SCIENCE IN THE SERVICE OF THE VISUALLY HANDICAPPED IN INDIA

ALL INDIA CONFEDERATION OF THE BLIND

Sector- 5, Rohini,
Delhi. 110 085
Ph: 7050915
7054082
7247469

1997

BASED ON
THE EXHIBMON ATTACHED TO THE NATIONAL CONFERENCE ON TECHNOLOGY FOR THE VISUALLY HANDICAPPF_T

ORGANISED BY

ALL INDIA CONFEDERATION OF THE BLIND

IN COLLABORATION ITH

'MAC, MINISTRY OF SCIENCE & TECHNOLOGY
AND
CHRISTOFFEL BLINDEN MISSION
IN
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CONTENTfS

FOREWORD

For ages blindness has remained a psychosocial enigma inviting rank social prejudice. So obvious are the limitations of blindness that total helplessness has been assumed.

The march of science and technology has yielded a crop of educational and vocational devices that have helped in diminishing the limitations of blindness. Indeed, they have greatly extended the functional ability of visually handicapped persons and have greatly improved their image in the community. The invention of Braille was the first watershed. The advent of multimedia computers and text reading machines have opened up vast vistas of education and employment to the visually handicapped.

In the last decade or so India has made some progress in the development of indigenous technology for the visually handicapped. But a large number of problems still remain unresolved and are amenable to technololgical solutions. Therefore in collaboration with the All India Confederation of the Blind, a National Conference on Technology for the Visually Handicapped was organized in New Delhi in February 1997. Many distinguished experts and consumers attended the conference.

Along with the conference was also held an Exhibition displaying a number of high tech devices for the visually handicapped. The proceedings of the Conference have been separately published. This volume contains brief description of the aids shown at the exhibition. This volume is being published in the hope that it will stimulate the imagination of scientists and consumers alike and result in increased interest on the part of the scientific community in resolving the manifold educational and vocational problems of the visually handicapped.

I wish AICB all success in this difficult task.

(V.S. Ramamurthy)
Secretary
Department of Science and Technology

HTL LTD : MADRAS

Braille Typewriter

M/s. HTL Ltd., formerly M/s. Hindustan Teleprinter Limited, Madras a Public Sector Enterprise, which is in the Telecommunication field for the last 35 years has developed a mechanical Braille Typewriter for the use of blind persons, as a substitute for imported Brailler. As a part of serving a social cause, the R & D team in HTL took up the challenge of developing the Brailler and successfully brought out this product in 3 months time.

The machine is used for writing on one side of a Braille paper (size 270X340 mm) using the 6 dot system. The keyboard contains 6 levers which operate the punches that make the braille dots and has one space lever. The machine is also provided with two functional keys such as Backspace key and Carriage Release key. The braille letters are formed by pressing one or more keys simultaneously. Before reaching the right margin, as determined by the right margin stopper, a bell sound gives a signal to the operator that in another six characters formation, the line will come to an end. Line feed is done manually by rotating a knob.

The components in the HTL Brailler are fully made in HTL and have gone through a stringent quality control process. It is very rugged and easy to operate and handle. The total weight of the unit is 6kg and the size is 150x230x120 mm. The Brailler is just having 125 parts only and any operator with minimum mechanical knowledge can easily assemble and dismantle this unit. All the parts that are assembled in the units are manufactured in highly sophisticated machines like EDM wire cute, spark erosion, Amada turret punch press, etc. and critical components are hardened to give perfect functioning and long use. A good number of molding tools and press tools were made to manufacture the parts. To give sturdiness, the base is made out of cast iron. It has a provision for holding all mechanical parts like seven key levers, punch head assembly, carriage feed assembly, paper holder assembly with line feed, back space mechanism and top casting for embossing dots.

G.S.T. Road, Guindy, Madras, 600 032,

The HTL Brailler is provided with a base for comfortable typing and a box to carry it. The speed of the machine is 60 words per minute and the cost of the machine is Rs. 6,100/- plus tax as applicable which is much ckeaper than the imported machines. An operation and service manual is also being proyided along with the machine.

The HTL Brailler was evaluated fully by the Regional Centre, National Institute for the Visually Handicapped, Madras and they found it satisfactory.

Braille Embosser

Many electronic systems are designed, developed and put to use to increase the efficiency of Visually Handicapped persons at work and one such system is the Braille Embosser It is a micro-processor based braille printer which converts the text entered in the P[illegible]erson. Computer into standard braille code and gives embossed print out onasheet of paper. This system will be highly useful for institutions for the blind in preparing text books and class notes for blind students. It can emboss in open ,or contracted braille and it is capable of embossing 8 characters `Or second. This niaaline can be interfaced through RS232C or centronix pirallel inteifice to 'a number of PCs or work stations.

The embossing pins, arranged in .,x2 matrix, form a standard 6 dot braille The embossing On moves upwards while energizing the solenoids on whibh the pins are piQunt‘a and embosses:the paper. The set of solenoids and the pin assembly are mounted on a carriage which moves incrementally to a new position followed by the actuation of the solenoids thus completing the embossing operation character by character. The paper feed mechanism in this system consists of a stepper motor for line feed. An audio alarm for "No-Paper" condition has also been incorporated.

The microprocessor module used in this system is designed using inter 8085 with 32k ofEPROM, 32 k ofRAM and 48 1/0 lines. The EPROM contains the system monitor programme which receives the information from the PC, drives the mechanism and indicates the current status of the system. The system creates a print buffer in its memory and stores the data received from the host. The size of the buffer is 40 pages. The embosser can accept data from any

version of IBM compatible PC. The system is also provided with front panel visual indicators and control switches. A self testing programme is also incorporated to ensure that the machine is in perfect condition whenever the same is switched "On".

The materials and components used in this machine are indigenously available and there would not be any problem in the continuous usage of the machine The complete system is highly compact having the size of43x27.5x13 .5 cm and weighs about 11.5kg.

The size of the paper used is 300x255 mm with weight of 170 gms. Other language braille code conversion software other than English language can also be supplied depending upon the need. The price of the machine is Rs. 25,200/- plus other applicable taxes.

JADA'VPUR UNIVERSITY : CALCUTTA

Computerised Braille printing - kindling lights & hopes

Introduction

A computerised Braille Transcriptor system has been developed under project braillescript jointly funded by the Department of Electronics, Govt of India, and the Ramakrishna Mission Blind Boy's Academy, Narendrapur. The system, developed by personnel from the Department of Computer Science & Engineering, Jadavpur University and the S.N. Bose National Centre for Basic Sciences, Calcutta, automates braille translation by eliminating the need to have specialised knowledge of braille code and braille translation procedure on the part of the operator. Thus any ordinary user can type in a text using the normal typewriter-like computer keyboard and with the help of a special software developed for the purpose convert it into equivalent braille form. A user manual is available which explains how the system can be operated with a few simple keystrokes. Conversion into the Contracted Braille form, which is the standard followed worldwide to teach visually handicapped students at the secondary level of education, is also possible in this system.

The transcriber system, currently operational at the Regional Braille Press in the Blind Boys Academy, has two ways of producing outputs. The first is through a Perkins Brailler which has been suitably modified for direct actuation by the computer and the other uses a Marburg Stereotype machine which has similarly been provided with a computer interface. The Perkins &miller is useful when only a few braille copies are to be produced whereas the metal sheet produced by the Marburg machine is useful for getting large number of identical copies.

System components - The Computer does it all

The computer used in the system is an ordinary personal computer (PC-AT) which with the help of the software provided can transcribe English text into braille. For transcribing other Indian languages into braille a special card is used in the computer and a different software package is utilised. Languages Such as Bengali, Assamese, Manipuri and Oriya can all be transcribed in this manner. Devnagari scripts can also be similarly transcribed into braille. The same keyboard is used to enter text into the machine for these vernaculars as well and sighted users can see the corresponding text on the computer

Prof. P.K. Das : Jadavpur University, PO. Box.. 17004, Calcutta, 700 032, India

screen . The mapping of the English keyboard for these Indian languages is available as separate charts.

Simple & friendly user interface

Using the system is extremely simple.When the programme is started it first asks the user to specify the maximum number of cells that the printer paper or metal sheet for Marburg can accommodate on each line and the Maximum number of lines per page. These facilitate the use of different sizes of paper. The user is then asked to specify the name of the text to be transcribed. There is also a provision to print a running headline as well as a page number on each page. While the transcribing process is in progress the system displays the Waffle code in graphics on the screen on a line by line basis for the sighted user, When a page gets completed the programme waits automatically with a blank white page displayed on the screen. This is the time when a new page has to be inserted in the printer or a blank metal sheet has to be loaded in the Marburg. The user indicates the completion of this loading by pressing a button on the keyboard and the programme resumes its operation instantaneously. This entire procedure is independent of the language being transcribed. The programme stops automatically when the entire transcription is over on the Marburg machine when a sheet is completely embossed it is automatically ejected by the computer.

Advantages of the system

The system offers a number of advantages over the existing manual method ofbraille transcription. Transcribing is fast, accurate and consistent. Computers 49, not suffer from fatigue. nor do they engage in gossip or laze away time otherwise. Even with the slowest of printers the system can generate outputs at four times the speed of manual transcription in a sustained fashion. As the system is built around a computer. All of its attendant advantages are automatically available in the system. For example, information can be stored in the computer in a very compact form-a single, 5 1/4" floppy disk can store the equivalent text of a 400 page book, a 3 1/2 hard disk can store more than 1 litilibn characters whiCh exceeds the content of a complete encyclopedia-and any information out of this can be obtained instantaneously. Any keyword can be searched in a matter of seconds. Thus metal foils need not be saved which would free costly storage space and the metal plates can be recycled easily, because transcription cost would be negligible both in terms of labour and

time. With the growing use of electronic mail (e-mail) and electronic storage, books and other materials available in these forms would be instantly available to the visually handicappe students who are currently deprived of even the bare necessities like text books would 4.ow be able to read magazines news items and story books, even classical literatures and scientific journals.

Built-in Safeguard against Inoperation.

The systefn is designed around components all of which are indigenously available. This, along with the fact that the entire development of hardware and software was carried out here; means that the availability of spares and the maintenance expertise is guaranteed. For essentially the same reason the system is immune from obsoleseence as any improvement in technology can and would be promptly incorporated in 'the;*system: It would not be out of place to mention here that imported equipment irrespective of their• origin or cost always suffers from these problems and the sheer number of costly imported equipment lying inoperative in unmaintainable conditions in our hospitals, laboratories and other places would bear testimony to our claim. Last, but not the least, the system is cheap compared to the sophistication and flexibility it has got.

Further flexibilities

Having a computer at the centrestage of the system has other advantages too. Efforts are currently on to automate the entry of input text into the computer with a special camera-like optical device and a special software working in tandem it would soon be possible to open a page of text in front of this device, make a few keystrokes and produce the same text in braille form.

