CELLMATE: Prototype HyperCard Stack for Anatomic Pathology Quality Assurance

Jules J. Berman **G. William Moore**

Veterans Affairs Medical Center, Baltimore, Maryland 21218

ABSTRACT

Apple Macintosh HyperCard® is a hierarchical programming environment, with linkages between visual data fields. CELLMATE is a public-domain hyperCard stack containing three graphic user templates: a report template modeled on the standard U. S. Government tissue consultation form, a quality assurance template, and a statistics template that automatically compiles data retrieved from the report files according to the specific search and organization instructions contained in the statistics "buttons". Maneuvering through the stack is accomplished by user-initiated events (system messages) trapped by objects. Included features of the program include printout of reports and other stack cards; generation and printout of followup letters; and retrieval of cases by diagnosis, by submitting physician, or by patient. CELLMATE's functions can be expanded by scripting newly declared objects, permitting the user to customize quality assurance activities. CELLMATE is portable throughout Macintosh computers, and is a potential aid for automated quality assurance systems.

CELLMATE

CELLMATE (Copyright 1990, Jules J. Berman) is a HyperCard stack designed to produce cytology and surgical pathology reports and to document quality assurance activities. It consists of a background (object) configured to resemble the standard government Tissue Examination form (SF-515, Figure 1). The background was constructed by using menu-selected graphic tools included with hyperCard. Reports are made by typing in data fields just as one would type in a paper form. Text that extends beyond the visible size of a field can be scrolled. Each field can contain up to 32 kilobytes of text [1]. When a card is complete, the user can go to a new (blank) card with the same background so that the next surgical pathology or cytology report can be prepared. The theoretic limitation to the size of a stack is nearly 17 million cards.

In Figure 1, the boxes are the data fields, and 18 fields are shown. Buttons are displayed in the lower portion of the card. A card can contain up to 32,000 card objects (buttons and fields)[1]. Objects can be either hidden or displayed. Any object can be programmed to respond to user-initiated events.

In CELLMATE, a background script has been written to hide the QA fields from view when a report is typed. This script also prompts the user to choose whether a cytology report or a surgical report is being prepared. A QA button has been scripted to pop-up selected fields used for quality assurance documentation when the mouse is clicked over the QA button (object). The QA card contains QA fields as well as fields borrowed from the report card.

LINKED DATA IN CELLMATE

One of the most useful features of hyperCard is its easy naviagation through linked data fields. CELLMATE is linked to a card file of anatomic pathology information that can be accessed from any point in the stack. Found text can be 'cut' and 'pasted' into reports. The pathology file is intended to be expanded by the user.

QUALITY ASSURANCE ACTIVITIES

Completing a variety of QA activities is a formidable task for any pathology department. HyperCard scripting can minimize the effort by allowing the user to script QA protocols. CELLMATE can find a class of cases to review (e.g. by tissue type, diagnostic category, doctor's name, etc.) and permits quality assurance documentation on pop-up fields in the patient's report. Moreover, users can ignore the provided features of CELLMATE and write scripts that collect data according to their own needs. This can be done by modifying scripts in CELLMATE or by declaring new objects and writing new scripts.

QA STATISTICS WITH CELLMATE

The College of American Pathologists requires that cytology departments maintain statistical records of the percent normal, percent atypical benign, percent atypical suspicious and percent positive reports. In CELLMATE a user can produce a current count of all the specimens in the department by clicking his mouse over the "DO TOTALS" button. The statistics card can also be printed with the touch of a button.

PRACTICAL LIMITATIONS

There are very few theoretical limitations to the use of hyperCard as a database manager. Unfortunately, hyperCard's lofty potential can be thwarted by hardware limitations. Because

hyperCard loads an entire card (along with its entourage of objects, text and graphs) into (RAM) memory the ability to run a hyperCard program is limited by available memory. Furthermore, as an interpreted language, hyperCard is slow compared to compiled languages. As stacks get larger, routines that search or shuffle cards take longer and longer to run. Stacks with more than 1,000 cards can easily defeat a MacPlus (1 megabyte RAM and chip speed of 8 megahertz).

