information stating the forms of international tendering and contracting;

(v) Information detailing the steps of the tendering procedure;

(vi) Information on the main international contractors who are active and competitive in respect of experience, capability, and productivity, and regarded as the major competitors in the international construction markets;

(vii) Information depicting the main international projects completed by or under construction by the China Harbour Engineering Company (CHEC).

Characteristically for hypertext systems, the information forms a network that is initially presented to the user as a structured hierarchy. The aforementioned seven categories of information constitute the 'top level' and from any one of these categories the user can gradually move to deeper levels of detail, through an initial contents screen which is available both in English and Chinese (figure 2).

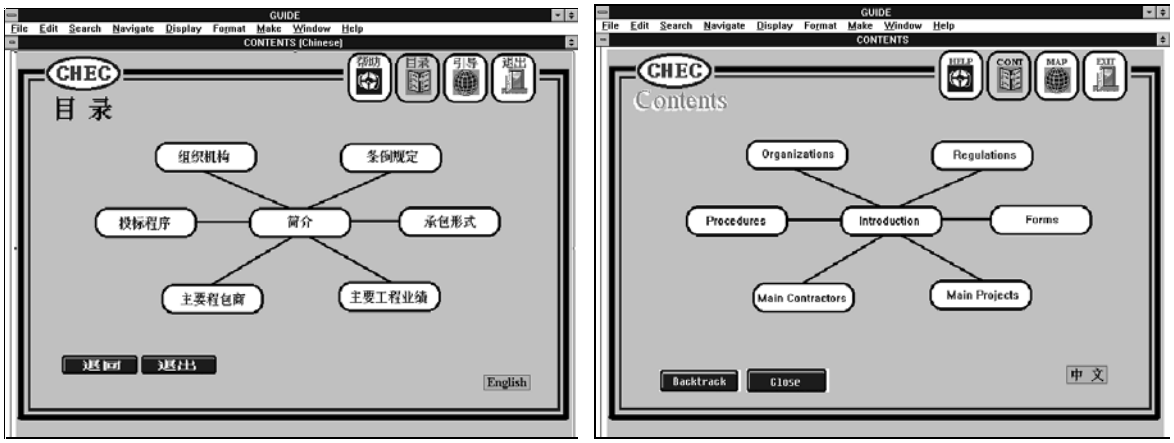


Figure 2 : Chinese and English Contents Screens

GWIC includes backtrack facilities and a number of orientation devices such as the system map (figure 3) which indicates the users current position within the overall system structure.

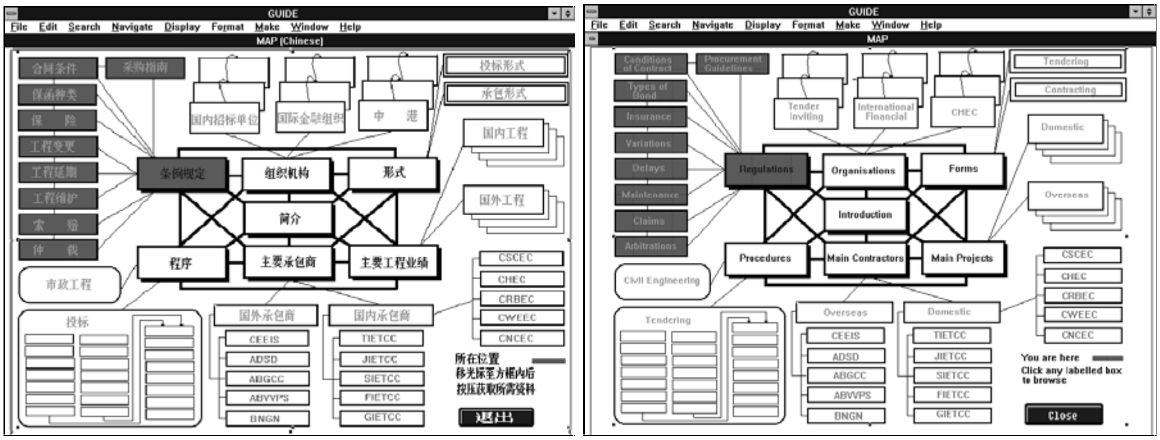
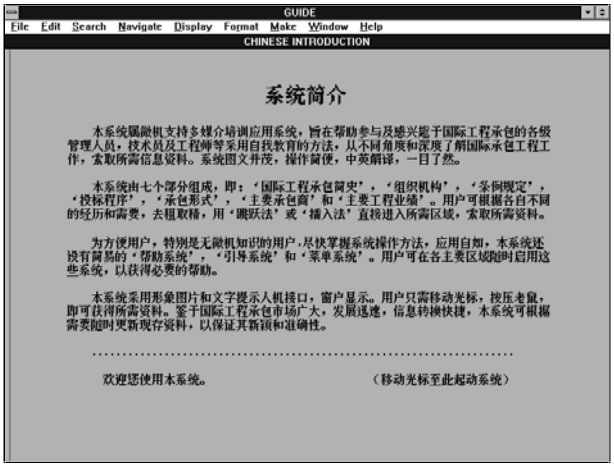