The system is also of great practic4 help to those whose visual handicap is partial in nature any text that the system has stored in its memory can be displayed in large print form on the computer screen. Moreover, the size of these prints can be varied to suit individual geed.s and the user can do this interactively:

With all these and a few more which are being planned, the computer would turn out to be of immense help in spreading literacy among this section of the society and would make them feel a part of the world of education by not having to depend any more on specialist transcription services. The inordinate delay between the publication of a new book and that of its braille edition would be effectively reduced to a negligible minimum.

* * * *

INDIAN INSTITUTE OF SCIENCE : BANGALORE

t4velopment of Microprocessor based Electronic Braille Shorthand Machine

It is well known that Braille shorthand system has been well developed and standardised and a considerable number of visually handicapped persons have working knowledge of it. Mostly, the mechanical Braille shorthand machines are used in India. These machines consist of a Braille key pad and a paper tape roller.

The key-strokes are embossed on the paper tape on completion of taking dictation or notes, the visually handicapped person has to take this paper, read the shorthand Braille script and retype the text on a type-writer. Though, this system has been serving its purpose, it has a number of disadvantages:

46 (i) The machine is bulky and difficult to carry.
(Error correction is very difficult.
( ) It needs paper rolls of specific dimensions
(iv) It cannot be interfaced with electronic type-writer or to the computer.
(v) The maximum data-storage is also limited by the size of the paper roll.
(vi) There is continuous wear and tear.
(vii) Eventhoug,h. the operator may by efficient, the number of steps involved in the process makes the whole operation slow and time-consuming.

Since computer-usage by the visually handicapped has become a reality, the development of electronic shorthand machine has been undertaken by the group at Indian Institute of science, Bangalore, to enable the visually handicapped to carry out entry and retrieval of information using braille shorthand system much more efficiently. The electronic shorthand machine consists of a braille key-pad, a microprocessor, a large data memory and a computer interface. It operates with mains adapter or through batteries and it is portable . The operator carries this equipment to the desk of his/her boss and takei down the dictation directly on the key-pad using standard Braille shorthand code. After asserting the depression of the correct combination, he presses the space - bar key. At this instant, the key strokes are stored in the data memory in the shorthand form. This process continues till the dictation is complete, keying in is very difficult in the absence of vision feedback leading to frequent

(J. E . Diwakar, CEDT, Indian Institute of Science Bangalore.56G012).

errors in the data entered using the keyboard. These drawbacks of the conventional computer based job option by a visually handicapped person have been eliminated. Once the dictation is complete, the operator takes the machine and connects it to a PC using the PC's standard serial port. By pressing a key on the key- pad, the data stored in the data memory is down loaded in the PC's main memory. A dedicated software written in a high level language converts this Braille shorthand into expanded English. Expansion from shorthand to English is done by the computer in a very short time At this stage, the visually handicapped person can read the text using the speech synthesiser interface and can edit it, if necessary. Obtaining hard copies of the edited text through a printer attached to the PC becomes an easy and straightforward task. Thus the entire process of information entry and retrieval can be efficiently carried out using the electronic shorthand machine. It is useful not only for secretarial jobs, but it can also be used to take notes during visits, meetings, class room lectures or travel etc. by any person knowing Braille shorthand.

Tentative specifications

Size(approx.)	15 cm x 10 cm x 5 cm
Weight	700 gm.
power	"AA" size rechargeable cells or through mains adapter.
Interface	.One serial interface with adjustable baud rates.
Memory	64 k ,tosuit atleast 20 pages ofinformation,with provision for memory expansion.
Ergonomics	: Models to suit tabIe-top or lap- top usage and models to suit usage in situations without external supports.

INDIAN INSTITUTE OF TECHNOLOGY.: KHARAGPUR

Multiread - A PC Based Multiuser Multilingual : Braille Library System

Blind people in India faces Herculean difficulties in getting formal education due to the lack of low cost technological support. Libraries for the blind have been organized at different places in India for providing reading facilities to the blind population. These libraries **maintain an archive of different texts (literature,** science etc.) in **the form of Braille coded texts.** However. such libraries suffer **from a:IC4er of practical difficulties.**

Firstly, most of such libraries run on severely constrained economic resources. **As the Braille pages are ratherthick, a normal volume of printed text turns** out to be **afvoluminous Braille text;** keeping **in view the limited space the** libraries can **afford, archival storage a'** a considerable repertoire of books becomes next to impossible .

S dn4ly, the Braille printing system being very costly, the production cost of the e texts shoots up beyond thelmeans of these libraries. •

These problems coupled with the moving urge of the blind people to have educath **atsupport motivated us to develop a low cost Braille reading system,** which can, **at least partially, alleviate some of these difficulties.**

It may **be mentioned that most of the reading aids available abroad are** personalized **and do not provide any multiuse'' feature. Secondly, the cost of** such system is **rohibitive in the Indian context. The lcurzveil synthesized speech** system,which **incidentally is very popular in the west costs about $ 8000, for a** single user. **Thirdly, the multilingual needs of the Indian population are not** catered for by ::any **of these phonon based speech output systems. A very** interesting **(stem has been developed at the I.I.T Delhi, addressing the need** of classrooi **teaching and does not allow different users reading different texts** and as Alen **cannot satisfy the needs of the libraries for the sightless.**

Nations earch Development Corporation, Regional Interaction Office, C/o Dean, (SRIC) Indian Institute of Technology : Khargpur, 721 302 (W.B.)

Multiread is the system which adheres to the Brae form of output. Its nareft)? Resat its being able to cater to the needs of a number of blind users from the same system. This feature makes it specially turned to the needs of the libraries for the blind. At the same time , the system can be used as a single user personalised systeth (of courses at a reduced cost). Moreover, it is possible to read texts written in different. Indian languages through the same machine.

Multiread is *centered* around a PC-XT, where the texts to be read are stored. The users have separate reading modules at their disposal through which they can read the texts they require. The reading modules consist of a tactile reading system and a small keyboard with 12 keypads for controlling the reading process. The reading device is a single 3 x 2 pin array (compatible with the Braille code format) through which the characters are floated in a sequence. The technique of such temporal sequencing saves a lot of hardware. Although, such an approach is unfamiliar to the blind people accustomed to spatial sequencing. It has been found that a little practice enables them to be acquainted and soon they feel comfortable and adapted to this system. The keybords at the disposal of the individual users allow them to control the reading speed, page turnover (backwards and forward), line repeat, character repeat etc. The users can tune the system speed according to their own convenience. Audio supports are also provided to the individual users to communicate special messages. The host PC allows new users to log in and specify the texts to be read. Users can start, pause or quit the system independently. In the test mode the braille encoded texts can be displayed on the screen.

The salient features of this system are:

i) It is inexpensive,being based on PC / XT or PC/AT system .

h) The system provides multiuser facilities:that is, sixteen sightless readers can be served by a single system simultaneously.

iii) Multiuser Facility: The system enables different users to read different texts at the same time

iv) The users are provided with separate controls so that they can vary the individual reading speed. These controls also allow the user to access next page. next word, previous page, previous word etc.

v) Multilingual **Facility: Different users can read texts: in different Indian languages. Presently, the system can read texts written in English, Bengali, and Hindi**

These s make the SYstem` specially suitable for the libraries for **the sightltai. The hardware and the multiuser software system designed can cater to as many as 16 users without performance degradation.**

Market Potential

target users of this system are the libraries for the blind or individuals. Adoplon. **of this system also alleviates the need of the costly Braille printing procos. A number of Braille libraries for sightless have expressed their wil ss to install it at their site as it will be very useful to them.**

RaTiMaterials/Components Required:

[16]" The main components required are integrated circuits,transistors, tr. **'fifirtners, Nylon moulds, LED's, printed circuit board. The total cost of** th **onents is about Rs.5000/- The other bought out items will be personal** computer **with8255 port ZIST card &Add on card.**

Equipment Required for Fabrication:

o special plant and machinery is required for fabrication. Few dies have to cated in the beginning from outside from the firms having injection lug machine. Electrical assembly job can be done easily using soldering transformer winding machine, AVO meter etc.

Techweconomics of the project

uggested **Economic Unit** 100 Units/annum

Cost **of plant & Machinery** : Rs. 50,000/-

pace REQUIRED : Covered : 50 Sq . meter

Total : **100 Sq . meter**

Mag Power Required : Manager - 1

Skilled persons — 2

Unskilled persons - 3

Cost of Production

The principal cost of the system is that of the PC and the incremental costs are marginal as new reading modules are added up. The estimated cost of the system with 16 user terminals and a PC XT is around Rs. 40,000/-.

INDUSTRIAI DESIGN CENTER, IIT : MUMBAI

1111EMEtNin of ;w products/equipment related to mobility, Braille production and o 4iktifie requirements, in India, there are hrdly any specific products which can **be used by a visually handicaped person in his/her daily life. No** attempt has been **made so far to make the daily life work environment compatible** for the visually impaired **person.**

ArtlIndustrial Design Center, India Institute of Technology- Bombay, Mumbai, iSqi*htial attempts have been made to fulfil this lacunae by carrying out lies. Student projects. On one side the students fulfil the academic req &it, on the other side it helps to develop products for the blind in the areas Iftte computation, Braille production, and food preparation, etc.

As a **product design projects all these product concepts have been developed** based on the **basic users limitations and requirement along with economic and** manufacturing **criteria followed by blending of product safety and aesthetics so** that it can develop an **integrated and effective user-product-environment** relationship. Some **of the product concepts developed by IDC is given on separate** pages attached.

Br R$_{I:}$copier

Student Sanjay T. koli

M. Bhandari

M tkiRes Project III

Year : **1991**

The Braille **copier makes a bid to solve the problem of vocational** rehabilitation and **economic independence of the visually handicapped as** well as **tp Wiead literacy among the blind. The designed copier breaks away** from th 000entiottal **aids on which the blind are trained, and by identifying** their str(aciauglio **and tactile capabilties making the machine a tactile experience** in space **it could serve as a guideline for the design of the next generation of** machii **Aims** a **as EPBX,FAX, Cash Registers etc. for the blind .**

iic fir

G.G. Y, **Ph.D. Professor, IDC, IIT, Mumbai, Ph : (022) 578 3480**

The entire Braille text is _ stored in a compact disk, data from which can be accessed page by page. The output is in the form of mechanical pins which orient and re-orient conforming to, the text on the page -and the copy is achieved by mechanical punching,akin to a die press operation. The mechanical operation of copying ensures total independence to the operator.

The form of the product can be seen as a staggering of surface with respect to each other. Grooves crisscross the textured surface, providing a rough sequence to be followed and the planes thus formed serve as a landmark for control or activity.This result in a visually (form)disturbing but performance wise more appropriate concept .

