5th International Online Information Meeting

London 8-10 December 1981

5th International

Online Information

Meeting
London 8–10 December 1981

Organised by
Online Review
THE INTERNATIONAL
JOURNAL OF ONLINE
INFORMATION SYSTEMS

Learned Information Oxford and New Jersey

Organising Committee

P.L. Holmes (Chairman)	Blackwells
R. Barrett	Hatfield Polytechnic
R.R. Bilboul	Learned Information
D. Clarke	Hatfield Polytechnic
C.R. Clough	ICI Agricultural Division
H.R. Collier	Learned Information
J.L. Hall	UKAEA Culham Laboratory
V. Horsnell	Library Association
P. Leggate	Cairns Library
D.A. Lewis	ASLIB
J. Sergeant	Derwent–SDC
R.E. Wiggins	BP International
R. Woolfe	Butler Cox & Partners
A.G. McClellan (Secretary)	Learned Information
P.N. Asser	STM, The Netherlands
B. Aveney	Blackwell North America, USA
H. Bechtel	Metallgesellschaft, FRG
J. Borrell	Library of Congress, USA
L. Clifford	Irish Export Board, Ireland
H.J. Ehlers	Ernst Klett Stuttgart, FRG
A.W. Elias	Biosciences Information Service, USA
G. Lubbock	Slamark, Italy
T. Matsumura	Bureau of Science and International Affairs, Japan
M. Moureau	Institut Français de Pétrole, France
T. Myllys	Technical Research Centre of Finland
D.S. Nag	Danmarks Tekniske Bibliotek, Denmark
P. Popper	IIASA, Austria
D.I. Raitt	The Netherlands
M. Ronai	Infotecture, France
B. Stukenbröker	Diebold Deutschland, FRG
M.E. Williams	University of Illinois, USA

ISBN 0 904933 33 4

Published by

Learned Information
Besselsleigh Road
Abingdon
Oxford OX13 6LG
England

Learned Information, Inc.
The Anderson House
Stokes Road
Medford
NJ, 08055, USA

Printed in England by Cotswold Press Ltd., Oxford, England

Contents

INTELLIGENCE IN THE USER'S TERMINAL: A LOOK AT CURRENT OPTIONS AND POSSIBILITIES

Lucy Tedd, Consultant, UK

Keywords: Intelligent terminals, Microcomputer systems, Online Searching, Word processors.
Abstract: Many organisations are now replacing, or supplementing, their original terminals used for accessing external online search services with terminals which offer some form of intelligence. This paper describes the basic components of a terminal with 'intelligence' and indicates how such terminals, be they word processors, microcomputer systems or specially packaged intelligent terminals can and are being used to assist online searching of remote databases and, in some cases, to process local databases.

1 INTRODUCTION

Many of those who have been using external online search services, such as Blaise, Dialog, ESA-IRS, SDC etc, for a number of years are currently contemplating upgrading their terminal for one with some 'intelligence'. Hohenstein defines a 'smart' or 'intelligent' terminal to be a terminal which includes "a microprocessor and some memory and is capable of being programmed". (Ref 1). Such a definition encompasses word processors, microcomputer systems, general intelligent terminals and specially packaged intelligent terminals. In this paper I hope to digest some of the information gleaned from the wilderness of details regarding such hardware in order to give you an idea of what is meant by the terminology and how these systems can, and are, being used to enhance the search process. The papers given at a conference on minis, micros and terminals for libraries and information units provide a useful source of more detailed information for anyone contemplating acquiring such hardware. (Ref 2).

2 COMPONENTS OF A TERMINAL WITH INTELLIGENCE

The basic functions of any terminal are those of data entry, data display and data communication. In this section the components which may be, although probably not all will be, present in a terminal with intelligence is described.

2.1 Character Set

Any information to be processed by computer needs to be coded into a series of bits (binary digits). Nearly all terminals use the ASCII (American Standard Code for Information Interchange) code which is 7 bits long and so can be used to represent 2^7 or 128 values. This full ASCII character set includes codes for A-Z, a-z, 0-9, symbols (e.g.<,[,&,!,*,?, etc) and special control characters. Not all terminals support the full

ASCII character set; some support 64 or 96 ASCII characters only.

