

BRAILLE-EDIT PROGRAM
CONNECTING AN APPLE II COMPUTER WITH A VERSABRAILLE PAPERLESS BRAILLER

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Abstract

I am working on a number of small computer projects of interest to the blind. These involve connecting an Apple II personal computer* with the VersaBraille paperless brailier*. The core of these projects is a program for the Apple computer called BRAILLE-EDIT. BRAILLE-EDIT is a general purpose text editor which has been crafted expressly to work with the VersaBraille. The major goal of these projects is to enhance communication between blind and sighted persons involving text and some graphical material.

The VersaBraille

In order to properly discuss this project, it is necessary to explain in detail what a VersaBraille does. A VersaBraille is a small (9"x14"x4"), self-contained braille information system. An equivalent device for a sighted person would have a small keyboard, a tiny television (CRT) display, and a cassette storage system. The user could type in text on the keyboard, see the characters on the display, and store the text for later recall. At a later time, the text could be restored from the cassette to be read or possibly altered. The VersaBraille is similar to the device described, except for the keyboard and the display. For the VersaBraille, the keyboard is made up of six keys and a space bar (there are six dots to a braille cell, so a character is determined by the combination of the keys struck together). The storage mechanism is a cassette system, capable of digitally storing 400,000 characters on a single C-60 cassette. The braille display consists of a metal plate with 120 holes spaced for 20 characters of braille dots. Each hole has a metal pin which can be raised by electromechanical action. The

* Apple is a trademark of Apple Computer Inc., VersaBraille is a trademark of Telesensory Systems Inc.

drive electronics select the desired combination of dots to be raised. The display is read as if it was 20 characters of normal paper braille. Only 20 characters are used since the braille display mechanism is extremely expensive. It is useful to compare the braille display to a 20 character CRT display. In both cases, the desired characters can be read, but there is no permanent paper copy

Text is divided into "pages" of 1,000 characters, with 200 pages to a side of a cassette. These pages are grouped into chapters. Any text within a page can easily be edited (character or word changed, inserted or deleted, paragraph deleted, etc.). The importance of being able to edit braille cannot be overstated. The usual way of editing paper braille is to rebraille the whole page (except for repairing single characters or crossing out sections). In fact, if a machine was made for sighted persons with the analogous capabilities of the VersaBraille, it would not be too useful, since paper and pencil are so much more flexible than braille.

BRAILLE-EDIT

The BRAILLE-EDIT program is a text editor for the Apple II which is designed to communicate with the VersaBraille. The program has an optional braille keyboard mode (six keys are used like a standard braille keyboard) and an optional braille CRT mode (displaying the pattern of braille dots on the hi-res screen). The program handles text as an arbitrary stream of characters, just like the VersaBraille. One limitation of the VersaBraille is that editing outside of the current 1,000 character page is not allowed. For example, it is not possible to move the contents of one page into another page automatically. Of course, one can enter text into the second page, but this must be done manually. BRAILLE-EDIT is designed to facilitate large scale editing, so this problem is eliminated. One simple, quick command allows two blocks of text up to 4,000 characters

long to be swapped. Another important feature is the ability to handle, edit and display all ASCII characters, including control characters. One version of the program has been modified to use the new Votrax Type 'N Talk speech synthesizer, allowing a blind person to use the program.

Current Applications

All these features allow for a wide variety of applications. The program can be used as a data entry system for the VersaBraille by a sighted person who may not know braille. The user would use the standard keyboard and display modes to enter and display the text. If necessary the text could be printed out for proof-reading before connecting the Apple and the VersaBraille (using standard cables) to transmit the text. If the material was in grade two braille (abbreviated braille), then it would be easier if the braille keyboard and braille CRT modes were used. This would turn the Apple into an electronic braillewriter for a sighted brail-ist. Another application for the program is to be able to read a VersaBraille cassette, perhaps reformat it, and then print out the text. A variation is to transfer the contents of a VersaBraille cassette for the sole purpose of large scale editing or reformatting. After editing, the contents could be read back to the VersaBraille. By making use of the voice output version, this double transfer could be done independantly by a blind person