Computer for the Blind

Student : Sudhakar Lahade
Guide : M . Bhandari N . Sadhu
M . Des : Project III
Year : 1992

The computer for the blind makes a bid to solve the problem of vocational rehabiltation,economic independence, and equal participation of the sightless in today's computerised world.

The proposed design breaks away from conventional aids making design a new experience through sensory transformation. It also serves as design basis of the next generation products for the blind. Besides functional efficiency and aesthetics,ergonomics also plays an important role in the proposed concept. Computer being an organisation of many components and spaces design. Design concepts become a console where reach, positioning and the ease of operation become vital factors.

The input is through a Braille keyboard as a replacement of normal keyboard and floppy drive which is guided by appropriate levels and grooves.

The output has a printer cum Braille sensor and a voice synthesizer.The sensory level which combines the input and output levels where the user finds a Braille line sensor for feedback of input data

The design is organization of tactile elements creating tactile language for the blind as well as a usual experience to be seen by sighted person through a monitor.

Design Aid for the perception of visual sense for the Blind
Student : Sridhar M.Rangaihn
Guide : R. Poovaish , A.G. Rao
M.Des : Project ir
Year : 1985

The proces1 of perception for the blind involes all the sensory input except visual.

The project entitled Design Aid for the Perception of visual Sense for the Blind explores the possibility of using the tactile sensory path towards developing different types of teaching, recreational, and informative aids for the blind which would act as a basis to graphic literacy of the blind.

The process of thermoform was used to develop different 2D and 3D (Partly) relives on a PVC sheet of 0.125mm.

Several experiments were carried out on ten 4th standard students (age 8-10yrs) with average intelligence of a blind school who were congenitally blind or lost sight before 3 Yrs. of age. The experiments involved recognition of points (dots) and lines, with ascending order of size and thickness, proximity of dots required to form a line both in inclined and horizontal orientation,traceability of intersection of a dotted and undotted curved line overlaps at the intersection, recongnition of the line which runs over and under and overlap of different forms and their recognition .

The report came out with several important findings which were later on used towards developing a tactile graphics learning book for the blind. The visual images were vacuum formed on plastic sheets accompanying with the related story matter appearing both in Braille and printed words facilitating easy correlation and also to help a blind student by a sighted person .

Design of Electronic Braille Learning Machine

Student	**kashmira N.Rathod**
Guide	**M . Bhandari**
M.Des	**Project III**
Year	**1986**

Considering the limited availability of the Braille learning machines and their inherent merits and demerits, present study was an attempt to develop an electronic Braille learning machine which satisfies the followig requirements:

1) It allows keying at a single keyboaid-ri6 produce the same tactile output at two separate Braille displays.

2) It allows clearing/refreshing of the Braille display and also allows back and forward spacing.

3) It allows Braille code generation through only six keys.

4) It has audio output (feedback) for self paced leafing.

5) It provides a non-visual signal, to indicate the end of the display.

Apart from those criteria the product also fulfil the basic ergonomic and safety criteria,ease of maintenance, and aesthetically pleasing quality both for non sighted and sighted persons, it can be placed along walls without use of extra space and any hindrance.

Developing a LPG Stove for the Blind

Student		Anirban Ghosh
Guide	:	G.G. Ray, S. Nadkarni
M.Des.		Project II
Year		1996

Preparation of food is one of the most essential activity for human survival. Like every human being the blind also require to prepare food but currently by using the existing LPG stoves which are specifically designed for the sighted persons.

Video documentation shows that the use of existing LPG stove for prepartion of food by the blind is not only inconvenient but potentially dangerous. Several rehabilitation schools and training centres are rather compelled to use the commonly available LPG stove in the market for training the blind towards its use and food preparation.

At any point several risk factors are playing which make the existing product unsafe. Those factors are 1) chances of small and major burns at each and every step of operation, 2)at any moment the vessels can topple leading to a major

accident, 3) the clothing can catch fire at any time, 4) malfunctioning of the stove can lead to a disaster and 5) chances of getting cuts and injuries in the hand while cleaning.

In the final design emphasis has been given towards referencing. The top platform of the stove has several steps so that the user can understand at what level his /her hands are and become cautious accordingly. This gives a feedback about the position of the hand in respect to the burner. For the safety reason only one burner stove has been recommended. The stove has other features like auto ignition,auto flame failure and flame control device, discrete knob positions for precise flame control device,discrete knob positions for precise flame regulation, use of specially adopted vessels for stability,easy and safe cleaning, provision for spatulas and cooking ingredients, drip tray,etc. The estimated cost will be around Rs.1500/- .

* * * * * a1/4

The main operating parts viz. **Keys for dots, space bar, line spacing and** back spacing, feed knobs and handle **have been shaped to suit the movement of** fingers.

The parts namely paper feed knobs, paper release lever, pressure roller and rubberised roller have been designed to enable trouble free paper insertion and accurate sliding on completion of a line.

The brailler has useful provisions of left paper stop, left and right margin, bell that rims before seven cells to the end of line. They can be set in a simple manner tq$_f$plia,user's requirement. The carriage, carriage lever and embossing head, sipperplate have been matched to function in the most synchronous way.

As *Si***wtole. all the the functional aspects as desired by visually handicapped peetailliaifrebeen considered to enable them achieve best _output.**

(B) Manufacturing :

All the components of "Minal" braille writer have been produced under well defined **and rigorously monitored manufacturing processes. The main thrust is to achieve the set quality norms by using precision tailor made toolings so that dimensional conformance is ensured.**

belbw materials of specified standards have been chosen to give desired Me i and avoid fatigue failure. For the many of the parts, stainless steel has beenkmed and on other metallic parts, proper surface treatment is given like pain zinenickle plating, anodising etc. for longer durability and elegance.

Par the critical parts, use of CNC machining has been resorted to so that quality on repeatative basis is maintained although it involves additional cost.

(C) Reliability :

:The tested and proven design, controlled manufacturing process and quality pro yes adopted leaves minimum scope for any change of failure during ope--4ion of the machine provided the operating instructions are followed properly.

The machine after assembly is tested in three stages i.e. subjecting to minimum 50.000 strokes, after vibration test and after drop test. This ensures that the machine works in such abnormal conditions without any trouble.'

(D) Customer Support/After Sales Service :

0, Cpstotp,er r s education and after sales support is of prime importance to us and hence we as a policy matter have decided to impart training to a representative of blind institute/organisation at our works for maintenance/ minor rop*free,of q9s.t. ,i.t

iii'64 the parts have been f Uecñthbuséfloca1ly. availability of ii'are1/4`7411 not pause in3Pprobliiii?' Further, iii finure we are planning to have 'gel6eidi1 oaes t9 **enitire'e y alid-cluick access to the user.'**

The **"Mind' braille writer, carries a guarantee for a period of one year however we shall attend to any, of customer calls in at one week's time.**

Notes :- We are reproducing below an article by Curtis Chong which appeared in the "Braille Monitor", an organ of the National Federation of the Blind of ,This, article shall prove,ofiunnense v4ue t911AosRengaged ii1 Scientific eand **Itckvi.plogiregUtAKTRA** *.4,L;12typippW11thitOffi*

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Nar

NATIONAL FEDERATION OF THE BLIND IN COMPUTER SCIENCE : MINNEAPOLIS

Commercial Technology for the Blind

From the Editor Emeritus: As Monitor readers know, Curtis Chong is the president of the National Federation of the Blind in computer science. He is employed of Minneapolis. As a member of the World Blind Unions Committee on Technology, he recently prepared a paper concerning guidelines for designing modern technology that can be used by the blind.Very few subjects have more importance to the blind than this one, and Mr. Chong's straightforward approach is refreshingly underst has

Introduction

Although **here will always be a need for some specializ cd, technology** designed especially for **the blind** (for example,the Braille Writer), it is preferable for people who **are blind to be able to operate me same tecnnotogy mat is** commercially **available to the general population. The problem we face is that,** more often than 14,0t, **commercially developed technology is desiged in such a** way as to **preclude efficient and convenient use without sight. It is not that** manfacturers **deliberately set out to prevent blind people from 'using the** technology they develop. It is simply that they haven't considered the possibility that a blind person might want to use their product.Moreover, even if some developers wish to ensure that blind people can use a specific device, they face the problem that there are no easily obtainable guidelines which they can follow to meet this goal.In other words,their design efforts are likely to be conducted on a hit-or-miss-basis.

The ideal goal is to have electronic appliances usable by everyone, including people with physical, sensory, or cognitive disabilities. However,in attempting to achieve this goal, it is important to recognize that features that make the device to be unusable for another. For example, replacing printed labels with raised pictographic symbols may be useless to blind people with learning disabilites, but they are useless to blind people who may read Braille or raised print. Accordingly, it shoul be clearly understood that this paper focuses specifically, upon the access requirements of persons who are blind.

Curtis Chong, Minneapolis

This paper will attempt to establish broad principles and suggest some specific practices that may be followed by developers of commercial technology so as to ensure that the products tiny develop can be operated by a blind person without sighted assistance. It should be viewed as a guide that can be used to stimulate thinking on the subject-not as the definitive solution to the problem.

This paper will not address the problem of access to computers and the graphical user interface. Many organizations have devoted substantial times and energy to this problem. However,relatively little thought and effort have been devoted to the question of how modern consumer electronics can be designed so as to be operated by those of us who happen to be blind. As a growing number of these devices use digital controls and computer technology to carry out basic functions,our ability to use them steadily diminishes.

Guiding Principles

Before making specific design recommendations, I would like to suggest a few principles that should be used to shape the design effort . These include operability, integration,usability built-in, and accessible documentation.

Operability in this context means that a specific appliance is designed in such a way that a blind person can exercise all of its essential functions without sighted assistance.

A good example of this concept is the television. We may not be able to see the picture while enjoying our favorite movie; but we are able to turn the television on and off, adjust the volume, and select the desired channel without asking a sighted friend to help us. (At least, this is the case with most televisions available today.)

The principle of integration is aimed at ensuring that features necessary to operate an appliance without sight are an integral part of the design and benefit everyone who uses the appliance -not only the blind . A telephone with buttons that can be operated by touch is an excellent example of this concept. The fact that the buttons can be felt is beneficial not only to the blind user but also to everyone else. Other examples include the talking clocks and calculators formerly manufactured by sharp and the talking answering machines currently available

from such companies as AT &T and Panasonic. With regard to these latter devices, the speech generated is sufficient to enable full control and operation without sighted assistance.