Figure 3 : System Maps (in Chinese and English)

Rather than extol the virtues of GWIC as a graphical hypertext information system, we wish to focus upon its use of second language support. GWIC provides a prime example of an attempt to accommodate the special needs of non-native speakers of English.

4.2 Second language support

From the screens already illustrated, it will be evident that one simple approach to the support of native Chinese speakers is to duplicate information displays and allow users to avail themselves either of the Chinese or the English versions at will. In GWIC, this only occurs with screens that reflect the formal structure of the system. These screens contain the least quantity of information and primarily serve as navigational aids. On principle, we have made all such screens available in both languages, with easy switching from one language to the other under user control.[6]



系统簡介

本系统属微机支持多媒介培训应用系统，旨在帮助参与及感兴趣于国际工程承包的各级管理人员，技术员及工程师等采用自我教育的方法，从不同角度和深度了解国际承包工程工作，索取所需信息资料。系统图文并茂，操作簡便，中英解译，一目了然。

本系统由七个部分组成，即：‘国际工程承包簡史’，‘组织机构’，‘条例规定’，‘投标程序’，‘承包形式’，‘主要承包商’和‘主要工程业绩’。用户可根据各自不同的经历和需要，去粗取精，用‘跳跃法’或‘插入法’直接进入所需区域，索取所需资料。

为方便用户，特别是无微机知识的用户，尽快掌握系统操作方法，应用自如，本系统还设有簡易的‘帮助系统’，‘引导系统’和‘菜单系统’。用户可在各主要区域随时启用这些系统，以获得必要的帮助。

本系统采用形象图片和文字提示人机接口，窗户显示。用户只需移动光标，按压老鼠，即可获得所需资料。鉴于国际工程承包市场广大，发展迅速，信息转换快捷，本系统可根据需要随时更新现存资料，以保证其新颖和准确性。

