Arduino Based Interaction between Blind, Deaf and Dumb People

R.Jeena[1], Attur Keerthana[2], R.Meenakshi[3], K.Priya[4]

Assistant Professor, Panimalar Institute of Technology, Chennai, Tamil Nadu, India[1]

UG Scholars, Department of Information Technology, Panimalar Institute of Technology, Chennai,

Tamil Nadu, India[2,3,4]

ABSTRACT: Science and Technology have made Human life addictive to comfort but still there exists an underprivileged group of people who are fighting for finding an innovative way that can make the process of communication easier for them. According to the World Health Organization, about 285 million people in the world are blind, 300 million are deaf and 1 million are dumb. In this project, we are going to propose a new system-prototype called the SHARO] AN BRIDGE in an effort to bridge the gap in the process of communication between the Blind, Deaf and Dumb people. The SHARO]AN BRIDGE will make use of the Wearable Technology, Texas Instrumentation Circuitry and Arduino Circuit Boards to provide a means of communication to differently-abled people having one or all of the above mention disabilities. It is assumed that a person who is deaf is also dumb but vice versa is not true.

KEYWORDS: Accelerometer, Arduino Circuit   Boards, Blind, Deaf, Dumb, Flex Sensors, Gesture, Microcontroller, Tactile Sensors, Wearable Technology.

I.   INTRODUCTION

According to the statistics given by the World Health Organization, about 285 million people in the world are blind, 300 million are deaf, 1 million are dumb and many more suffering from one or more of the above mentioned physical disabilities. The developments in Science and Technology have reached to great heights in making the Human Life easier and comfortable within a short span of time. During the last few decades, we have come across various technologies that have made our life so easier and comfortable that we even do not have to move our body to do a task. But always running in the race to be ahead of everyone we have forgotten that we still have a section of our population called the physically disabled people who are deprived of the advancements of Science and Technology because it has not given them that comfort that is required by them to feel that they too are the part of the society and they too can walk hand in hand with others. Communication being a fundamental aspect of human life is very much difficult for the people who are Blind, Deaf or Dumb.

There are a little means of communication between there people like the Braille Language [10] for communication between Blind people and the Sign Language for Dumb and Deaf people. This paper is going to concentrate on the above mentioned fact and tries to develop a new instrument which can help differently abled people (Blind, Deaf and Dumb) to communicate easily in the living world with other normal persons or the persons of their own kind.

II.   LITERATURE REVIEW

This research investigates a new way that can be productize so that a new gadget can be developed that can bridge the gap in communication among differently abled people who suffer from any of the possible combinations of the disability of Blindness, Deafness and Dumbness. For this we are looking for some sort of wearable technology that can satisfy our purpose.

III. EXISTING SYSTEM

This project was proposed in order to achieve the need to convert different modalities into common medium shared and understandable by deaf and blind individuals, for instance, converting images into Natural Language (NL) text. [5]. This project gave a prototype that consisted of cameras attached to dark glasses along with speaker and microphone and a portable Pc. Motivation: We came across various technologies that can help differently abled people to communicate among themselves and with the normal world easily but all of the technologies studied so far were focusing only a certain parameter or extent of disability among the three of Blindness, Deafness and Dumbness. None of the technology was so developed that it can be used as a general approach that can tackle any combination of these three disabilities. So to solve this purpose, we proposed an approach that can be used as a general way in which people suffering from any type of combination of these three disabilities can think themselves as a part of this beautiful world.