Usability ouutln means that ideally peripheral (and often expensive) piece of assiistive technology is not necessary for a blind person to operate an appliance. Although in some cases necessity may force us to use assistive technology ,'e.g..a Braille'n Speak equipped with an infrared transmitter) to operate some equipment with inftared:orother Ocainection schemes installed, this is not tille preferred method of controlling an electronic appliance. It makes no sense for us to have to use a piece equipment costinfta thousand dollars simply to op(crate an appliance that may at most cost a few hundred. One method for accomplfishing this goal would be to provide speech output, either built into the applianc or available as a low-cost accessory. Given the increasing sophisticatio,n of digital technology, this may well become a necessity for the appliances of tomorrow.

Accessible documentation refers to the concept of making instruction manuals available in a medium other than print. For manuals prepared using a word processor, it should be possible to make ASCII-text versions available (for a nominal Age) sty :mat we =gum wwu pc trkuisurwou Imo Dram or rcad on the blind person's own computer.

Guidelines for Physical Controls and Labels

Physical controls usually take the form of knobs, dials, switches, slide controls, and buttons In digitally controlled devices, they have sometimes taken the form of s.witches activated by light, pressure, heat, or capacitance. Usually these switch(3s are located on smooth control Panels that are totally unusable by the blind . Moreover, these switches often provide only visual cues indicate that they have belen activat-4. In some cases remote controls with tactile buttons are available, btit Jae user is presented with only visual, cues to indicate what the appliance is (doing.

Physic a co itrols should not depend upon sight alone for operation. Consideratio n ne xis to be given to the use of other senses (e. g. touch and hearing) to rnanii ulate controls: This would be of benefit to all Anon, blind and sighted alike;. Sighted users will appreciate not having to divide their visual

attention between two activities and will also enjoy the ability to operate the appliance even when lighting is poor Blind users will appreciate the ability to operate what would otherwise be an unusable appliance.

Here are some suggested guidelines. Bear in mind that other approaches are possible if sufficient creativity and motivation are brought to the design effort

1. Push buttons should be discernible by touch. The button can be indented, raised, or contained within a raised boundary that can clearly be detected by touch.

2. Push buttons should never be touch activated. Some minimal pressure should be required to activate the control, and the appliance should provide tactual or audio feedback to indicate when the buttons have been pressed.

3. The shape of a push button can provide important clues to its function. consider using texture or other tactual detectable changes (such as a raised symbol) to identify buttons for unusual or important fuctions.

4. Small closely clustered controls are often difficult to negotiate by touch. Consider spacing controls so that each one can be detected easily by touch. Ideally, spacing between controls should be no less than one- half the control's width or height. Crowding controls together to provide what appears to be a seamless surface makes them difficult to operate by touch.

5. Buttons that turn modes on or off should provide tactile or other nonvisual means to indicate the on or off state. These might include:

   Leaving the button in when a mode is on and causing it to pop out when the mode is off, or

   Generating a high tone when the mode is turned on and a low tone when the mode is turned off.

6. Slide controls can be made more useful if they have notches,clicks,or tactile markings indicating normal settings.

7. The use of a continous rotary selector (as in radio tuning knob) will be enhanced for everyone if a notch, dot, or raised pointer is placed on the knob. Also it is very helpful if the selector has a detent for every possible setting so that individual setting can be selected by touch.

8. Tactile lables should be built in to supplement visual labels which the blind cannot use. These may consist of raised sans serif upper-case characters made of thin lines. Tactile lables should not use pictograms or other nontextural symbols. This assumes that the controls beging labeled are not dynamic in nature-that the controls always perform the same fuction.

9. Braille labels and overlays should be made available upon request.

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WORTH TRUST, : KATPADI

Perkins Braillers

Those who have used braillers, know the qiiality of Perkins braillers. There **is no other brailler in the world to match their quality, precision, sturdiness,** and **long serviceability. However, the cost and procedure have been a matter of concern. The changing.dollar-rupee value had made this American Brailler expensive. Import regulations were so complicated, that it became difficult to fulfil even by those who could afford it.**

WORTH is a registered charitable trust, involved in the rehabilitation of **persons with disabilities. For over thirty years, the trust has been producing three wheelers, wheelchairs, and other aids and appliances. Recently it has started producting articles needed for those who are blind or with low vision problems. Aware of the difficulties faced by those who use, braillers, WORTH, with the active assistance from Perkins of USA, has plans to progressively manufacture the Perkins braillers in India. As a first step, WORTH has imported complete sets of components and under the direct supervision of experts from Perkins, has started the assembly of Perkins braillers.**

The Original Perkins braillers with the same guarantee, are readily available at a reasonable price of Rs. 9,500 each, exfactory Katpadi. No sales tax and excise duty. Forwarding charges and insurance will be extra as applicable. They can be despatched, on receipt of payment in full by demand draft payable to "WORTH TRUST" in any bank in Vellore and despatch instructions.

It is hoped that you will take advantage of the availability of the world class brailler, at a reasonable price, on rupee payment, without having to go **through the frustration and delay in fulfilling import formalities and foreign exchange regulations.**

Worth Trust, 48, New Thiruvalam Road, Katpadi - 632 007

Perkins Worth Braillers

The Perkins **Brailler, designed and developed by David Abraham, has set** the standard around **the world for braining excellence** since **1951. More than** 200.000 Perkins **Bfainershave been manuiitetuied. Perld is Braillers come with** a one year guaraipe. **against defe9tive parts and work lanship. All models** have adjustable margin **stops and will accomodate pape_** upto **fourteen inches** long. All mac nes ge mow **shipped with large paperfeed knobs and a redesigned** paperfeed roll **r system to better accommodate narrow paper. Printed operating** instructions ii **gnglish, french, German and Spanish are included with each** machine. All **iachines are supplied with braille instructions, a dust cover and a** wooden eraser.

Standard Model

The standard **erkini WORM Brailler is stwdy and portable and can** emboss ***a*** **lines with 42 °es on an 11"x11" 1/2" sheet of paper.**

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY: NEW DELHI

1. Development of an "Interactive Learning Environment"

This is a Joint Project between the Spastics Society of Tamil Nadu (SPASTN), Rajiv Gandhi Foundation (RGF) and NIIT Ltd. The project title is "CATERED", and is being carried out under my direction.

The full Project is described in the attached two reports.

In the context of the blind, the system offers the ability to build an Interactive Learning Environment - using speech synthesis, and interaction through a single-point input (I WRITE - the key board need not be used). The emphasis is on enabling teachers to easily enter courseware (teaching materials) into the computer, which can be used interactively by students.

Also books can be scanned into the system, and then selected and accessed by the I-WRITE methodology - and read out.

2. Braille Terminals

A foreign firm is requesting NIIT to be a sales outlet for its range of Braille terminals. The costs of these terminals will be rather high- the minimum price being Rs. 60,000 approx (minimum number of characters with no speech synthesis) going upto nearly Rs. 2 lakhs (40 characters + speech synthesis).

We have offered value addition services such as adaptation for Indian languages, etc. for a joint project with them. Would this be a desirable move from the point of view of the blind in India? I am searching for an answer that could be debated in the conference.

3. Braille Embosser Software for Hindi & Other Languages

We **have carried out a feasibility study on the generation of Hindi using a** two-sided **embosser, and ,this project could be completed in about 2 months** effort after **the specifications have been frozen.**

4. tor Aldow_ **Cost Braille Tutor Aid**

ıı[lpsin,g low-cost circuitry and a tape recorder, we had made a small prototype for **a Braille tutor. We would like to undertake such hardware/software projects,** if there **is a need for them.**

INDIAN INSTITUTE OF TECHNOLOGY & ALL INDIA , ANSTITUTE OF MEDICAL SCIENCES : NEW DELHI

Technological Advances in Rehabilitation Engineering for the Blind

Braille Duplication machine

Completely indigenous design

Enhanced perception of dots

Elevation of dots on different grades of Braille duplication paper well perceptible

Uniform heating and vaccum throughout the size of the Braille paper

Running electronic display of the process

Automatic electronic counting of copies upto 100

Swivel design ergonomical, more suitable

An indigenous model termed INDUTHERM has been designed and protypes are in use in a number of institutions spread over the country.

TECHNICAL KNOW HOW for production was accepted by the National Scientific Co. , New Delhi.

Braille duplication sheet

INDUBRAIL is a indigenous braille duplication sheet that has expelled the Foreign supply

Indubrail rolled to different thickness allows multiple applications

Quality reproduction

Reusable

Thermo-mechanically stable at room and elevated temperature

Electrostatic charge negligible

Variation in temperature, vacuum level and duration of heating allow for accomodai tr ome range ana quality or %v al text

Readability, reusability, surface texture and durability of the dots **on Indubrail w 4ccepted Stable** in humid and hot storage conditions

Electronic Touch Plate Braille Stylus : A Novel High Speed Note Taking Aid

Radical improvement **er the Braille stylus currently being used by the Blind**

A low cost **mechanical version**

Selection &dots **by light touch force**

An electronic version at a slightly higher in cost

Touch selection

Electromagnetic actuator

Writing down character by character

a miniature module with six sliding pins

Upstroke utomatically resets the module .,

Writing speed almost doubles

Micrometer for the blind

Standard micrometer modified for use by the blind at nominal cost

Tenth of the imported version

Linear and circular scales amplified

Accuracy not compensated

Use by sighted not affected

Performance fficiency as that of

User trials

Knowhow Transfer

Same as above

Monitor for Stress on the Blind

Portable respiratory and cardiovascular function Kuwait=

Data accesable on a small tame:corder.

Arrangement to strap the system on the back for ambulatory monitoring.

Study planned and conducted during street crossing

Applications in excercise physiology.

Graphomat

In the training schools for the blind there is considerable constraints in the communication of diagrams, maps and shapes. Presently the training is based upon the use of embossed sheets having the diagram or map as elevated lines and dots which the blind can feel with the hand. Even in the best schools only a few such embossed sheets with a limited variety of diagrams are available. Therefore the teaching is limited to these diagrams and there is no flexibility of making changes within the classroom. The student also cannot communicate back to the teacher. A new concept entitled GRAPHOMAT has been conceived to overcome all the above limitations.

The concept is based upon a convenient system of communicating X and I/ co-ordinates of the points along the lines of a diagram as well as the level information. The communication is by voice. A simple and quick method of reconstruction of the communicated information maintaining the relative coordinate orientations is provided. Furthermore the reconstruction is implemented with pegs of different heights so that the blind can feel the contours with the hand and also at the same time obtain level information.

To realise the concept in practice the X-Y coordinate coding is obtained by means of a cursor sliding over a drawing with the position movement in the two directions can be read out by the teacher. For reconstruction a perforated mat in the form of a matrix of holes is provided. A cursor is moved over the mat in synchrony with the movement on the teacher desk. Corresponding to the two coordinates read out by the teacher the student places pegs of the appropriate height in the holes in the mat. Thereafter the diagram can be felt. A special orientation of the holes in the mat allows for quick reconstruction

with a coarse matrix for most diagrams. Thereafter the required highter density filling can be done.

