SENSORY AIDS

Edited by

Howard Freiberger, A.M.

Electronics Engineer, Research and Development Division
Prosthetic and Sensory Aids Service, Veterans Administration
New York, N. Y. 10001

Fabrication of Obstacle Detectors for the Blind

Bionic Instruments, Inc., Bala Cynwyd, Pa. 19004
Thomas A. Benham, J. Malvern Benjamin, Jr., D. Ridgeley Bolgiano, and E. Donnell Meeks, Jr.

During the period from August to December 1968, most efforts related to the production of 10 laser canes; therefore work was not primarily being done on the research portion of the project. However, problems of laser safety were investigated. Tests were made of a new GaAs diode made by Laser Diode Laboratories to see if it would be possible to replace the General Electric H1D1 laser. This proved to be the case, so it is planned to make a replacement on the last few canes. The new diode is only one-fifth the price of the G.E. unit and, since it is more efficient, it will also take appreciably less power, thus further reducing the complexity of the cane. The remainder of work on this project consisted of investigating some other means for ultimately reducing the price of the cane. Other elements beyond the substitution of the new laser are not yet sufficiently advanced to warrant reporting at this time.

Research on Audible Outputs of Reading Machines for the Blind

Haskins Laboratories, Inc., New York, N.Y. 10017
Franklin S. Cooper, Ph.D., Jane Gaitenby, and Ignatius G. Mattingly, Ph.D.

The objective of the work at Haskins Laboratories is to find practical methods for generating spoken English from literal text as the output of a reading machine for the blind. Three different types of spoken output are being investigated, each offering its own advantages (in voice quality, for example) and disadvantages (operating costs, additional development time, etc.). The three methods were described and characterized in BPR 10-9 and BPR 10-10, 1968. The comparative merits of the methods and the major considerations affecting the establishment of a Library Service Center were discussed in a paper given at the Speech Symposium in Kyoto at the end of August, 1968, and were included in the preprints for that meeting.

Further programing has been done to automate the production of compiled speech. Some reprograming has been required by the change

from IBM to CDC disk files; however, the new system has the advantages of reliable operation and more than twice the former storage capacity. A complete test of the compiled speech system is being made with a small dictionary and trial texts. This is nearly complete and should repay the effort by insuring against expensive errors in recording the full-scale dictionary.

The tracing box for spectrograms mentioned in the last report has been built; also, the logarithmic circuits for compressing and expanding the PCM recordings of compiled speech have been built. The design of additional circuits for the speech synthesizer has been completed; this should improve the quality of nasal sounds. Cooperation has been given to the Stanford Research Institute in its research on the man-machine problems of an on-line reading service center for the blind. Information, test tapes, and a small dictionary for use in making compiled speech have been supplied to the Stanford Research Institute. The joint effort will help the Institute's research and provide Haskins with useful information about the acceptability of different kinds of machine-generated speech.

The Development and Evaluation of a Personal Reading Machine for the Blind

Mauch Laboratories, Inc., Dayton, Ohio 45439
Hans A. Mauch and Glendon C. Smith

Primary progress during the period from August to December 1968 includes completing the design of the Cognodictor logic circuits. Twelve out of the thirteen printed circuit boards required have been assembled and tested. The artwork for the last printed circuit board was completed and a breadboard version was assembled. The thirteen boards occupy a volume 4.5 in. x 4.5 in. x 6.4 in. Three of the printed circuit boards for the Cognodictor (Photocell Input, Word Storage Unit, and Word Synthesizer Electronics) were installed in the older Recognition Prototype II where they operated as well or better than the discrete component circuits they replaced.

A system of coupling two Visotactors in a "master-slave" arrangement was designed and two Visotactors were modified to operate in this fashion. The system adopted requires adding miniature nine-pin receptacles to both Visotactors and providing a cable with matching plugs on both ends. With the cable connected to both Visotactors either user can monitor the output of the other user's Visotactor.

A number of design changes were made in the compartmented attaché case to increase the protection it provides against possible damage to the Colineator or Visotactor/Visotoner, and the Viscous Damping Device was improved by adding rubber seals to prevent leakage.

By the end of December 1968, three significant improvements in the Colineator design had been completed and tested. The first change was to make the transparent plate of General Electric's Lexan polycarbonate sheet which is 0.125 $\pm$0.005 in. thick instead of Plexiglas which is 0.125 $\pm$0.015 in. thick. The smaller thickness variations found in Lexan improve optical performance when reading through the transparent plate. Second, the procedures for applying the high-friction polyurethane rubber coating to the transparent plate were simplified. By applying the coating in a clean room, dust and lint particles were greatly reduced. The third Colineator improvement is a design change which makes it easy for the user to remove and reinstall the transparent plate. This is important when a replacement is necessary. The new design also permits turning the plate over. By making the plate easily reversible, the high friction coating is needed on one side only. When the coating is next to the print in reading through the plate, the few particles present do not affect the print image excessively.