2.2 Data Entry Devices

The usual method for entering search commands etc with an intelligent terminal is via a keyboard. The appropriate ASCII code is generated when a key is pressed. The layout of keys is usually similar to that of a typewriter (i.e. QWERTY) and the full 128 values are generated using special sequences of SHIFT and CONTROL keys. Some intelligent terminals allow for the function of particular keys to be defined by the purchaser. Sometimes the keyboard also has a numeric pad and also keys to control the movement of the cursor on a video display unit (VDU). The keyboard and VDU may be an integral unit or, in some cases, the keyboard is a detached unit.

Some terminals have a 'touch-sensitive' VDU where a command is entered by the searcher touching the screen; the searcher's finger breaks intersecting beams from infrared light-emitting diodes mounted in the VDU case.

Speech input devices are coming on to the market, but, to my knowledge, have not yet been used for online searching.

2.3 Microprocessor

A microprocessor is a central processor unit manufactured using very large scale integration (VLSI) technology on a single 'chip' of semi-conductor material, usually silicon. Its very small physical size is the main reason for the term micro. The most used microprocessors, such as Intel 8080, Zilog Z80, Motorola 6500, deal with a computer word length of 8 bits. Recently microprocessors such as Motorola 68000, Zilog 8000, which deal with a word length of 16 bits have been developed and these are more powerful and faster than their predecessors.

2.4 Internal memory

The internal memory is also manufactured using VLSI technology. It usually consists of two types:

- ROM (Read Only Memory which is used to store permanent information such as systems programs, initial start-up programs for the terminal and so on.)
- RAM (Random Access Memory) which may be used to store data (such as search commands) or programs. The amount of RAM may vary from 1 Kbyte (about 1000 characters) in a small terminal to 64 Kbyte in a large terminal.

2.5 Storage devices

Devices attached to, or sometimes incorporated in, terminals to provide extra storage facilities include:

a. cassette tapes. With some terminals audio cassettes may be used whereas with others more heavy duty computer cassettes may need to be used. The capacity of a cassette varies according to the density of the data, the recording method used and so on; a rough estimate might be 100 Kbyte.

b. floppy discs. A floppy disc consists of a plastic disc (5¼" or 8" diameter) coated with a magnetic material and encased in a cardboard jacket. The capacity varies from about 70 Kbytes on a single-density, single-sided 5¼" disc to about 1 Mbyte (one million characters) on a double-density double-sided 8" disc.

c. hard, or Winchester, discs. These discs are more reliable than floppy discs because the 'heads' which read and write information from and to the disc are incorporated in the physical disc pack and not in a special disc drive. Recently 5¼" and 8" hard discs have been developed and these have

a much higher capacity (5 Mbyte - 20 Mbyte roughly) and faster access times than floppy discs - but they cost more.
d. video discs. An introduction to this technology is provided in Barrett's paper in these proceedings and by Sigel (ref 3).
e. bubble memory. A bubble memory is an electromagnetic circuit that stores digital information by changing the magnetic polarity of a thin crystalline film.

2.6 Video Display Units (VDUs)

The characteristics of a VDU include:

- physical features, which include screen size, display area, total dimensions and weight.
- character set
- character generation. Characters are displayed on the screen using a technique known as raster scanning and characters are generated, from the ASCII code, into a matrix of 7 x 9 dots which constitutes a 9 x 12 character cell.
- character format. Most VDUs display 24 lines each of 80 characters; a 25th line is sometimes present which may be used for special messages.
- scrolling. Normally lines are scrolled up one at a time, but some VDUs may scroll a page (i.e. 24 lines) at a time or a specified block of lines at a time.
- colour. Light characters (white, orange, green or yellow-green) are usually displayed on a dark screen although the opposite (referred to as inverse or reverse video) is often possible. Colour VDUs which use combinations of red, blue and green are now available.
- highlighting. Characters or character strings may be highlighted using special blinking or reduced intensity or double width facilities.
- cursor. The cursor (a square, triangle, underline or similar symbol) is used to identify visually positions of data on the VDU. It is usually controlled from the keyboard and its location may be stored within the terminal.
- video output. Most VDUs can be linked to a television monitor.

