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International Sensory Aids

A. Blindness and Visual Impairment

Sensory Aids R&D

BLINDNESS AND VISUAL IMPAIRMENT

AIST (JAPAN)

BOOK-READER FOR THE BLIND

Agency of Industrial Science and Technology
Ministry of International Trade and Industry
1-3-1, Kasumigaseki, Chiyoda-ku
Tokyo, Japan

The Agency of Industrial Science and Technology (AIST) of the Ministry of International Trade and Industry has a research contract with Nippon Electric and Anritsu Electric to develop a book-reader for the blind, a system to turn pages and read print from a few Japanese type fonts. Industrial Products Research Institute (IPRI) of AIST is developing a book-reader for multi-fonts, but without an automatic paging system. Nippon Telegram and Telephone Corporation is developing an automatic paging robot and reading machine separately.

IPRI's new reading machine system for the blind consists of three units: (i) a reading unit with optical scanner, (ii) a recognition unit for multi-font Chinese characters, and (iii) a speech-synthesis unit to convert recognized characters into spoken Japanese. Experimental studies are being done to obtain insight into a method for recognizing multi-font characters with a single dictionary, and for generating a synthetic voice.

The reading machine contains a small TV camera that picks up the characters in a sentence, breaks down the characters into small dots, and feeds the data into a computer. The computer is equipped with a memory that serves as a dictionary containing 1,059 printed characters — the 881 kanji (ideographs) most frequently used (those required to be learned in school), the hiragana and katakana phonetic symbols, and punctuation marks. Printed Japanese is a mixture of kanji and kana, so a larger memory capacity is required for the recognition of Japanese text than for English text. This drawback has been overcome with the development of high-density integrated circuits that produce small-sized memories with large capacities. Characters are read and identified through the extraction of outline features and detail matching of line distribution patterns, and converted into synthesized voice ■

UC (NEW ZEALAND)

ENHANCED SPATIAL PERCEPTION FOR THE BLIND THROUGH AN ACOUSTIC SENSOR

Leslie Kay, Ph. D.; Garry Hornby, M.A.; Nora Kay, B.A.; Marion Satherly; and **Stephen Bellamy**
University of Canterbury, School of Engineering
Christchurch, New Zealand

A new design of acoustic spatial sensory aid has been used in a program for training totally blind school children to perceive objects in their near space. The sensor, shown in helmet form (Fig. 1) for gymnasium use, provides a narrow central field of view of 10 degrees having a resolution capability of 4 degrees together with a wide-angle peripheral field of view of 60 degrees. The maximum sensing range can be adjusted from 0.5 meters to 5 meters. A distance code of 5000 H, representing the maximum chosen range, is used similar to the earlier binaural sensory aids (Sonicguide™). Object recognition features are enhanced in the central field relative to the peripheral field, enabling a user to explore objects in greater detail. At the same time, any object motion in the peripheral field immediately demands the user's attention. This generally takes the form of head turn towards the new spatial event for more detailed observation. The generation of flow patterns experienced in the binaural sensory aid has been retained in a modified form.

Tests have been carried out (using sighted students under blindfold) to determine the accuracy of location of objects, the resolution of two objects at the same radial distance, the location accuracy of a discontinuity (edge) in an object space, and the discrimination between different objects in the viewing field both at the same and different radial distances.

These tests have led to the design of a teaching program for use in a school setting where a trained teacher guides a blind child through a series of 40 lessons. The lessons cover acquisition of reaching and locomotion skills related to various aspects of

spatial awareness enhanced relative to that using only natural cues. Data using an N = 1 experimental design is being collected to determine the rate of learning and the extent to which this transfers to later lessons.

The results to date suggest that the approach now being used could be integrated into a spatial awareness training program for blind persons. Its influence on methods of mobility training are being explored ■

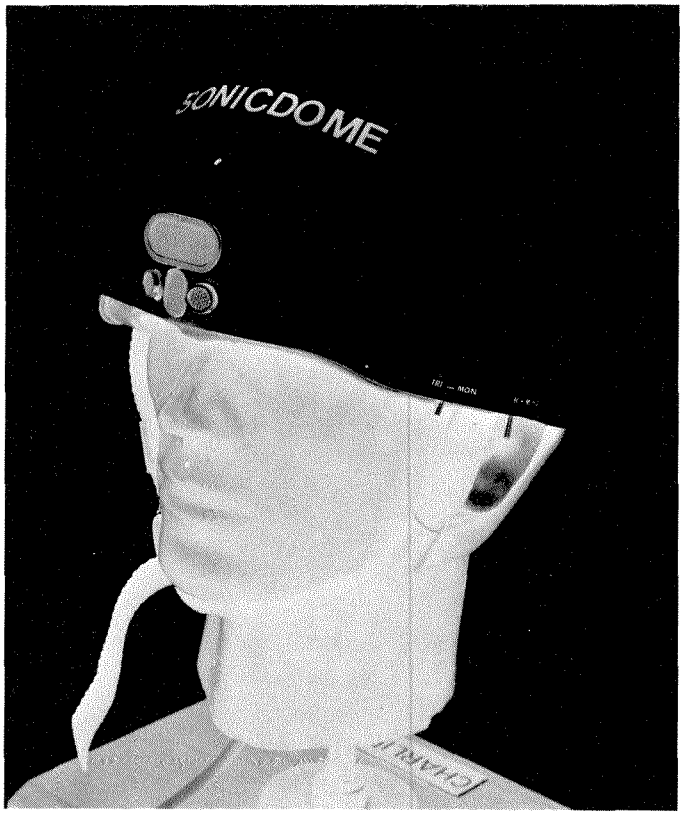

FIGURE 1
A "Trisensor" (binaural system with three receiving channels) totally enclosed in a lightweight cycle helmet. No cables are attached so as to allow a blind child complete freedom to play in a gymnasium, learning important spatial concepts. The auditory outputs are from special miniature speakers fitted in the helmet.