Universal Graphical and Braille Communication System for the Blind

A computer based system had been developed earlier by the investigators to communicate diagrams and text to the blind in the class room (16). The system was based upon a single computer placed on the teaching desk and only monitors on student desks. Access to the information displayed on the monitors was obtained by means of an optoelectronic sensor and vibrotactile output. Two versions of the sensor had been made, one for sensing line diagrams and the other for Braille text. The innovation now adopted brings in the capability of the computer along with the digitizer to present complicated physical, political or mobility maps to the blind students. Maps are placed on a digitizer plate illuminated from the bottom and traced by the 'Mouse'. Coordinates of the digitized boundaries upto an accuracy of 0.001 mm are stored as digital values to be retrieved as a reconstructed map on the computer screen. A modified version of the vibrotactile stimulator used for tracing line drawings is moved over the screen to study the map outlines. Different shades of gray are perceived as changes in frequency of vibration. Through proper training, the blind students can distinguish at least seven different vibration frequency. For improved perception the map boundaries are drawn by adjoining black and white lines. This gives a 100% discrimination of the boundaries. When a small portion of the map is to be presented in detail, that section is enlarged by computer software to a user selectable magnification and displayed on the monitor screen. Thus the maps fed into the computer once can be modified retrieved and updated by simple software techniques. An added advantage of the system is its low cost and convenience to use. Efforts are underway to provide a hard copy of the map on the plastic sheet. The system is being tried at one of the Blind Schools in Delhi.

Central Lathe for the Blinds

In the past blind mechanics have been taught to work on the capstan lathe set by the sighted and by moving a few levers repetitively producing similar job pieces again and again. There was no known system enabling the blind to work on a centre lathe machine which is a general purpose equipment very widely used. For the rehabilitation of the blind it is a challenge to devise a scheme not

involving automation but opening up the centre lathe operation as an avenue of employment.

For this purpose the perceptive capabilities of the blind was examined in detail especially in respect of touch, vibration 'and sound. These modalities were then used as substitutes for sight in ceittre lathe operation. A scheme was devised by which all designed to give a practical shape to the scheme (17). All jobs made by the sighted could also be made by the blind at a speed comparable to that of the sighted.

This project received the National technology Award from Ministry of Welfare on the World Disabled day and National research and Development Corporation Award. Also the Product was selected for World intelectual property award.

INDIAN INSTITUTE OF TECHNOLOGY : KANPUR

Vaneeshree.. a speech synthesizer Multiple Handicapped

Vaneeshree is a speech synthesizer useful to the vocally handicapped and/or spastics. It has in its memory most of the useful sentences needed for communication in normal day-to-day life. The patients may select any sentence ' using two switches and by pressing "talk" (a third switch), the sentence becomes ='audible in &nearby speaker. The latter draws its power from 220 volt ac line and 'fthe loudness may be made enough for the whole house.

The sentences remain in the memory in highly compressed and coded form: it takes only 2% of the memory-space compared to what the digitized sentence would have taken . This has reduced the size of vaneeshree to that of a calculator. Edge-connectors are provided for different types of touch-operated switches mountable to the wheelchair or in any part of the dress of the handicapped person if they do not possess the required mobility of fingers.Footoperated or chin-operated switches will also be available.

Thus the handicapped people who otherwise remain bed-riddeen and can not communicate even if they are thirsty or hungry, will not have to wait till somebody sympathetic comes and asks their need. Some spastics move freely either on foot or on wheelchair. For them a portable vaneeshree is available. It is operated only with 5v supply and it has its miniature speaker mounted inside. The life of the batteries (2or four, rechargeable) depend on the models; usually it will vary between 3 to 8 times longer compared to the life of the same battery within a'2 cell torch (consider the life within the torch as unity).

The following models of vaneeshree will be available:

Model -1: It is simplest in operation .It has 56 sentences,each having duration between 3.5 to 7 seconds. Its speaker (including audio-amplifier) lies mounted somewhere in the house and a thin 3 wire connection is provided between the speaker and vaneeshree.The connection is detachable using freely available 3 pin stereo-jack. This model gives brightest LED display of sentence number in its portable model, the life of the battery will be 3 to 4 times.

Kanpur, 208 016, India

Model-2: Somebody may feel it difficult, at least initially, to remember the sentence- number for his/her particular need: it is expected that it will be considerably easy afterwards in the same way one remembers the telephone numbers of friends and relatives. However, this difficulty, is removed in the second model. Here the sentence, in short form, is also visible in LCD display by the side of the number which may be varied in the same way as in model-1. The size of this model is about 20% bigger than the first model. but its power consumption is considerably less. The battery life will be about 7 to 8.

Model-3: Here a graphics display is provided (eg.a glass with water instead of writing" water"). In addition to the additional charm of graphics, this model is useful to the handicapped deprived of formal education.

Model-4: In this model a chord-less connection is provided between vaneeshree and the highpower amplifier hanging somewhere in the house. The handicapped person may move freely in the house, courtyard and the garden, and may even communicate.

A Technical overview:The sentences are recorded and coded off-line.The very recent model of mixed glottal excitation is used here. All the. sentences and the execution programme remain within the EPROM(27CXXX series). Using only one such EPROM, about 250 sentences may be stored, with more EPROM the storing capacity will be multiplied. The long synthesis programme is executed on-line using the recently available high speed DSP chips

<u>Other uses of Vaneeshree</u>

(I) In Hospitals and Nursing Homes:

This device may also be used in many places. eg . for communication between the patients and the doctors (or other medical personnel)in the hospitals and nursing homes. The patients simply will have to select the appropriate sentence number : on giving "run", the doctor on the other end will hear the complete details (here long paragraphs are delivered against a single number) and may expedite all emergency apparatus and personnel .

(ii) Multilingual Talking-Aid to the Tourists and other Executives:

Tourists may ti'ave1 **in areas where tilp knguage ic ti"f known. They** may communicate **their questions (du action** finding,purchase in **lecal market** etc) through vaneeshree. **In this use, t e EPROM is kept replacea Le like the cassettes in audio-player The user.will simpry nave to change me ritaOM(raising a handle and refixing b zk)of the language needed.**

(iii) Communication from Inside the Mini :

The device] also helpful for communication from inside the mine where little electrical pc ver is available. The portable vaneeshree with the speaker outside the mine .may provide a 'reasonable solution to this otherwise critical problem. Since *ewer on the surface is enough, attenuate amutification with **other siren like alarms may** be provided if the bay tery-operated Vaneeshree sends a signal of danger.

Modification of vaneeshree for visually Handicapped

Simple modifieauons of vaneeshree are possible to convert it as a talking thermometer, talking weighing machine etc. A few modalities are shown below:

1. **Talking thermometer: In this case, the circuit conveying the sentence number may be modified as a number varying with temperature (or weight in case of talking weighing machine).**
2. **Audible type-writer Vaneeshree may be hooked up with a computer operating' as a type-writer or controlling a typewriter: m this case, each letter typed may be made audible. This will enable the visually handicapped person) operate the typing machine.**
3. **S.T.D booths for the blind: simila** type of **extension is possir** 4e in S.T.D booths. **With telephone numbers, billing etc made audible** a visually **handicapp d person may operate the booths.**

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BHABHA ATOMIC RESEARCH CENTER : MUMBAI

Team

Text Entry and Access Management system ((TEAM) is a text editor **developed for the visually impaired. Visually handicapped can independently use this system to handle/create, and read text documents even in the** printed **form that might otherwise have been difficult or impossible. Users require** no **previous computer experience to use this system via the braille keyboard,** while **experienced users can use the PC keyboard. TEAM offers a magnified** mode of **text display, with high contrast for the partially sighted. A special communication mode between blind and deaf is incorporated to help multiply handicapped communities to interact and help each other.**

The development of TEAM system for the blind is an excellent spin-off from the Nuclear and Reactor technology in service of mankind. This has far **reaching social effects on the status of blind community. The TEAM** system **opens better prospects for integrated education, rehabilitation and higher** status **employment opportunities to-the visually handicapped.**

Features :

Creating, Reading Editing and accessing of text documents.

- **Pause/Resume Read**
- **Edit Text**
- **Find/ Replace Text**
- **Scroll Pages**
- **Scanning of text from books, papers and magazines.**
- **Keyboard access to all facilities.**
- **Provides a flexible, customizable user interface that can accommodate the user's needs and preferences.**
- **Support the user's choice of input methods by providing PCand** Braille **keyboard access to all features and by providing access to common tasks using simple mouse operations.**

Screen review in the form of audio feedback.

A r, B readditikes toe tos aitpiayea 'visually **on the screen and Makes it available as synthesized speech.**

High quality continuous speech.

Unlimited spoken vocabulary

The ,Ity alsq **,tracks what the wet** is doing and the location of **he** focu I to **describe the important aspects** of what is happening on **he** screen.

E **ascribes the selection aid foctis to the user.**

Describes and activates controls and other screen objects.

P **,rides visual focus by highlighting the word that is can being gaol**

"**zoom" facility scales everything in the document to a user-selected rdo.**

Support for high contrast selection.

A 6hat mode which allows conversation between blind and deaf and di **II).**

T **speech output can be oustontized for**

Ottt' 'Volume tat	**(low-high)**
* **Pitch level**	(low-high)
Speech rate	**(stow-fast)**
Speaker type	**(different voice characteristics)**

Braille Keyboard

norms key scanning, Braille code interpretations and conversion tn ASCII **code.**

Transmission to PC via COM1/COM2 port.

- **Provides 68 printable ASCII characters for Grade 1 Braille.**
- **A command interpreter for converting Braille to ASCII.**

System Configuration

IBM Standard PC 486 or Pentium with Windows 95 Loaded

SVGA monochrome monitor (SVGA colour for partially sighted)

Any standard printer with Windows 95 compatible driver.

Optical Scanner flatbed Scanjet II P or higher.