欢迎您使用本系统。　（移动光标至此起动系统）

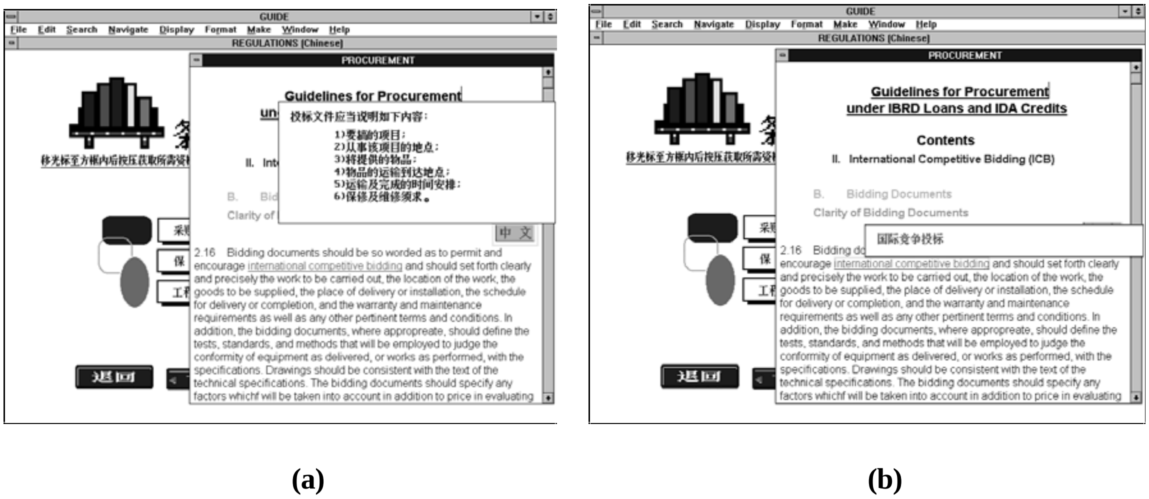
Figure 4 : Chinese Introduction

For practical reasons, complete second language duplication of any such large information system is untenable. Rather, we have attempted to accommodate the second language (Chinese) at those points where it appears most reasonable to anticipate such needs. This extends to the provision of a 'Chinese-only' introduction screen, explaining the principles of system interaction (figure 4).

A third significant use of the second language serves to annotate aspects of the English information. Such notes take two forms. In the first form, the Chinese annotation briefly summarises the main points contained in the otherwise entirely English screen (figure 5a). The second form of Chinese note attaches to specific terms or significant points in the English screen and provides a translation or elucidation that seeks to clarify and ensure comprehension of these aspects by the Chinese user (figure 5b).

Main point summaries are denoted by a special button with the legend 'Chinese' (written in Chinese). The presence of individual Chinese notes is signified by underlined English text in red. In the examples below, figure 5a shows a pop-up note with summary in Chinese of the main points concerning 'the clarity of bidding documents'. Figure 5b shows a single Chinese note providing a translation of the English expression 'international competitive bidding'.[7]

[6] We employ a simple button device (bottom right of screen) with the legend 'Chinese' (written in Chinese) on English screens and the legend 'English' (written in English) on Chinese screens (see figure 2).
[7] We are grateful to Wen, Cui for assistance with some of the Chinese annotations in GWIC.



GUIDE
File Edit Search Navigate Display Format Make Window Help
REGULATIONS (Chinese)
PROCUREMENT
移光标至方框内后按压获取所需资
退回
中 文

Guidelines for Procurement

投标文件应当说明如下内容:

1)要编的项目;
2)从事该项目的地点;
3)将提供的物品;
4)物品的运输到达地点;
5)运输及完成的时间安排;
6)保修及维修须求。

Guidelines for Procurement
under IBRD Loans and IDA Credits

Contents

II. International Competitive Bidding (ICB)

B. Bidding Documents

Clarity of Bidding Documents

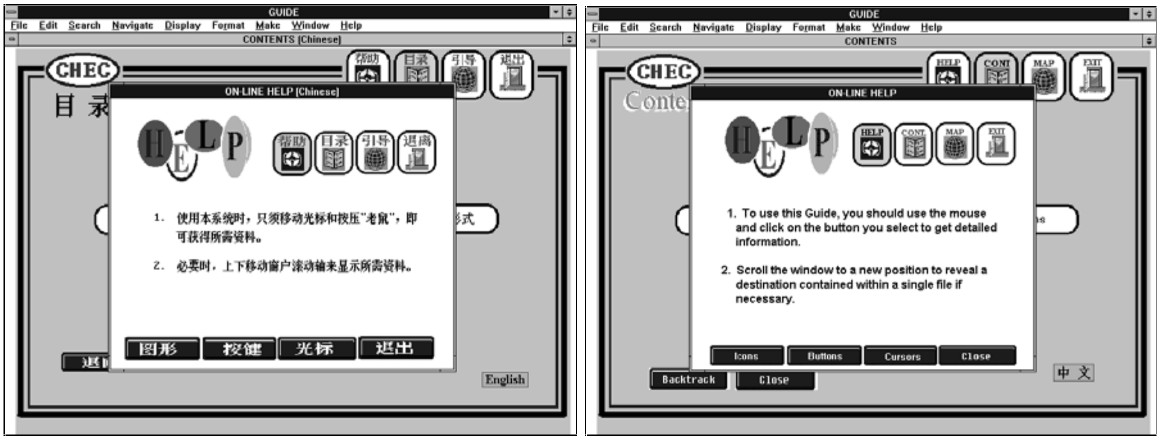
国际竞争投标

2.16 Bidding documents should be so worded as to permit and encourage international competitive bidding and should set forth clearly and precisely the work to be carried out, the location of the work, the goods to be supplied, the place of delivery or installation, the schedule for delivery or completion, and the warranty and maintenance requirements as well as any other pertinent terms and conditions. In addition, the bidding documents, where appropreate, should define the tests, standards, and methods that will be employed to judge the conformity of equipment as delivered, or works as performed, with the specifications. Drawings should be consistent with the text of the technical specifications. The bidding documents should specify any factors whichf will be taken into account in addition to price in evaluating