IV. BLOCK DIAGRAM
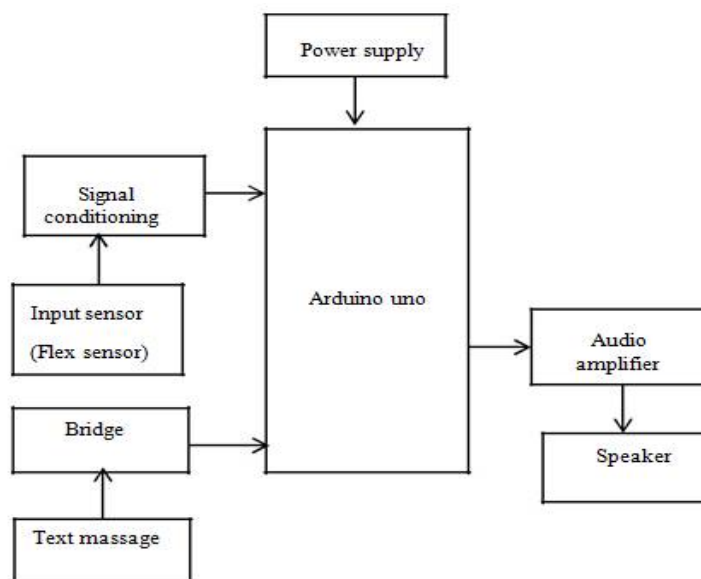
V. WORKING PRINCIPLE

We have taken into consideration that can arrive in case of the three types of disabilities and facilitate every disabled person and the normal person to communicate with the disabled ones. The person can communicate and transfer the message as per his ability and desire. The dumb can use their Sign language to transmit the message while those who are unable to understand the Sign Language can make use of the device to get the output in the audio form for normal or blind people and in the form of Braille Language for Blind and Deaf person. Moreover the message can also be displayed in the form of text on the LCD screen for Deaf people and even the transmission of the message can be made over large distances by the use GSM Wireless Networks. Thus this approach can tackle to any type of difficulty that can come across the process of communication among differently abled people and the normal world.

VI. HARDWARE REQUIRMENTS AND EXPLANATION

- Arduino uno
- Flex sensor
- Audio amplifier

▫ Speaker
▫ Power supply
▫ Signal condition
▫ Text to bridge

VII.   EXPLANATION OF MODULE USED WITH ITS DIAGRAM

FLEX SENSOR MODULE

1.   ARDUINO MICROCONTROLLER WITH POWER SUPPLY

OVERVIEW

Arduino/Genuino Uno is a microcontroller board based on the ATmega328P (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. You can tinker with your UNO without worrying too much about doing something wrong, worst case scenario you can replace the chip for a few dollars and start over again.

"Uno" means one in Italian and was chosen to mark the release of Arduino Software (IDE) 1.0. The Uno board and version 1.0 of Arduino Software (IDE) were the reference versions of Arduino, now evolved to newer releases. The Uno board is the first in a series of USB Arduino boards, and the reference model for the Arduino platform; for an extensive list of current, past or outdated boards see the Arduino index of boards.

TECHNICAL SPECS

Microcontroller	ATmega328P
Operating Voltage	5V
Input Voltage (recommended)	7-12V
Input Voltage (limit)	6-20V
Digital I/O Pins	14(of which 6 provide PWM output)
PWM Digital I/O Pins	6
Analog Input pins	6
DC Current per I/O Pin	20mA
DC Current for 3.3V Pin	50mA
Flash Memory	32 KB (ATmega328) of which 0.5KB used by boot loader
SRAM	2KB (ATmega328P)
EEPROM	1KB (ATmega328P)
Clock Speed	16 MHz
Length	68.6mm
Width	53.4mm
Weight	25g

POWER

The Arduino/Genuino Uno board can be powered via the USB connection or with an external power supply. The power source is selected automatically.

External (non-USB) power can come either from an AC-to-DC adapter (wall-wart) or battery. The adapter can be connected by plugging a 2.1mm centre-positive plug into the board's power jack. Leads from a battery can be inserted in the GND and Vin pin headers of the POWER connector.

The board can operate on an external supply from 6 to 20 volts. If supplied with less than 7V, however, the 5V pin may supply less than five volts and the board may become unstable. If using more than 12V, the voltage regulator may overheat and damage the board. The recommended range is 7 to 12 volts.

The power pins are as follows

- Vin. The input voltage to the Arduino/Genuino board when it's using an external power source (as opposed to 5 volts from the USB connection or other regulated power source). You can supply voltage through this pin, or, if supplying voltage via the power jack, access it through this pin.
- 5V.This pin outputs a regulated 5V from the regulator on the board. The board can be supplied with power either from the DC power jack (7 - 12V), the USB connector (5V), or the VIN pin of the board (7-12V). Supplying voltage via the 5V or 3.3V pins bypasses the regulator, and can damage your board. We don't advise it.
- 3V3. A 3.3 volt supply generated by the on-board regulator. Maximum current draw is 50 mA.
- GND. Ground pins.
- IOREF. This pin on the Arduino/Genuino board provides the voltage reference with which the microcontroller operates. A properly configured shield can read the IOREF pin voltage and select the appropriate power source or enable voltage translators on the outputs to work with the 5V or 3.3V.

MEMORY

The ATmega328 has 32 KB (with 0.5 KB occupied by the boot loader). It also has 2 KB of SRAM and 1 KB of EEPROM (which can be read and written with the EEPROM library).