Determination of Performance Attainable with the Battelle Optophone

American Center for Research in Blindness and Rehabilitation, Newton, Mass. 02158

Leo H. Riley, M.D., and Mrs. Ruth Morris

Miss F.B. has continued her training with the optophone in her home. She is sufficiently motivated and enjoys the progress she is making. Although she goes out to work each day, and does additional work at home, she has progressed to doing at least ten lessons plus five supplemental reading lessons a month by herself with Mrs. Morris teaching her once a week.

The following are her test scores:

Test 5	7.4	words	per	minute
Test 6	9.0	"	"	"
Test 7	4.9	"	"	"
Test 8	5.2	"	"	"
Test 9	5.0	"	"	"
Test 10	5.5	"	"	"

Miss F.B. is reading more fluently and with greater comprehension. She attacks new work easily and looks forward to more difficult and varied reading.

The tracking board still presents a problem because of the binding of the wheels in the carriage of the crossbar.

Miss F.B. has been a most cooperative trainee and the Center looks forward to obtaining a Visotoner for her use.

Evaluation of Ultrasonic Aid for the Blind

American Center for Research in Blindness and Rehabilitation, Newton, Mass. 02158

Leo H. Riley, M.D., and Mrs. Ruth Morris

The evaluation of subjective responses of Kay device users has continued.

While pitch-distance relationships are being emphasized, an effort is being made to assess the importance of other sensory inputs which the users receive simultaneously with the pitch information from the Kay device.

Subjective interpretations of Kay device output in certain simple tasks are being collected for analysis.

Reading and Mobility Aids for the Blind, Centrally Directed Clinical Application Program

Central Rehabilitation Section for Visually Impaired and Blinded Veterans, VA Hospital, Hines, Ill. 60141

John D. Malamazian and Harvey L. Lauer

The Visotoners and Visotactors B, developed and built by Mauch Laboratories, are being used at Hines VA Hospital in four ways:

1. Teaching the Skill to Students

Three Visotoner students have completed the 200-lesson Battelle course of training. They read some of their mail, but still require practice in reading, lessons in the efficient detection of readable print, and lessons in reading unusual print. There is a new Visotoner student who is reading lesson 50. A Visotactor student has now read four-fifths of the course. Practice has been irregular, but improvement is now expected. Mr. Lauer's skill with this instrument has been improving slowly as time permits him to practice. Reading speeds for these students remain at 12 words per minute or less.

2. Developing Instructional Aids

Several telephone amplifiers for use in telephone teaching were selected, tested, and modified. These units provided hands-free telephone communication of modest quality and enabled teachers to hear the Visotoner over the telephone. It is hoped that this will provide a valuable tool for communication between teachers and between teachers and students.

Some of the reading cards ordinarily used to test visual acuity were also tested and used. This is a step towards filling the need for lessons for advanced students discussed above. Work continues on other such items and in collecting print samples. In preparation for the new reading machines on order, ancillary hardware for use in teaching is now being procured and tested.

Work continues with Miss Margaret Butow of The Hadley School for the Blind in the use of reading machines in general and in the development of her Visotoner screening course. Assistance was extended in revising and expanding the users' manuals for the new Visotactors and Visotoners. The rating table drafted for evaluation of reading machine candidates has been seen and commented upon by colleagues, and it is ready to be revised.

3. Testing New Equipment Designs

Several modifications by Mauch Laboratories are currently being field tested. The first is a very valuable teaching monitor for the Visotactor which enables the teacher to both present the code to the student and receive the code as the student reads. Another is a useful a.c.-operated power supply for either reading machine. The reading machines themselves have undergone some additional minor modifications.

4. Public Information

In addition to conferring with visitors and corresponding with interested persons in the field, Mr. Lauer spoke and demonstrated reading machines at the annual meeting of the Kansas Association for the Blind. A great deal of interest was expressed as a result of which there is increased participation in The Hadley Visotoner Screening Course.