(a) (b)

Figure 5 : Chinese 'Pop-Up' Note Buttons

Finally, second language support extends to the provision of conventional on-line help. GWIC includes a set of pop-up windows that serve to explain the range of cursors, icons, and buttons available to the user in system interaction. This information, which is essential for smooth user-system operation, is provided both in English and in Chinese (figure 6).



1. 使用本系统时，只须移动光标和按压"老鼠"，即可获得所需资料。
2. 必要时，上下移动窗户滚动轴来显示所需资料。

1. To use this Guide, you should use the mouse and click on the button you select to get detailed information.
2. Scroll the window to a new position to reveal a destination contained within a single file if necessary.

Figure 6 : Chinese and English Help Screens

We consider this range of second language usage adequate to accommodate the language support needs for a user population whose first language is other than English.

Clearly, GWIC is unusual as a system with second language support. While this example integrates the main information system and the second language support within a single application framework, it is now feasible to develop hypertext applications as 'adjacent' systems, especially in the context of windowing environments such as MS-Windows.

5. Further developments

The design of GWIC is such that integration of any alternative second language modules can be achieved by simple file replacement. The set of files that constitutes the Chinese language support may be replaced by an alternative set for some other language (e.g., Arabic). A few minor modifications would be required in the main GWIC documents simply to reflect the character of the new language.

A recent new release of GUIDE application software now allows easy interfacing to MS-Windows multimedia facilities. With this in view, our next step is to embody spoken Chinese (audio support) within GWIC, both as annotation and also as a source of guidance on navigation and system interaction.

6. Bibliography

Adowd, G.D. & Dix, A.J., 'Giving undo attention', *Interacting with Computers*, 4 (3), 317-342, 1992.

Archer, N.P., Chan, M.W.L., Huang, S.J. & Liu, R.T., 'A Chinese-English microcomputer system', in *Communications of the ACM*, 31 (8), 977-982, 1988.

Carroll, J.M. & Rosson, M.B., 'Paradox of the active user', in J. M. Carroll (Ed.), *Interfacing Thought: Cognitive Aspects of Human-Computer Interaction*, Bradford Books/MIT Press, 1987.

Greenberg, S., *The Computer User as Toolsmith*, Cambridge University Press, Cambridge, 1993.

Lau, K.T., 'Adapting existing computer systems to oriental language software', Report no. TRA8/88, Department of Information Systems and Computer Science, National University of Singapore, 1988.

Lee, A., 'Investigations into history tools for user support', Technical Report CSRI-271, Computer Systems Research Institute, University of Toronto, 1992.

Ni, X.Q., 'Guide to work on international contract (GWIC)', MSc Thesis, Department of Computer Science, University of Strathclyde, Glasgow, 1992.

Owen, D., 'Answers first, then questions', in D. A. Norman & S. W. Draper (Eds.), *User Centred System Design*, LEA, Hillsdale, New Jersey, 1986.

Sommerville, I., *Software Engineering*, (4th Edition), Addison Wesley, Wokingham, England, 1992.

Tayli, M. & Al-Salamah, A.I., 'Building bilingual microcomputer systems', in *Communications of the ACM*, 33 (5), 495-504, 1990.

Weir, G. & Davenport, C., 'PRIAM: a plan-based interface design', in *Proceedings of the Second Symposium on Human Interface*, Society of Instrument and Control Engineers, Tokyo, Japan, 1986.

Weir, G.R.S. & Hollnagel, E., 'Principles of procedural support in man-machine systems', in *Proceedings of the Ninth European Annual Conference on Human Decision Making and Manual Control*, Commission of the European Community, Varese, Italy, 1990.

Yang, Y., 'Undo support models', *International Journal of Man Machine Studies*, 28 (5), 457-481, 1988.

Yang, Y., 'Motivation, practice and guidelines for 'undoing'', *Interacting with Computers*, 4 (1), 23-40, 1992.