INPUT AND OUTPUT

See the mapping between Arduino pins and ATmega328P ports. The mapping for the Atmega8, 168, and 328 is identical. Each of the 14 digital pins on the Uno can be used as an input or output, using pinMode(), digitalWrite(), and digitalRead() functions. They operate at 5 volts. Each pin can provide or receive 20 mA as recommended operating condition and has an internal pull-up resistor (disconnected by default) of 20-50k ohm. A maximum of 40mA is the value that must not be exceeded on any I/O pin to avoid permanent damage to the microcontroller.

In addition, some pins have specialized functions:

- Serial: 0 (RX) and 1 (TX). Used to receive (RX) and transmit (TX) TTL serial data. These pins are connected to the corresponding pins of the ATmega8U2 USB-to-TTL Serial chip.
- External Interrupts: 2 and 3. These pins can be configured to trigger an interrupt on a low value, a rising or falling edge, or a change in value. See the attachInterrupt() function for details.
- PWM: 3, 5, 6, 9, 10, and 11. Provide 8-bit PWM output with the analogWrite() function.
- SPI: 10 (SS), 11 (MOSI), 12 (MISO), 13 (SCK). These pins support SPI communication using the SPI library.
- LED: 13. There is a built-in LED driven by digital pin 13. When the pin is HIGH value, the LED is on, when the pin is LOW, it's off.
- TWI: A4 or SDA pin and A5 or SCL pin. Support TWI communication using the Wire library.

The Uno has 6 analog inputs, labelled A0 through A5, each of which provide 10 bits of resolution (i.e. 1024 different values). By default they measure from ground to 5 volts, though is it possible to change the upper end of their range using the AREF pin and the analogReference() function.

There are a couple of other pins on the board:

- AREF. Reference voltage for the analog inputs. Used with analogReference().
- Reset. Bring this line LOW to reset the microcontroller. Typically used to add a reset button to shields which block the one on the board.

COMMUNICATION

Arduino/Genuino Uno has a number of facilities for communicating with a computer, another Arduino/Genuino board, or other microcontrollers. The ATmega328 provides UART TTL (5V) serial communication, which is available on digital pins 0 (RX) and 1 (TX). An ATmega16U2 on the board channels this serial communication over USB and appears as a virtual com port to software on the computer. The 16U2 firmware uses the standard USB COM drivers, and no external driver is needed. However, on Windows, a.inf file is required. The Arduino Software (IDE) includes a serial monitor which allows simple textual data to be sent to and from the board. The RX and TX LEDs on the board will flash when data is being transmitted via the USB-to-serial chip and USB connection to the computer (but not for

serial communication on pins 0 and 1). A Software Serial library allows serial communication on any of the Uno's digital pins. The ATmega328 also supports I2C (TWI) and SPI communication. The Arduino Software (IDE) includes a Wire library to simplify use of the I2C bus; see the documentation for details. For SPI communication, use the SPI library.

PIN DIAGRAM

Atmega168 Pin Mapping

Digital Pins 11,12 & 13 are used by the ICSP header for MOSI, MISO, SCK connections (Atmega168 pins 17,18 & 19). Avoid low-impedance loads on these pins when using the ICSP header.
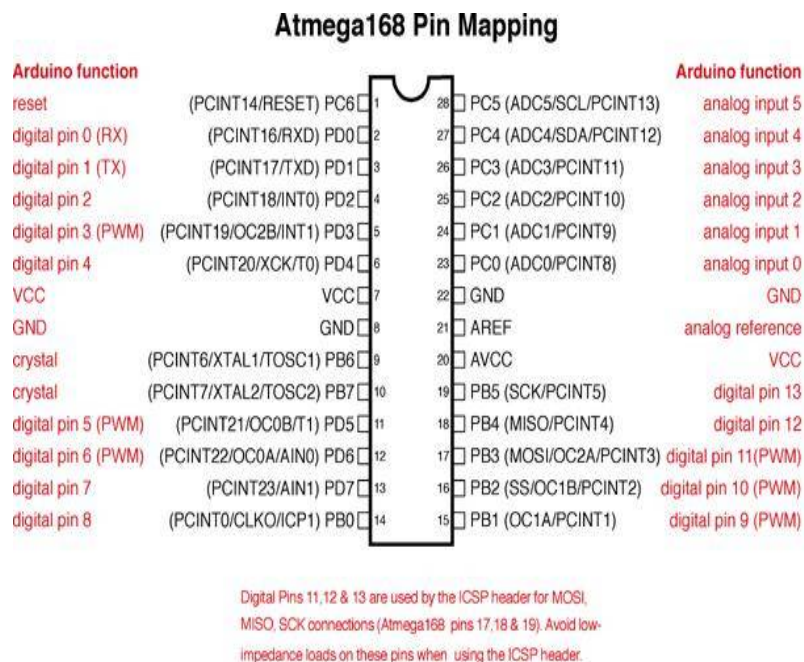
SENSING A BEN2. SENSING A BEND WITH A FLEX SENSOR + ARDUINO