VDUs normally display information using a cathode ray tube. An alternative is to use a plasma display which is much less bulky, more costly, and can only display 12 lines of 40 characters and so is not of great use for online searching.

2.7 Printers

Printers are used to prepare a permanent (or hard-copy) record and may be classified as follows:

- printing technique. Impact printers form characters on ordinary paper by actually striking the paper with the print-head whereas non-impact printers form characters by using techniques such as spraying ink from a jet on to the paper, or heating particular portions of a special heat-sensitive paper.
- character formation. Fully formed characters are like those made by a standard electric typewriter whereas dot matrix characters are shaped by a combination of dots.
- speed. Some printers print a character at a time and are known as character printers or serial printers, whereas others print a line at a time and are known as line printers. A detailed description of printers and points to consider when buying one are given by Becker (Ref 4).

2.8 Communications

Aspects which affect how a terminal communicates with a host computer

include:
- speed of transmission. This is generally measured in bits per second (bps) and sometimes in characters per second (cps). The VDU, printer, telecommunications link, host computer, modem will all probably be able to operate at different speeds and it is necessary to ensure that all are set to send, or receive, data at the same speed. Typical speeds are 300 bps and 1200 bps.
- method of transmission. Most online search service computers expect characters to be transmitted asynchronously i.e. characters are enclosed within start and stop bits and can be sent whenever required and not necessarily in a continuous stream. Some online search service computers also use synchronous transmission i.e. the terminal and computer are synchronized using timing signals and information is transmitted to and from the internal memory of the terminal. Another aspect of transmission is whether the host computer expects information in a full duplex (in either direction at the same time) or half duplex (in either direction only one at a time) manner.
- modem. A modem, or acoustic coupler, (if operating at 300 bps) is necessary to change the digital signals generated by the terminal or host computer into the analogue signals which may be transmitted along telephone wires.

When linking together various parts of the terminal (e.g. VDU to printer) it is necessary to ensure compatability; the standard interface adopted by the American Electronic Industry Association is known as RS232C and this is equivalent to the international CCITT standard known as V24.

2.9 Graphics

Many VDUs can display graphic as well as text information. Broadly speaking the ways in which this may be achieved varies from storing special graphic characters, which occupy a character cell, in ROM to varying the intensity of illumination of a block of dots (known as a picture element or pixel). In the ultimate case a pixel consists of a single dot. Borrell's paper in these proceedings gives an overview of graphics technology.

2.10 Software

Some terminals cannot be programmed by the end user; they arrive complete with programs which may be in ROM or which may have to be loaded from a backing storage device, such as a floppy disc. Microcomputer systems however can be programmed and compilers and/or interpreters exist on many micros for a variety of high-level languages such as Basic, Pascal, Fortran, Cobol and so on. One of the most popular operating systems used on microcomputers is CP/M (Control Program for Microcomputers). It is written for microcomputers which are based on an Intel 8080 or Zilog Z80 microprocessor but other microcomputers can be adapted either by hardware (PET) or software (APPLE) to run this operating system. Packaged programs which may be run on microcomputers are available from a variety of software mail order firms such as Lifeboat Associates and Microcomputer Products International; these packages include editors, sorters, data input and validation programs, data management packages and the more complex database management packages. Details of software written specifically for online searching are given later.

2.11 Videotex

Some terminals can be made to look like a viewdata terminal and so can be used to access a national or a private viewdata service. Alternatively some viewdata terminals are being developed with floppy discs, extra RAM and the ability for the user to run programs. Sedman discusses aspects of intelligent access to Prestel (Ref 2).

3. BROAD TYPES OF INTELLIGENT TERMINAL

The boundaries between the types of intelligent terminal described below are somewhat hazy. However, because manufacturers tend, at present, to market them in these different ways I think it is important for us, the users, to be aware of the differences.