Another major use for the program is to use the contents of a typesetter's tape to make a braille copy. Much printed material is available in machine readable form because word processors or computer-driven typesetters are used in their production. Making use of a typesetter's tape greatly reduces the tak of making a braille copy of a printed text. There are three major problems with this approach. First one has to convince the publisher to release the machine readable copy. The next problem is to transfer the tape to the machine you are using (it is not easy to load the contents of an IBM 9 track tape onto an Apple computer). The last problem is stripping off all the special control sequences that were used for tape formatting, type font control, discretionary hyphenation, etc. Assuming that the first two problems can be solved, the BRAILLE-EDIT program can handle any sequence of control characters. It is not difficult to clean up a text, removing control sequences and inserting VersaBraille paragraph markers. I am currently producing a braille copy of "Disk Operating System - Instructional and Reference Manual" published by Apple Computer Inc. Apple has graciously provided me with the text on

five diskettes. As part of the agreement, I will provide VersaBraille copies of the manual at virtually the cost of the cas-ettes. In any event, I am using my program to reformat the text for the VersaBraille. Previously I had processed two other machine readable texts on a mini-computer as a 'dry run' for processing the Apple manuals. It is worth noting that Apple is first providing me with the DOS manual rather than the Applesoft manual (which I would have preferred) because of legal technicalities concerning the authorship of Applesoft.

Additional Projects

There are a number of projects that I have just started or want to work on. The most important is a braille grade two translator. Braille has several grades. Grade one is just a letter for letter transcription. It is useful people just learning braille, but it is considered too bulky for normal use. Almost all books are published in grade two braille, which has 187 standard abbreviations or contrac-tions. I have started work on a fast assembly language translator. I feel that it is important to provide two versions, one to go from print text to grade two braille, and another to do the reverse, from grade two to print text. If a blind person has written some material in grade two on a VersaBraille, and wanted to get a print copy, a grade two to print text translator would be essential. Persons familiar with the needs of braille print-ing houses know the need for print to grade two translators. Only when blind persons get to use personal computers and braille word processors does the need for the reverse translator arise.

One major project that I am working on would translate braille math encoded mater-ial into a graphics language for printing out mathematics equations on a graphics printer. The system will be able to handle superscripts, subscripts, integral signs, greek letters and all the rest. My wife is a blind math professor and could use the system to work out math examples on her VersaBraille, and then get an inkprint copy for duplication for her classes. While I am obviously writing the program because of the needs of my wife, the pro-gram could be useful in any situation where a blind or sighted person wanted to trans-late braille mathematics code to conven-tional math symbols.

Another area I would like to attack involves braille maps. Braille maps are difficult to make, read, use, and update. I think that small computers may be useful to generate the kind of information which is available to a sighted person from a map. So far, all I have done is to make a VersaBraille copy of a street directory

for the city of Madison, Wisconsin using a typesetter's tape. While a street directory (an alphabetic listing of streets with locating instructions) is useful for locating a street, it does not give true route planning information.

One area of great potential interest concerns video disks. Eventually, video disks are going to be used to hold vast quantities of digitally encoded information. One disk can hold 6.4 billion characters, or the entire Encyclopedia Britanica. Once this technology is in place, and material is published in this format, I would like to interface a video disk reader to a VersaBraille to allow the blind equal access to this flood of information.

Closing Remarks

The principles that I use to guide my projects are to use commercially available hardware (even if it is expensive), to write good programs which push the limits of my skill, and to try to meet real human needs. By working with my wife and other members of the blind community, I feel that I have a grasp of what is a useful project, and what is a waste of time.

Even though the hardware combination that I use for my projects is fairly expensive (an Apple II and a VersaBraille cost about \$10,000), there are applications which require little investment. I have noticed that a large number of Apple computers are owned by professional people who leave the house during the day. The majority of volunteer braillists (those that make braille copies of textbooks, cookbooks, novels, or anything else a blind person may need) are retired people. It seems to me that it would be possible to pair off the braillists with Apple owners, giving access to the computer during the day. The braillists would just need some diskettes for the programs and the text being entered. After entering the text for a book or an article, the diskettes could be mailed to a central resource for making a paper braille or a VersaBraille copy. The math graphics program (when finished) could be used to proofread equations being transcribed for braille technical books. Or a blind technical student could enter his homework results to an Apple using the braille keyboard, and display the equations to his/her professor. There are many useful applications as long as there is access to an Apple computer.

My wife's VersaBraille was half-funded by the Wisconsin Division of Vocational Rehabilitation. Other than

that, none of my work is supported by grant money so it cannot be sabotaged by budget slashing. I welcome inquiries, comments or correspondence.