We spend so much time talking about sensing things less mechanical, that is easy to forget the accelerometer isn't the only part in the town. The flex sensor is one of those parts often overlooked by the advanced user. But what if you need to check if something bent? Like a finger, or a doll arm. (A lot of toy prototype seems to have this need).

Anytime you need to detect a flex, or bend, a flex sensor is probably the part for you. They come in a few different sizes (small, large) The flex sensor is basically a variable resistor that reacts to bens. Unbent it measures about 22KΩ, to 40KΩ when bend 180º. Note that the bend is only detected in one direction and the reading can be a bit shaky, so you will have best results detecting changes of at least 10º

2.   AMPLIFIER MODULE
AUDIO AMPLIFIER:

An audio amplifier is an electronic device that increases the strength (amplitude) of audio signals that pass through it. An audio amplifier amplifies low-power audio signals to a level which is suitable for driving loudspeakers. The input signal of an audio amplifier may only measure a few hundred microwatts, but its output may be tens or even thousands of watts. Design parameters for audio amplifiers include gain, frequency response, distortion and noise.

TYPES OF AUDIO AMPLIFIERS

There are many different kinds of audio amplifiers and at Future Electronics we stock many of the most common types categorized by gain, nominal gain bandwidth, output power, maximum supply voltage, packaging type and number of channels. The parametric filters on our website can help refine your search results depending on the required specifications.

The most common sizes for gain are 20 dB, 26 dB, 30 dB, 36 dB and 48 dB. We also carry audio amplifiers with gain as high as 115 dB. The number of channels can be between 1 and 10, with the most common audio amplifier semiconductor chips having 1, 2 or 4 channels.

AUDIO AMPLIFIERS FROM FUTURE ELECTRONICS

Future Electronics has a full selection of programmable audio amplifier chips from several manufacturers that can be used to design a home audio amplifier, mini audio amplifier, audio amplifier IC (integrated circuit), car audio amplifier, digital audio amplifier, inline audio amplifier, low power audio amplifier, PC audio amplifier, TV audio amplifier or stereo audio amplifier. Simply choose from the audio amplifier technical attributes below and your search results will quickly be narrowed to match your specific audio amplifier application needs. If you have a preferred brand, we deal with several manufacturers such as New Japan Radio, NXP, ON Semiconductor, STMicroelectronics or Wolfson Microelectronics, among other manufacturers. You can easily refine your audio amplifier product search results by clicking your preferred audio amplifier brand below from our list of manufacturers.

APPLICATIONS FOR AUDIO AMPLIFIERS:

Applications for audio amplifiers include home audio systems, concert and theatrical sound reinforcement and public address systems. The sound card in a personal computer, every stereo system and every home theatre system contains one or several audio amplifiers. Other applications include instrument amplifiers such as guitar amplifiers, professional and amateur mobile radio and portable consumer products such as games and children's toys.

3.   APR VOICE

APR33a3 Voice play back provides high quality recording and playback with **11 minutes** audio at 8 KHz sampling rate with 16 bit resolution. The aPR33A series C2.x is specially designed for simple key trigger, user can record and playback the message averagely for 1, 2, 4 or 8 voice message(s) by switch, it is suitable in simple interface or need to limit the length of single message.
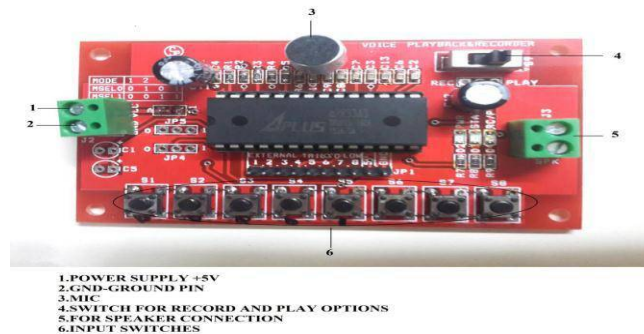
The aPR33A series are powerful audio processor along with high performance audio analog-to-digital converters (ADCs) and digital-to-analog converters (DACs). The aPR33A series are a fully integrated solution offering high performance and unparalleled integration with analog input, digital processing and analog output functionality. The aPR33A series incorporates all the functionality required to perform demanding audio/voice applications. High quality audio/voice systems with lower bill-of-material costs can be implemented with the aPR33A series because of its integrated analog data converters and full suite of quality-enhancing features such as sample-rate convertor.