3.1 General intelligent terminals

Typically these consist of a keyboard, VDU, a microprocessor, some internal memory, some storage device, sometimes a graphics capability and usually the ability to attach a printer. Usually the user is not able to write programs in a high level language but functions of special keys on the keyboard may be defined by the user using a very low-level language. The main purpose of the 'intelligence' is to assist in the terminal's role as an input/output device by providing improved facilities for inputting and editing data, transmission to and from the computer and displaying or processing data received from the computer. The British Library Research and Development Department (BLR&DD) funded work involving the HP2645A intelligent terminal in 7 UK library schools during 1976-9; the Polytechnic of North London used it for experimenting with the design of forms for catalogue input (Ref 5) and Leeds Polytechnic used it for developing teaching packages (Ref 6). The cost of such terminals is currently in the order of £2-£3000.

3.2 Word Processors

Word processors were originally produced to mechanise the typewriting functions of offices but many manufacturers have extended the capabilities of their products so that they can now be thought of as intelligent terminals. Word processors are typically specially packaged hardware and software systems. The hardware usually consists of a microprocessor, storage devices (eg floppy disc), a special keyboard, a VDU and a high quality printer. The software usually provides fairly sophisticated techniques for the input, editting, formatting, storing, output and sometimes sorting of text. Henry describes a system at Unilever Research Port Sunlight Laboratory in which a word processor (Philips 5002) is used to produce an information bulletin and to transmit the records used for this to Unilever Computer Services Ltd for eventual online searching via DECO software (Ref 2). Whitehead provides a good overview of word processors (Ref 7). The U.K. National Reprographic Centre for documentation at Hatfield Polytechnic, is carrying out research into the potential use of word processors in libraries and information units. Stand-alone word processors cost a few thousand pounds whereas a system with multiple input and output units attached to a central word processor costs tens of thousands of pounds. Several word processing software packages are available for microcomputers; these include Wordstar (which runs under CP/M), Applewrite (for APPLEs), and Wordcraft 80 (for PETs). These packages typically cost a few hundreds of pounds.

3.3 Microcomputer Systems

The difference between a microcomputer system and a microprocessor is that the former includes input/output devices, storage devices, internal

memory, a power supply and so on and is designed to be used on its own as a computer whereas the latter is designed to provide the processing capability in a device dedicated to a particular application (e.g. cash registers, digital weigh scales, washing machine controllers, or microcomputers). Burton has produced a directory of UK libraries and information units using microcomputers and the most used ones were Commodore PET, APPLE and Research Machines Ltd (RML) 380Z (Ref 8). These three were also the microcomputers, costing up to £2,500, chosen, after rigorous testing, by the U.K. Central Computer and Telecommunications Agency (CCTA) for use by government departments. In the middle price range (£2,500 - £6,000) the microcomputers chosen were the Casu Super C, Digital Microsystems DSC-3, and Zilog Inc MCZ Series 1, whereas the top range (£6,000 - £15,000) consisted of BMG Microsystems 5020, Equinox 200 and General Robotics 11/23. If a microcomputer system has the necessary interface to enable it to be used as a terminal to a remote host computer then it provides a very flexible intelligent terminal.

3.4 Special Intelligent Terminals

Various organisations and people (such as commercial companies, search service suppliers, users and research workers) have, or have had, developed special intelligent terminals. These include:

a Aston University

Jamieson and Oddy, at the computer centre at Aston University, have developed a special terminal with funding from BLR&DD. By using the terminal to translate a user's search request into the search language of the host computer system to be used, the researchers are able to experiment with various retrieval techniques on a large scale using a real document collection. The terminal incorporates three Motorola 6800 microprocessors (Ref 9).

b. Blaise-Cortex

Cortex is a software system developed by Blaise to be used with a Zentec ZMS-70 microcomputer. Cortex includes facilities for storing searches, editing retrieved data, data entry, dealing with the British Library's extended character set of 186 characters and printing datafiles. It uses the CP/M operating system. Cortex is still under development and is being used experimentally at some libraries within London University (Ref 10).

c. CAST

The Chemical Automated Search Terminal has been designed to translate chemical searches into suitable formats for use with the Chemical Abstracts database on Dialog and SDC, the Medlars database on NLM and the Chemical Information Service database at the US National Institute for Health. At present it is only available in the US and costs $19,500.

