

Adapting computer equipment to the nation's blind programmers

At LBL's Math and Computing Department, staff members are working on ways to make computers more accessible to the visually handicapped. They have started by adapting equipment already available at the Lab for the use of one of their colleagues Donald Belew.

Belew, who came to LBL last year from Los Alamos Scientific Laboratory in New Mexico, is one of about 600 blind programmers in the U.S. today.

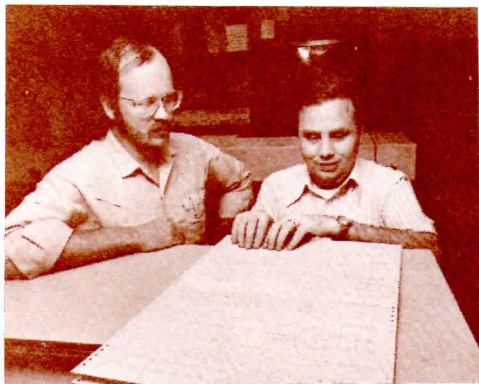
As one of nine consultants in the department's Users Services section headed by Eric Beals, Belew advises users of the Lab's computer facility on how to make the best use of LBL equipment to solve their problems. Most of Belew's business is conducted over the telephone, but occasionally he must intercept a program before it is sent back to a user so that he can analyze and run it himself.

Blind programmers, who entered the computer field a little over a decade ago, are normally hired on the same basis as regular programmers. To offset their physical disability they must rely on better-than-average skills to find employment, and they often begin work at a company that does not have any special facilities for their use.

Once on the job, however, these programmers must devise their own way to handle the demands of their particular assignment. Generally, they must come up with ways to interact efficiently as well as effectively with the computer, and to assimilate volumes of technical material that is not in braille.

To read the print in journals and reference manuals, Belew uses a device he brought with him called an optacon (optical to tactile converter). Using a hand-held camera to focus on each line of print he senses tactile images by feeling the vibrations as he inserts his hand into a box containing a matrix of pins.

A difficult device to use, the optacon requires diligent practice before it is a useful



Charles Montgomery (left) and Don Belew examine some computer printout produced in upraised braille characters.

Belew (front, right) sits in on a weekly meeting of the Users Services group.



tool. Particularly bothersome to decipher are graphs, tables, different type styles and handwriting. Using a telescopic lens on the optacon, however, Belew can read the print in newspapers and sometimes even the fine print in telephone books.

Charles Montgomery from the Systems Programming Group has been the most active in helping Belew develop other tools. Montgomery has written a braille conversion program in machine language—an intricately coded program that enables the computer to produce a printout in lines of periods to form symbols in the braille alphabet.

To use with the program, Belew has assembled a bracket that has a piece of elastic stretched across it. The bracket is attached to the line printer to receive the braille output. With the pressure of the strokes set very high, the elastic provides a soft surface so that the images are embossed on the paper.

The method, at best, is still slow and requires vast amounts of paper to run—nine lines of dots on the average equal one line of regular print. Setting up the printer to do the work each time is cumbersome, while the programs that are to undergo the conversion must be suitably tailored beforehand. Nevertheless, with the braille conversion program and the bracket device, Belew is able to acquire documents immediately in a readable form, eliminating the effort of line-by-line transcribing.

Belew has written his own companion program to the one for braille conversion. It places the titles at the top of pages and numbers the pages so that it is easier to retrieve information from the large stacks of paper.

Montgomery has started work on a program called VORTAX that will allow the computer to vocally speak to a blind user. He wants to have the computer read out text in a canned vocabulary through a vocal

synthesizer.

To provide for a third form of output in addition to the braille and the vocal, Montgomery has contacted an electronics firm in the Bay Area about making an interface for the computer and the optacon. This system is now being evaluated by Belew.

Mechanical equipment to enable a non-sighted person to communicate with a computer was unheard of when the blind began working in the field. Pilot training programs were launched under the notion that if a blind person had the ability to organize



Belew works with a terminal hooked up with an optacon.

thoughts, much of the actual contact with equipment could be left to technicians. The emphasis of these early programs was to train blind programmers solely as "think" persons.

Efforts to change this approach have been slow. Progress in producing new equipment or making improvements in them has been confined mostly to those for education and research, with few operational or practical ones for experienced people to use on the job.

As better tools for the blind become available, career opportunities will expand. The Math and Computing Department at LBL is pulling together the resources and expertise to help bring this about.