Perhaps the easiest solution is for departments to purchase the fastest computer with the most memory available. This does not mean that departments need to buy a mainframe system. Top line computers using hyperCard-like programs could meet the demands of many laboratories without the need for accessory software.

As CELLMATE has not been tested with large databases or in pathology laboratories (other than the authors') we suggest that CELLMATE be used at this time only as a prototype application until testing is complete.

LOADING EXTERNAL DATABASES INTO CELLMATE

One of the most important barriers in informatics is the problem of sharing data held in a wide variety of software formats and operating systems. DVA Fileman is the medical informatics software used by most U. S. government medical facilities. In the pathology department of the Baltimore DVA Medical Center, Anatomic Pathology report files were downloaded from a VAX to a ComTex 386 personal computer. The downloaded file was formatted for Macintosh (using Apple File Exchange) and converted to a Wordperfect (for Macintosh) file. Using Hypercard's read file command, individual reports were read into cards on a hyperCard stack. Although these steps required skill beyond those used in operating hyperCard, they demonstrate the feasibility of transporting external report files into CELLMATE.

CONCLUSION

Scripting languages provide pathology departments with an economical means of entering their pathology reports into a flexible environment that permits post hoc manipulation of data fields, resulting in facile generation of QA reports. CELLMATE is a hyperCard stack in the public domain that can be used as a prototype application by pathology departments to enter, prepare and store cytology and surgical pathology reports and to facilitate all QA activities. Additionally, CELLMATE permits the user to have a customized linked information base that can be instantly accessed so that pertinent text can be read and transcribed to CELLMATE reports. CELLMATE is a prototype for pathology software that can be created with object oriented scripting environments.

REFERENCE

1. Waite, M., Prata, S., and Jones, T.: 1989, The Waite Group's Hypertalk Bible. Hayden Books, Indianapolis.

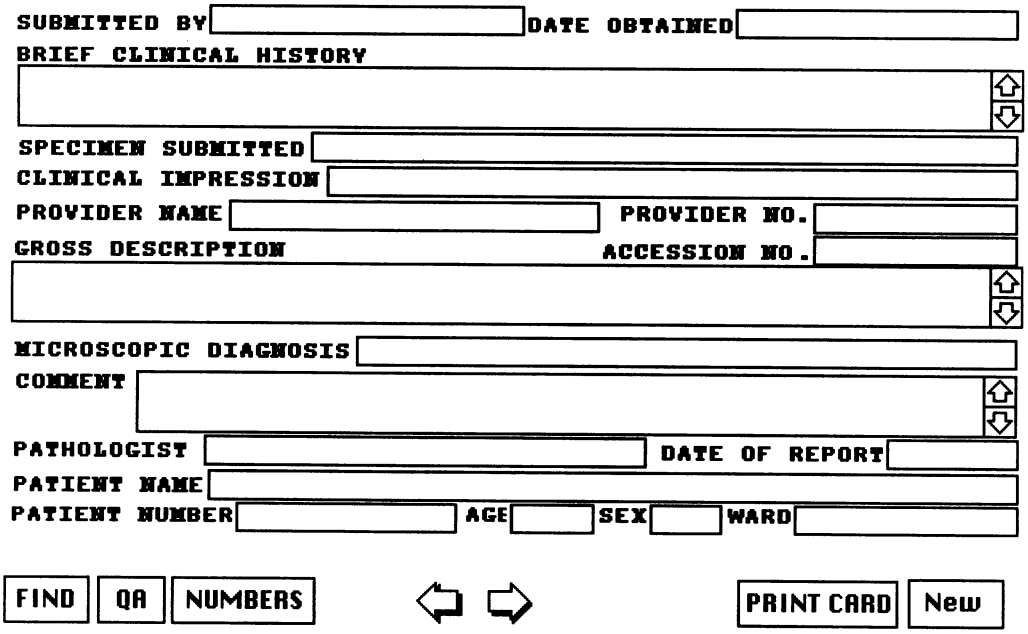

Figure 1. A background card for surgical pathology and cytology reports. Boxes with double arrows on their right edge are scrolling fields that can hold up to 32 kilobytes of text or graphics. Buttons are placed, in this example, at the bottom edge of the card. When the mouse clicks on a button, a script is initiated or a navigation command is executed.