Sound Blaster Card SB-16 Creative

Optional Braille Embosser (Centronix compatible)

Additional Hardware

Electronic Braille Keyboard (BARC)

Software

TEAM aplication software

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wiNATIONAL INSTITUTE FOR THE VISUALLY $122: HANDICAPPED : DEIIRADUN

EducatiorptrAids for the Blind

(Geome tit. Graph Board. Tactile Diagrams. Scrabble and Mathematical Board) Prh

Most **of the subjects, like mathematics, science,economics,etc.demand diagrams** to **enhance understanding and for better explanation. without a proper diagram** it **is very difficult to ensure proper understanding of these subjects, without doubt it is a challenging task for educators to teach these subjects effectively to the visually handicapped.**

Efforts are being made to teach these subjects effectively with the help of models: making drawing with thread and glue: producing drawing with the help of **thermoforming machines: using capsule paper: cellophane paper , etc. It has been observed that to produce tactile diagrams we have to go for expensive methods-technology, machinery, time, money demanding ideas, etc. some educators shy away from the subjects due to lack of sufficient teaching aids.**

The **Witrinically weaker sections find it difficult to buy this technology which wokmake it easier to teach these subjects effectively to their children. If any m gful device is developed which overcomes the problems of maintenantoinfort in using the device, recurring expenses, procurement of the devicatrwithin their capacity, using indigenous materials for production of the drawings, no doubt it will be appreciated by all sections of society. If any educationalid can be developed to overcome these problems for poorer sections of the corrunnity it would be of benefit to all.**

In **India in the recent past some meaningful devices have been developed** to teach ***objects like Geometry, Graphs, Science subjects (physics, chemistryNology etc.)Maths,crossword puzzle board (to improve vocabulary)** and so or **These simply constructed,low-cost devices never demand any** additional **effort ,expensive equipment, maintenance,etc. with the help of these** simple delicps **we can produce a variety of embossed drawings on simple paper** (photo_copy ,quality **paper) or plastic sheets.**

116, Rajpur Road, Dehradun, 248 001, India

Geometry set :

This simple Geometry set consits of a rubber mat board, of size 300x300x1 Omm fixed to a hardboard base serrated scale with "C" bracket, spoon pencil Braille scale with locating pin, Braille scale "B", serrated arm protractor, spring divider, serrated circular disc, writing frame with stylus, protractor, etc.

The rubber mat board has a number of holes. The vertical holes on both sides are for fixing braille scale and for writing frame. The holes given in radial have a distance of 5 degree, and are for drawing open angles from 0 degree to 90 degree. To draw open angles the serrated scale with bracket can be used.To fix these on to the board the C scale and bracket pins at the bottom. To form a triangle ,parallel lines, and any other desired geometrical shapes the braille scale and armed protractor are used. The braille scale, which has a pin at each ends can be fixed horizontally and vertically on both sides of the board to draw circles the serrated disc is used. The slot given in the disc is to locate the point where the centre pin of the disc is to be fixed. The index finger is used to locate the point.

The embossed lines are drawn on the paper with the help of the spoon pencil, the serrated instrument placed on the desired place and then the paper is placed on the instrument. (The paper can be fixed to the clamp which is fixed at the top of the rubber mat board). The spoon pencil has a small groove which helps to draw embossed lines and avoid mistracking. In a similar way the circular fraine is used to write in Braille. No doubt the board with its disc is also used to draw circles, etc. The writing has its own limitations which are overcome by the new version of it.

Geometry kit (New version)

This new version kit requires no additional instruments. The same instruments can be used if required. The design of the board is such that it mostly avoids the use ofthe instruments like serrated arm,serrated arm protractor, etc. If required the same can be used which are supplied with the instrument.

The new verson is an aluminum board measuring 3 00x300x1.5mm with a number of holes. The vertical big holes are meant to fix the braille scale,writing guide, etc. The board has a number of small holes which are vertical, horizontal angles of 15degree,30 degree,60 degree-and in a circular direction. The distance, of the circular direction holes is 5 degree and the rest of the holes are 5 nit apart. A clamp is fixed at the top of the board to hold the paper.

DiO: **Twisted thread with a needle is used to make the desired geometrical shapes. The thread is taken out at the starting point of the hole.i.e "a", and is inserted into the hole "b" at the required distance. The thread is taken out from hole It" and inserted into the next desired distance hole "c" The thread can be *died at the bottom of the plate by using a paper clip,coloured thread will help the low-vision children to see the drawing once the threading on the plate is pleted a paper can be placed on the board. The paper can be fixed using the clamp attached to the paper. The spoon pencil is used to draw on the paper** which produces the embossed **drawing.The same can be used for thermoforming** also if required.

By manipulating the twisted thread and instruments any geometrical figures can bie **obtained on the board and print can be taken on the paper manually.**

:This method can also be used on the graph board to obtain graphical figures. Ano ler method can also be used to draw a graph. A graph drawn on graph paps [¯ **can be fixed on the board. The printed locating point can be used as a** guid **for quick threading and to confirm the graph figures drawn by the sighted.**

The graph board is also made out of 300x300x1.5mm aluminum board with clamp. The writing frame can be used for writing in Braille. self-adhesive tape **can be used to show the points.**

TO* Diagram Boards

rSome of the science subjects cannot be taught with models,i.e.three-dimensional models. For example. light rays, magnetic waves, some minute organisms, etc. The concept of these subjects can be taught only through two-dimensional **media ,i.e. drawings For some subjects models can be prepared and** practically **explained to the V.H childem but models cannot be made into two-**dimensional **form for effective teaching and to have reproduction of prints, etc.**

For any **permanent standard tactile diagram board to have full educational** 4,414, **they should avoid recurring expenditure and be able to produce print on simple commercial paper.**

rrt

Nearly 150 various tactile diagrams have been on standard plastic material. size of the board is 150x110x2mm.The boards explain subjects like physics, chemisny, maths,geography,etc. Embossed print can be taken on simple paper ItXplacing the paper with the help of an eraser. Since nothing is written in braille on the board it can be used by any language and they can write in Braille in their

own language on the self adhesive strip and paste it on the board. A thick, suitable color sketch pen can be used to draw lines along the embossed lines on the board and hence can be used as a low-vision aid. The size is also comfortable from a manufacturing and pricing point of view. since the size is comfortable the information received by the board and hence can be used for many years. Some of the large drawings are split and molded to avoid any additional manufacturing cost. This type of tactile diagram board has also been developed elsewhere Any design can be molded on request, at low cost.

Crossword Puzzle Board (Scrabble Board)

Various designs and models of scrabble boards are available in the market.The developed Crossword puzzle Board has many advantages over them. One of the best education and recreation aidi is C.W:P. Board .The board has been developed not only for the blind but also for the low-vision sighted people. All can play together and enjoy it. The low cost of the equipment no doubt makes it attractive not only for developing vocabulary but also for teaching simple maths, bar charts, etc.

To keep the price of the board at the lowest level it is manufactured in hardboard. The foldable board has 15x15=225 square punched holes. The coins are made out of plastic. A total of 98 coins are supplied. These are square in shape with a "step" at one side to enable blind people to recognise the top edge. The top left-hand corner has an embossed print letter. On the underside of the coin there is a square projection,which is meant to be inserted into the square hole in the board. This enables the coin to sit properly and avoids disturbance of the coins while being read visually or by use of the fingers.

Numerical coins and symbols .are also developed to teach/learn simple maths. The same board and coins can be used to give a concept of graph charts and other graphical figures. If the embossed letters are written with sketch pens in pleasant colours the low-vision people can see the letters and play. Since the letters are embossed the blind and newly-blind can feel and recognise the shape of the letters, making it a very good integrated educational and braille learing kit.

The cost of all the educational aids is kept as low as possible to make them available to the economically weaker sections.

WAVELET GROUP PUNE

Trainin ties f r the visuall handica

Introduction:

The era of electronics and computers has opened up exciting avenues in development of aid equipment useful for visually handicapped people. The ***bbess,*** affordability and versatility offered by an electronic device today the technology an integral part of any scheme to develop aid/ equipment handicapped in general and the visually impaired in particular. Numerous fes ofprecedents of the use of electronic technology can be quoted covering li 'therapy units for speech/ hearing impaired, myo-electric limb control s for paraplegics and amputees, speaking calculators and note books for visually impaired, electronic magnifiers for the partially sighted etc. This presents a few specific electronic and computer based developments for by the visually handicapped and the impact of these technologies on the raining and employment options.

Job option with computers:

A modem day job in a typical office environment can hardly avoid being associated with the use of computers. Most computer based jobs require very little physical mobility, and are generally based on creative thinking of the user. These features make a computer based job option extremely suitablefor a visually liandicapped person .

A standard computer carries input and output devices. A large number of keys and a visual screen for interaction with the human user and relies on an operating system and appropriate software that is oriented towards the use of the input and device. For a visually handicapped person, the visual feedback on the screen of a computer is of no use. Further, the navigation of fingers over a large keyboard containing nearly 100 keys is very difficult in the absence of vision feedback leading to frequent errors in the data entered using the keyboard. These drawbacks of the conventional computer become a large obstacle in the excercise of the computer based job option by a visually handicapped person.

999-B, Navi Peth, Niyojan Society, near Dattawadi Bridge, Pune 411 030, India

Braille Talk

The Braille Talk add-on equipment developed by Wavelet Group of Arne, attempts to remove the traditional drawbacks mentioned above. The equipment has a native. India language (multi-lingual) speech synthesis capability that makes it possible to obtain response from a computer (instead of a screen) and a novel Braille coding based data-entry software. This indigenously developed aid equipment is compatible with the basic operating system of the computer (DOS) and also works in conjunction with a host of other standard software applications such as word processing. C programming etc. With these features, a visually handicapped person can use a standard computer just the„ same way a sighted person uses it and exercise the option of a computer based job. The device "Braille Talk" also offers other unique features such as external add-on to a computer, user-friendly command structure, truly Indian diction in speech synthesis, optional large font display on screen for partially sighted persons, file reader service reading computer text in Indian languages and at an affordable cost.

BrailleTrain for Training:

To make the employment option viable, however, sufficient training facilites need to be provided much the same way a sighted computer aspirant would need them. since there are no specialized training programming available to this effect, Wavelet Group offers a 2 month basic course called "Braille Train" to visually handicapped person covering DOS file handling, word processing and elements of C programming The persons entering the course is assumed to be knowledgeable in the use of English Braille and in general aptitude towards the learning of computers.

Two batches of 6 candidates each have already completed the "Braille Train" course and the results are truly satisying : The academic qualifications of the candidates varied from 10th standard pass to post-graduate in arts and all the candidates could complete the necessary training in the stipulated time period. The trained persons can for example take a dictation for data entry into word processors, author test files of their own creation, write C programmes and manage the file structure of the computer. During the visit by eminent persons to the course, it was found that the candidates were truly job-worthy in a computer based job situation.

Since "BrailleTalk" can read text files on computers (in English as well Indian languages) it is also useful in training at an individual level. Most texts are now-a-days available on computer compatible media as files. BrailleTalk can provide interactive access to this information along with information down-. loaded from networks like intemet etc. The aid/equipment "Braille Talk" was also found to be useful in providing a writerless platform for taking examinations by visually handicapped persons.

In this regard, it is important to note that most states in India do not permit visually impaired students to opt for science at higher secondary level, which to a large extent inhibits development of the student for possibly choosing a future option of computer based job. Braille Train's initial success should haps be taken as a cue to make a significant policy change in this connection.