d Lexis terminal

The terminal used to access Mead Data Central's online legal information service, LEXIS, has been specially designed to be used by lawyers and includes keys with functions such as 'next page' and 'next case'.

e OCLC terminal

The OCLC Model 110 terminal has 16 special function keys and uses the American Library Associations extended ASCII character set of 195 characters, which are stored in ROM. OCLC has plans to upgrade this terminal to include Hebrew and Cyrillic character sets and to allow software to be transmitted from OCLC's computer centre to be run on the terminal.

f OL'SAM

The Online Database Search Assistance Machine (OL'SAM), developed by the

Franklin Institute Laboratory in Philadelphia, evolved from Meadow's work at Drexel University (Ref 11). Features provided by OL'SAM include the use of a single search language (which is automatically translated into the appropriate search language on the host computer) and monitoring of strategy patterns to suggest improvements. The full hardware and software OL'SAM package costs around $12,000 whereas the software alone (written in Pascal) costs $995.

g Pergamon - Infoline Videopatsearch terminal

This recently announced terminal stores details, such as drawings and diagrams, of patents on a set of eight videodiscs. The searcher, having used the terminal to retrieve references from Pergamon's Patsearch database in the usual way, can then obtain more details of possibly relevant patents from the videodiscs.

h Searcher's workbench

This has been developed by Williams and Preece at Illinois University (Ref 12). It uses a microcomputer system and provides an interface to several online systems and databases and incorporates various 'transparency aids' developed at Illinois. These include a touch panel CRT, a special language (talk through touch and type) and automatic monitoring of search behaviour.

i Strathclyde University

Petrie, at the Andersonian Library at Strathclyde University, has developed software to enable passwords and search strategies to be stored prior to going online and references from a search to be stored locally. The software, which is to be sold for about £150, runs under the CP/M operating system and is used at Strathclyde with a Cifer 2684 microcomputer.

j Userkit

The Universal Search Enhancement and Retrieval Kit for Interfacing to Terminals (USERKIT) has been developed by Williams and Nevin and is basically a 'black box' which can be linked to a terminal to provide facilities such as improved communications, storage of log on sequences, storage of search statements (Ref 13). This first version of USERKIT, which costs from £1279, is currently used by such organisations as ICI, Shell, Unilever and the Ministry of Defence. The second version is more compact, cheaper and more user-friendly and has only recently been announced. Software to manipulate references retrieved from a search is currently being developed.

4 WAYS IN WHICH INTELLIGENT TERMINALS ARE BEING USED TO ASSIST ONLINE SEARCHING OF REMOTE COMPUTERS

Intelligent terminals are being used in a variety of ways to assist online searching of remote computers. Not all terminals are capable of carrying out all these tasks which include:

a automatic logon. The various passwords, identifiers and addresses necessary to use local or international telecommunications networks and the host computer are stored at the terminal and thus the logon process can be carried out with one, or a few, key strokes.

b storing search statements. The initial search statements may be input and stored offline and then executed on linking to the host computer. This saves time and therefore money, of inputting the search statements whilst online. The searcher can carry on to amend the search strategy if necessary using the keyboard as usual.