Development of Correspondence Courses for Personal Reading Aids for the Blind

The Hadley School for the Blind, Winnetka, Ill. 60093
Donald W. Hathaway and Margaret Butow

From August through October 1968, work continued on the editing of the tapes for the Visotoner Screening Course. On October 14, 25 copies of the demonstration and introductory lesson for the course were sent to interested students and various people in work for the blind throughout the United States. Of these, six people have returned their tapes saying they do not have time to take the course, and seven people have returned the introductory lesson and have been enrolled in the screening course proper. The introductory lesson and demonstration are on one reel of tape. The course proper has four reels of tape containing 25 lessons. Mr. Harvey Lauer, Electronic Reading Specialist, Hines VA Hospital, Dr. Eugene F. Murphy, Chief, Research and Development Division, Prosthetic and Sensory Aids Service, Veterans Administration, and Miss Mary Jameson, 17 Cromer Road, South Norwood, London, England, have been sent copies of the complete course for them to use in their own reading machine programs if they wish to do so. Mr. Russell Williams, Chief, Blind Rehabilitation, VA Central Office, has a

copy of the introductory lesson and demonstration which he will keep. Three veterans and four nonveterans have sent in lessons in the screening course.

In February 1968, two veterans and one other person completed the course, and all three are now trying to make arrangements to get further training with the Visotoner at Hines.

So far students have followed the directions well for sending in the lessons. They could hear the code quite well, and in the latter lessons were able to tell when the machine was out of adjustment. The worth of the course will be shown when the students who have completed it go to Hines for further training. Only then will it be known how much it has helped them.

It is known now that people can hear the tone patterns of letters and symbols, and can understand them through recordings alone.

Development of Test Procedures for Evaluation of Binaural Hearing Aids

Northwestern University, Evanston, Ill. 60201
Raymond Carhart, Ph.D., and Wayne O. Olsen, Ph.D.

Work has continued in the assessment of the function of amplitude modulated white noise on speech discrimination for monosyllabic words. Interference functions for normal hearers have been determined, and the equivalence of the test lists has been evaluated. The four lists and four randomizations of each list generate satisfactorily equivalent interference functions.

Another activity has dealt with threshold measurements on normal listeners for pure tones delivered to the ear via conventional earphones and via insert receivers. Interest is directed to comparison of sound pressure levels (as measured in standard 6 cc. and 2 cc. cavities) required for threshold response when the test signal is delivered to the ear by two different types of transducers, i.e., a conventional earphone in an MX41/AR cushion placed over the ear, and an insert receiver coupled to the ear by a conventional earmold.

Work has also continued in the assessment of the head shadow effect on the frequency response of an ear level hearing aid mounted on the head. Frequency response curves have been made for a hearing aid which has one forward facing microphone and another microphone directed to the back while the "listener" (either a dummy head or a human wearing the hearing-aid shell) has been oriented in different azimuths relative to the sound source. A switch allows selection of either the forward or back microphone.

Other efforts have been directed at further frequency response and distortion measurements of a specially constructed binaural hearing-aid

system, i.e., the system consisting of two hearing-aid shells with forward and back microphones, two amplifiers, a two-channel clipper, and insert receivers. Present work is directed at matching the performance characteristics of each channel of this binaural system.

Electroacoustic Characteristics of Hearing Aids

Houston Speech and Hearing Center, Houston, Tex. 77025
Jack L. Bangs, Ph.D.

Three experiments concerning the relationship between physical characteristics of hearing aids and speech understanding were completed during this past year. Several important implications for the general area of hearing-aid research were determined.

First, stable performance differences among aids with varying characteristics were obtained by a sentence identification technique coupled with a competing message. This finding highlights the importance of a standardized speech task for the evaluation of hearing-aid performance.

Second, a simple index of the irregularity of frequency response turned out to be a better predictor of performance differences than any of several other measures explored.

Third, the present results confirmed our previous finding that differences in hearing aids are at least as important for normal listeners as for the hearing-impaired.

Finally, response latency emerged as a very promising tool for the comparative evaluation of these aids.

The Development of Improved Techniques for the Analysis of Hearing-Aid Performance

BioCommunications Laboratory, University of Maryland, College Park, Md. 20742
G. Donald Causey, Ph.D., Earleen Elkins, Ph.D., Ronald Rayburn, and Eleanor Wintercorn

An evaluation of the phonemic distribution of the CNC (consonant-nucleus-consonant) word lists has been completed and indicates no significant difference between the phoneme count contained in the lists and the occurrence of these sounds in American English. An inter-list comparison for word familiarity has also been completed and reveals no significant differences between lists with regard to the number of words occurring in each of the four familiarity categories. Both studies give support to the inter-list equivalence criterion necessary for intelligibility test uniformity.

A preliminary study of the Modified Rhyme Test (MRT), a closed-response test of speech discrimination, is in progress. Speech discrimina-

tion scores of hearing-impaired subjects will be compared with the normative data developed by the test originators to determine if the MRT assists in the diagnosis of hearing impairment. It is anticipated that the MRT will provide the stimulus for a study concerned with hearing-aid evaluations.