Heye Vision:

A sizable proportion of the visually impaired population is partially sighted, in many cases retaining, sufficient vision to be able to read with the aid of a magnifier. In a typical visually handicapped rehabilitation facility, there may be many as 25% partially sighted persons who are otherwise categorized as 4 due to non-availability of suitable aid equipment. HeyeVision is an electronic enlarger whih offers high magnification (up to a factor of 40)with - high contrast. The electronic enlarger works around a TV set and a suitable '„timage sensor to provide crstal-clear, distortion-free enlarged images. HeyeVision has unique features such As 'souree for operation in any ambient condition, microphone for publiotaddressi of text being read and a truly affordable cost.

HeyeVision has a urtiquprapraqcation in training of visually handicapped hpersons with partial visimtAgAtxtsfcr advanced studies are seldom available in Braille embossed form, a partially sighted person can benefit from independent reading of the printed material using HeyeVision.

Conclusion:

The training and eliwlo me iltAipp ects need to be reconsidered in the era of electronics and computers to provide creatively challenging job options to the visually handicapped. ,Theftigeikrid/equipment such as BrailleTALK and HeyeVISION can be seen as picki establishing the need for a change in our policy.

ELECTRONICS CORPORATION OF INDIA LIMITED : HYDERABAD

Viewing Aid for the Partially Blind

The viewing Aid developed by ECM incorporates latest art of technology to provide reasonable level of magnification (of the order of 30) required by the partially blind.

The system is made up of Black & White CCTV Camera, lens system with a variable magnification facility, a stand to move the Camera in horizontal plane both X and Y direction. Three focus lights will provide sufficient illumination to pickup the images by the Camera. The reading matter/diagrams will be displayed on 20" Monitor in magnified size.

Care has been taken for smooth movement of the Camera with little effort.

INSTRUMENTS GROUP

Viewing Aid for the Partially Blind

The Viewing Aid for Partially Blind (low vision) people incorporates latest state-of-art technology to provide reasonable level of magnification for better readability.

The system comprises of high resolution Black & White CCTV camera, lens with magnification facility, a carriage system, lighting arrangement and 20" black & white Monitor. Monitor has + ve and - ve video selection.

The equipment can also be hooked up to a projection TV with large screen display for class room education where large number of students can read simultaneously.

Specifications

Camera	**1" vidicon camera/1/2" CCD camera CCIR-B standard, 625 lines, 50 fields/sec.**
Resolution	**400 lines horizontal**
Video 0/P	IV P to P
Power Requirement	**230V, Single phase 50Hz or 12V DC, 75 mA.**

Lens	• **Manual Zoom lens**
Magnifier	• **30 times (variable)**
Reading Table	**Hand operated X & Y axis movement independently**
	Light focussing arrangements for better Clarity
Monitor	**A3 size document coverage**
	Resolution 800 lines
Input	**IV P to P composite video (Max 2 V)**
Power Requirement	**230V, single phase 50Hz, 75VA**

NATIONAL COUNCIL OF: EDUCATIONAL RESEARCH AND TRAINING : NEW DELHI.

Adaptation in Science equipment & instructional material for disabled children at elementary stage

The Science Kit has been developed by N.C.E.R.T in an effort to improve the Science Education. It has been a part of Operation Blackboard and been adapted for the Visually Impaired Children. Instructional Material has been designed and developed to meet the Special Needs of Visually Impaired Children in Learning Science. In addition, some instructional material for the teachers has also been developed to have the teachers teach the students learn basic concepts through touch and through actions and experiments. The equipment can be used for measuring length, volume of solids and liquids, temperature and weight.

The Kit includes :-

(1)	**Embossed Scale**		
(2)	**Embossed Measuring Tape**	:	**For measurement purpose**
(3)	**Tray with centimeter Cubes**		
(4)	**Syringe**		
(5)	**Measuring Cylinder with Floating Indicator**	:	**Volume**
(6)	**Two Pan Balance**	:	**Mass of an Object**
(7)	**Spring Balance**		**Weight of an Object**
(8)	**Dial Type Thermometer**	:	**Temperature**
(9)	**Activity Sheets on each technique**		

The Instructional Material for the teachers to teach visually impaired children using the kit gives the suggested teaching steps, the equipment/material to be used and the learning outcomes.

NATIONAL FEDERATION OF THE BLIND IN COMPUTER SCIENCE: MINNEAPOLIS

Guidelines for More Sophisticated Digital Devices

Appliances which use digital technology pose a more complex problem for blind people: Individual buttons do not perform the same function consistently. Modes change automatically, without notice. Often, the operator is required to select an item from a menu displayed visually. Although for some devices a remote control with tactile controls may be available, the blind person may be unable to perform any control or selection functions because the choices to be made are displayed visually with no verbal prompts. In other words, many appliances have today become dedicated computers, with all that the term implies.

Although many digital devices with relatively simple control systems can be operated without sight. It is often necessary for the blind person to spend considerable time and effort memorizing numerous sequential procedures. The control of these devices is made more difficult when they memorize settings - even when turned off. Sometimes these devices will shift from one menu to another after a predetermined amount of inactivity time has passed, making it difficult for the blind operator to determine what function is being selected.

The guidelines presented here are at best a preliminary attempt to deal with the digital appliances of today. It should be understood that, as digital appliances become even more sophisticated, these guidelines will need to be adapted. Here are some suggestions that can enable blind people to operate digital appliances independently with the maximum possible efficiency.

1. **There should be a way for the user to return the appliance to a state where all mode settings are known. This is different from the "reset" function that many appliances have to restore factory settinges. The intent here is to enable the operator to predict what will happen when specific proceedures are executed. If the operator makes a mistake in executing the procedure, he or she should be able to return to a known starting point to try again. In addition,the operator should be able to perform any desired function from this known state with a minimum number of keystrokes.**

Curtis Chong, Minneapolis (USA)

2. If the design calls for displayed menus to change automatically after a certain amount of incactive time, there should be a way to lock the display so that it does't change, or, failing that, an audible cue should be provided to alert the operator to the fact that the display has changed. In this latter instance the design should be such that the user can predict what the display will change to, without having to see it: and it should be possible to turn off the audible cue when it is not needed.

3. The design of the digital appliance must be such that a blind operator can memorize a sequence of events that can be executed consistently to perform a specific function or set a desired state. If for any reason the sequence of events needs to be aborted due to an error in execution, the appliance should provide some means of letting the blind operator know that the error has occurred and return the device to a known state. A simple beep will suffice for most situations. Other audible cues should be provided to indicate, for example, wheii data are to be entered (as in the security code for an automatic teller machine): when an automatic sequence is beginning and ending: and when the appliance will no longer accept input. Audible cues may not always be desired: therefore, there must be a method for turning them off.

4. If speech output is built in to the appliance or 'provided as a low-cost accessory:

   a. There should be a way to turn the speech on and off. This mechanism should not require sight for use. People who do not need the speech may find it a novelty at first but will quickly find it an annoyance if they cannot disable it.

   b. Speech should be responsive and interruptable. This means that it can be stopped and started almost istantly, simply by pressing a key which causes new speech to be generated.

   c. A button should be provided which causes the speech to speak the entire display, if it is one line, or the entire list of menu choices, If the display consists of multiple lines. If **a** choice is to be selected from a list, method should be provided to speak each choice individually so that the operator will know what is being selected.

d. Speech outputdoes4ot need to carry **more information than the visual** display unless it is essential to the opefation of the appliance.

A headphone jack should be provided for private listening. This will **mole the blind person to hear confidential information as in the case of loatomatic teller machine.**

Conclusion

The principles and guidelines set forth in this paper should not be viewed as the total answer to the question of how technology can be made usable by ople who are blind. For one thing we cannot possibly know all of the forms at future technology will take and the problems that such technology will pose for the blind. Moreover, technology is changing at an accelerating rate. Solutions that may work for today's technology will certainly not solve the problems that wiltarise witirthe technologrofthe future. We ean hope,however fthat designers, engineers, and marketers will make a conscious effort to ensure that the products emerging from their work can be used by those of us who are blind - blind and sighted alike - and plan their work accordingly, we stand a better chance of maintaining parity with our sighted peers in our ability to use electronic appliances.

CENTRAL SCIENTIFIC INSTRUMENTS ORGANISATION.: CHANDIGARH

Ophthalmoscope

The ophthalmoscope is developed at CSIO. Chandigarh. as a part of the project "Design development of ophthalmoscope & otoscope diagnostic set", sponsored by Deptt. of Science & Technolgy, New Delhi. The instrument is presently being imported to meet the total requirement as there is no manufacturer of the same in the country.

The Ophthalmoscopic examination provides information about the presence of opacities in the cornea, lens or vitrous humour and status of blood vessels and fundus etc. The instrument is extensively used for the diagnosis of a detached retina, tumour or foreign body.

It consists of a power handle and an Ophthalmoscope head which can be quickly fixed on the power handle. The power handle has a provision to hold two dry cells of 1.5.v each and potentiometric on/off switchfor providing desired level of voltage to a miniature halogen lamp enabling the availability of continuously variable intensity level for eye examination.

The Ophthalmoscope head consits of a miniature halogen lamp 2.5v. 0.7amp. a parabolic condenser, an aperture, an objective lens and a mirror to provide a circular light spot of uniform illumination The rotatable knob which has two circular apertures, green filler and a graticule can be rotated by the doctor to postion any one in the light beam for aiding in the diagnosis of eye diseases. The lenses of various dioptric powers in the range of +/-1.0to+/-20 and-30 are incorporated on a rotatable lensatic disc, one of which can be positioned in the viewing path by the doctor for eye examination.

The dioptric power is illuminated by halogen lamp through a micro rhomboid prism which is then read by a magnifier.

Five prototypes of the instrument are fabricated and clinically evaluated at AIIMS. New Delhi: PGI, Chandigarh and Govt. Medical Collage, Chandigarh. The performance of the instrument is reported to be comparable to the equivalent model of the imported instrument.

Sector 30, Chandigarh, 160 020 India

HYDERABAD SCIENCE SOCIETY. RESEARCH AND DEVELOPMENT : HYDERABAD

Litt,.

Electronic Guido **Stick for the Visually Handicapped**

Inirouduction

During the year 1990, the Hyderabad science society demonstrated the principle of an electronic guide stick for visually handicapped using wire guidance technology. This is **similar to that used in** automatic guided vehicles- a project on which the Hyderabad Science Society had been working on since 1985. The first prototype of the guidance system for the visually handicapped had four channel capabilities-i.e. upto four different track routes could be selected by operating switches on the guide stick. Eight channel capability was subsequently developed. The **Government of India, Ministry of Welfare sponsored** a project in 1991 to fabricate **one hundred guide sticks and distribute them to different centres catering to visually handicapped people in 1995. A larger project was initiated by the Ministry of Welfare to fabricate and distribute two hundred and fifty guide sticks to different institutions throughout the country. This project is currently in dye§s.**

Application of wire guidance technology to electronic guide stick for the visually **handicpped:**

The wirt [141] **dance technology can be applied to the guidance of the visually handicappecifor indoor use and where guide wires can be laid outdoors-campuses pa#011ing areas, etc. As in the case of the automatic guided vehicles, the guide wire are connected to a power source. Tract detection is done by installing an fietitiition sensor inside a stick and connecting this-through appropriate electronic circuits-to** a buzzer. which gives an **audible signal when the stick is in the vicinity of the guide wire. This audible signal enables a visually handicapped person to move over the pre-laid track without much deviation.**

12-2-46 fdiOnam, Hyderabad, 500 028, India

b -)

By laying several wires-each leading to a separate destination and carrying different signals -several routes can be covered using one stick. However, route or track selection has to be done by the user by operating one of the track selection switches on the guide stick. Signal processing circuits inside the guide stick, pick up the particular signal whose switch has been operated and guide the user over this particular track to the selected destination.