c Storing search output. References, or data, retrieved from a search on a host computer may be recorded on to some backing storage for some further processing. A check should be made, in this case, with the host computer system and the database producer, to ensure that no copyright laws are being infringed.
d Reformatting of search output. The stored retrieved references may be reformatted,using a special program,before being given to the original requester. A listing of a BASIC program (unhappily bereft of any REM statements) which runs on a HP2649A at General Foods and is used to eliminate duplicate references retrieved is given by Riley and others (Ref 14).
e Gathering statistics of use of various host computers for accounting purposes.
f Assisting the search process by providing help or tutorial advice when requested by the searcher.
g Assisting the search of an unskilled searcher. The BLR&DD is funding work at the University of Manchester Institute of Science and Technology (UMIST) to develop a suite of programs which, by interrogating the unskilled searcher, will develop a set of search statements, hopefully matching the searcher's profile, to be used to carry out a search on a remote host computer. Obviously not all search topics will be amenable to this process and part of the work will endeavour to analyse which are and which are not.
h Monitoring search statements used and perhaps suggesting alternative approaches when the searcher appears to be 'stuck'.
i Providing graphics input. Chemical Abstracts Service (CAS) Online has recently announced that it can support searching of substructures by the diagram of that substructure being 'drawn' on the screen using a tablet and stylus. The graphics intelligent terminal recommended by CAS for this purposes is the HP2647A.
j Providing storage of fuller details of the material searched on the host computer.
k Providing local input and editing facilities for co-operative cataloguing systems. The OCLC terminal is one example and another is the Cifer 2632 terminal used by BLCMP Ltd for its BOSS service.
l Using more sophisticated retrieval techniques.
m Assisting with education and training. The use of intelligent terminals in the education and training of librarians and information scientists is described by Tedd (Ref 2). Armstrong and Large, in a paper in these proceedings, describe a microdatabase developed, with BLR&DD funding, for online search training.

5 SOFTWARE FOR PROCESSING LOCAL DATABASES

Several microcomputer systems are now being used for the creation and online searching of local databases. The number of records which can be processed will depend on the software and on the storage available; some microcomputers, with hard discs could now be used for online searching of files of thousands, as opposed to hundreds, of records. Examples of software developed for online information retrieval on microcomputers include:
- ASSASSIN (micro. version). A subset of the ASSASSIN information retrieval package, developed by ICI Agricultural Division, has been developed to run under the CP/M operating system. The programs are written in COBOL. The hardware and software package, yet to be christened,

will be marketed by the Mars Group.

- Eagle Eye. This has been written by Kent Barlow Information Associates and developed from work done, under funding from BLR&DD, on a package to demonstrate to school children features of online searching. It runs under CP/M and utilises the European Common Command Language and costs £310.
- InMagic. This was originally written in the US for PDP/11 computers but has now been converted to run under CP/M. It is supplied in the UK by Mike Hyman Information Systems Consultancy Ltd.
- Reflink. This package was written by Bivins and Eriksson at Linkoping University, Sweden and has developed from Bivins' REFLES (Reference Library Enhancement System) (Ref 15).
- STAR. This System to Automate Records (STAR) is a packaged hardware and software system which provides a stand-alone system for generating, maintaining and searching in-house.

General information retrieval packages, or data management packages, can also be used for the creation and searching of local records. Examples of such packages include Petaid (for PET), DB Master (for APPLE), DMS (for use with CP/M), CBS (for use with CP/M). Whitehead gives details of more general packages (Ref 2). Burton gives details of some of the users of these packages in the U.K. (Ref 8).

6 CONCLUSIONS

This field, as many others, is a fast changing one and so it is necessary to keep up to date with the technological developments. Useful journals include Practical Computing, Personal Computer World and Which Computer and a useful directory of suppliers and their equipment is given in the annual Computer Users Yearbook. Visits to national trade exhibitions, such as Compec in the U.K., gives the prospective buyer a good overview of the current equipment available. In the U.K., the Online Information Centre is currently investigating which microcomputers are suitable for use as intelligent terminals for online systems. Visiting a similar library or information unit using an intelligent terminal is also a useful way of deciding which equipment to purchase.

As for software, the BLR&DD is currently funding a project on the use of systems software for library applications of microcomputers at BHRA Fluid Engineering at Cranfield. The library at Aslib has details of software, for all types of computer, suitable for library and information applications. Also, the recently published International Microcomputer Software Directory is of use.

Finally, it is of interest to note that although the technology is changing, some of the ideas of how we, as users, can use the technology to assist online searching is not so new. In the early 1970s researchers on the RIOT (Retrieval of Information by On-line Terminal) project at the UK Atomic Energy Authority's Culham Laboratory developed a method of formulating a search request on a VDU screen without using boolean operators and sowed the seeds for the European Common Command language in the ORION (Online Retrieval of Information Over a Network) project (Ref 16).

REFERENCES

1 Hohenstein L., Computer peripherals for minicomputers, microprocessors and personal computers. New York, McGraw Hill, 1980 0 07 029451 8