Technical Aspects Of Guidance System:

When a single track is required, a guide wire is laid from the origin to the destination and back. The wire used is a multi-strand variety with adequate insulation to withstand water seepage in the floor.The wire can be laid under a carpet or matting or in a plastic conduit burned just under the floor, From the destination the wire is routed back to the origin where the power oscillator is generally housed. The return wire should be at a distance of more than two meters from the main wire, to avoid pick-up of unwanted signals.

For multi-track applications all the wires start from the power oscillator and each wire branches out from suitable points to different destinations. Return wires from destinations are provided as discussed above.

An extra wire is also run separately from the oscillators and meets the junctions of all tracks..This is known as a "beacon marker" and carries a signal different from the other tracks. This signal operates a different buzzer on the stick and indicates to the user that a branch line has been reached so that a different route can be selected at this stage instead of returning to the orgin and starting again.

Guide stick:

The guide stick is fabricated using a hollow plastic coduct of 18 mm diameter and 975inm length. The lower end of the guide stick accommodates the induction sensor. The electronic processing circuits take up the central portion while the upper part accommodates the batteries, switches and a gripper at the top end.

The induction sensor is a coil wound on a ferrite core. This is connected to the processing printed circuit board where the signals are amplified using op-amps and then passed to phase-locked loops. Depending upon which frequency/track is selected (by push button switches), the stick is tuned to this frequency which determines the track/route to be followed.

Eirc 'The signal, when detected, operates a buzzer which indicates that the user is on the right track. A battery holder accommodates four nickel cadmium/dry is and this powers the entire stick electronics. A red LED ed on the stick flashed intermittently when the power switch is operated, for others to be warned th a a visually handicapped person is walking.

second buzzer is used to indicate the location of a beacon market. A jack soc cet is provided to connect the battery charger if rechargeable cells are used.

Range of Applications:

U ors of the guide stick can be divided into four categories:

a) Permanently visually handicapped.

b) Temporary visually handicapped.

c) The aged whose vision is progressively deteriorating.

d) Normal sighted persons needing guidance in dark areas or at night.

SPARSH PRODUCTS : DEBRA DUN

RESEARCH NOTE ON THE INEXPENSIVE AND INDIGENOUSLY DEVELOPED DEVICES FOR RECREATION & DAILY LIVING SKILLS AND OTHER AIDS FOR THE VISUALLY IMPAIRED

Many Institutions and Individuals are working for the welfare of the handicapped in the field of education, rehabilitation, and technical research to make their life comfortable. Besides, Govt. of India has done tremendous work for the upliftment of the visually impaired persons.

I feel that the area of devices for daily living and recreation has not received adequate attention in our country. Due to the limitation of mobility visually impaired persons are not able to go out side, and make good number of friends to enjoy their leisure time Secondly, the recreational items which are readily available in the market are meant for normal children which cannot be enjoyed by the visually impaired usually. Thirdly, the recreational and daily living aids which are available for the visually impaired are very few and expensive also.

Considering all these factors I started my research work and develop various recreational items, daily living appliances and machines which are helpful in making life happy and comfortable. It is one of my hobbies and.' am engaged in this endeavour as a hobby only. The note worthy aspect of my efforts is that the items developed by me are inexpensive and do not require imported components. List of items developed by me and their brief descriptions are as under :-

1. Braille Alarm Clock
2. I.Q. Watch
3. Cubical Puzzle
4. Audible Foam Layered Ball
5. Audible Flying Disk
6. Plot-4
9. Luddo
10. Thermoforming Machine
11. Audible belts
12. Industrial Safety Device
13. Khaddi Attachment
14. Light Probe

Shiv Dev, Manager, C.B.P., NIVH, 116, Rajpur Road, Dehradun & Honorary Consultant to M/s Sparsh Products, 151-5, Rajpur Road, Dehradun.

Chinese Puzzle

8. Snakes & Ladders

15. Water Level Indicator

16. Brail Display attachment for PBX Board.

1. **Braille Alarm Clock :1991, I felt that Visually Impaired people are getting education and employment but wrist watches were not available. I have developed a pocket braille alarm clock which can be** carried easily and is sturdy **in use.**

2. **. I.Q. Watch: I.Q. Watch is a small device which is good for learning for preschool children. It has six in built features (i) The clock is useful in teaching the blind children to see the time. (ii) This clock has 12 different shapes, which helps the children in learning the different geometrical shapes. (iii) These shapes are numbered from 1 to 12 in raised print and in braille thus helpful in learning the shapes of numbers in print. (iv) ono These shapes are fixed around the clock in their particular allotted cavity eki and cannot be fixed in other cavity. This can be used as intelligence test for the children. (v) These shapes have different colours which are useful for low vision children in learning the colours. These shapes are helpful in developing fine motor development and different colours in retaining the residual vision.**

3. Cubical Puzzle : It is a puzzle for very young children which has six dice. **If all the pieces are joined together they form a cube. All the faces have** different colours. The puzzle is very interesting for younger children also.

Audible Foam Layered Ball : The foam ball is of the diameter 8" which contain many pieces of foam. An electronic module kept in-between the ball produces beeps when put on.

Audible Flying Disk The disk is made of foam of 8" diameter which is convered with synthetic fiber. An electronic module kept in- between the disc produces beeps with the help of a pencil cell when put on. It can be played by an individual or group of blind/low vision children.

6 **Plot-4 : This is an indoor game for two players. This can be played by blind and low vision persons among themselves and with seeing persons also. This game has 42 coins, 21 with holes and the remaining 21 without holes, and have different colours also. The objective is to build a row of four coins either horizontally, vertically or diagonally while trying to prevent your opponent from doing the same. This seems to be simple but it is not. The vertical play of this game requires the players to think ahead and players can enjoy for hours together.**

7 **Chinese Puzzle: This puzzle has 7 pieces, with these pieces more than five hundred puzzle games can be played. For each puzzle a separate PVC sheet is provided on which visually handicapped/partially sighted children can play. There are different levels of games.**

8. **Snakes and Ladders : A popular game adapted for visually handicapped has one dice. 8 different coins (includes 4 extra) the game can be played by two to four players.**

9. **Ludo : A popular game adopted for the visually handicapped has one board one cup one dice and 20 coins (includes 4 extra) the game can be played by two to four players.**

10. **Thermoforming Machine The machine is designed in standard size of 11" X 11.5" (28 X 29.2 ems). Thermoforming machine is a braille duplicating machine and can also duplicate raised figures on brailler (PVC) sheets. The machine has electronic heat regulator for regulating heat and electronic tinier which counts the time in seconds for the heat required by various thicknesses of PVC sheets. The machine produces beeps after the lapse of set time and thus can be operated by a visually impaired persons. The special feature of the machine is that it is adapted and designed to use Indian braille on sheets and the output is free of creases.**

11. **Audible belts; These belts produce two different sounds which can be used by two teams while playing kho kh• and kabaddi.**

12. **Industrial Safety Device : To avoid any accident while working on the machine having movable parts, this safety device was developed. When a person crosses the safety zone the machine stops and a siren sounds automatically.**

13. **Khaddi Attachment: This device is helpful to detect any broken thread in Khaddi which is operated by visually impaired people.**

14. **Light Probe : Light probe is helpful to detect whether light is being emitted by a source or not.**

15. **Water Level Indicator :- This device is helpful to detect the level of liquids.**

16. **Braille Display. attachment for PBX Board : Roorkee University has developed an interface which can be connected with a PBX board and the visually impaired gets information on a braille display. With my efforts I have reduced the size of braille display from 45 X 30 X15 cm. to 15 X 15 X 5 cm and the working of the display is more efficient.**

To make the items inexpensive some of the games are adapted from normal games. Items from serial Number 1 to 11 are being marketed by Mi/s SPARSH PRODUCTS, 151-5, Rajpur Road, Dehra Dun.

ANNEXURE "a"

S.No.	NAME OF PRODUCT
	BRAILLE EQUIPMENT
1.	Braille Typewriter
2.	Braille Embosser
3.	Braille Train for Trainning
4.	Braille Shorthand Machine
5.	Braille Copier
6.	Design for Electronic Braille Learning Machine
7.	Perkins Worth Brailler
8.	Braille Terminals
9.	Braille Embosser Software for Hindi and other Languages
10.	A low - cost Braille Tutor Aid
11.	Braille Duplication Machine
12.	Braille Duplication Sheet
13.	Braille Library System
14.	Computerized Braille Printing
15.	Minal Braille Typewriter
	TALKING EQUIPMENT
	Vaneeshree : A Speech Synthesizer
	Multiply Handicapped
	Braille Talk
	LOW VISION AIDS
1.	Heye Vision
2.	Viewing Aids for the PartiallyBlind

·MISCENELIOUS

1. Braille Alarm Clock
2. I.Q. Watch
3. Cubical Puzzle
4. Audible Foam Layered Ball
5. Audible Flying Disk
6. Plot - 4
7. Chinese Puzzle
8. Snakes & Ladders
9. Luddo
10 Thermofoming Machine
11. Audible belts
12. Industrial Safety Device
13. Khaddi Attachment
14. tight Probe
15. Water Level Indicator
16. Braille Display attachment for PBX Board.
17. Embossed Scale
18. Embossed Measuring Tape
    For measurement purpose
19. Tray with centimeter Cubes
20. Syringe
21. Measuring Cylinder with
    Floating Indicator
22. Two Pan Balance
23. Spring Balance
24. Dial Type Thermometer
25. Activity Sheets on each
    technique
26. Tactile Diagram Board
27. Crossword Puzzle Board (Scrabble Board)
28. Mathematical Board
29. Geometry Set
O -Job-Option-with-Computers
31. Computer for Blind

32. Design for the Perception of Visual e for the Blind
33. Develop PG Stove for the Blind
34. Guidelines for the more Sophisticated Digital Devices CO
35. Text Entry and Access Management system (TEAM)
36. Commercial Technology for the Blind (Minneapolis)