1.POWER SUPPLY +5V
2.GND-GROUND PIN
3.MIC
4.SWITCH FOR RECORD AND PLAY OPTIONS
5.FOR SPEAKER CONNECTION
6.INPUT SWITCHES

FEATURES

- Operating Voltage Range: 3V ~ 6.5V4
- Single Chip, High Quality Audio/Voice recording & playback solution.
- No External ICs Required.
- Minimum External Components
- User Friendly, Easy to Use Operation
- Programming & Development Systems not required
- 680 sec.(11 Minutes) Voice recording length in APR33A3-C2
- Powerful 16-bits digital audio processor
- Non-volatile flash memory technology
- No battery backup required
- External reset pin.
- High quality line receiver
- Resolution up to 16-bits
- Simple and direct user interface
- High quality analog to digital and PWM module

4. FLEX SENSOR:

Spectra Symbol's flex sensor is a 4.5" bendable substrate that gives higher resistance readings as it flexes to a tighter radius. This 10 KΩ sensor has low power requirements for its output feedback. The resistance can increase up to 5-times the base or flat state reading. Users can calculate the degree of flexure or the bend radius using resistance. Common uses include measuring finger traction, robotics and gaming. The low profile of the flex sensor allows it to wrap around surfaces or to fit in tight spaces. With a life cycle of over 1 million flexes, its durability is suitable for many consumer applications. Flex sensors are passive resistive devices that can be used to detect bending or flexing. It is a bi-directional flex sensor that decreases its resistance in proportion to the amount it is bent in either direction. The Flex Sensor achieves great form-factor on a thin flexible substrate. When the substrate is bent, the sensor produces a resistance output correlated to the bend radius the smaller the radius, the higher the resistance value. It can be interfaced with the microcontroller unit. The output from the sensor is analog.

FEATURES
- Input Voltage: 5V
- Output: Analog
- Resistance Tolerance: 30%
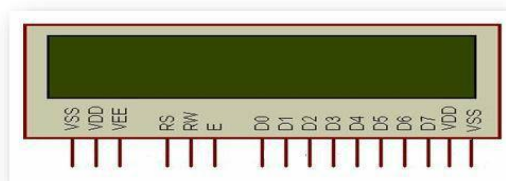- Bend Resistance Range: 45K to 125K ohms (depending on bend radius)

5.   LCD

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs.

The reasons being: LCDs are economical; easily programmable; have no limitation of displaying special & even custom characters (unlike in seven segments), animations and so on.

PIN DESCRIPTION

PIN NO	FUNCTION	NAME
1	Ground (0V)	Ground
2	Supply voltage; 5V (4.7V-5.3V)	Vcc
3	Contrast adjustment; through a variable resistor	Vee
4	Selects command register when low; and data register when high	Register select
5	Low to write to the register; High to read from the register	Read/Write
6	Sends data to data pins when a high to low pulse is given	Enable
7		DB0
8		DB1
9	8- bit data pin	DB2
10		DB3
11		DB4
12		DB5
13		DB6
14		DB7
15	Blacklight Vcc(5V)	Led+
16	Blacklight Ground (0V)	Led-

PIN DIAGRAM

VIII.   SOFTWARE REQUIREMENTS AND EXPLANATION

ARDUINO IDE

The Arduino/Genuino Uno can be programmed with the (Arduino Software (IDE). Select "Arduino/Genuino Uno from the Tools > Board menu (according to the microcontroller on your board). For details, see the reference and tutorials. The ATmega328 on the Arduino/Genuino Uno comes preprogrammed with a boot loader that allows you to upload new code to it without the use of an external hardware programmer. It communicates using the original STK500 protocol (reference, C header files). You can also bypass the boot loader and program the microcontroller through the ICSP (In-Circuit Serial Programming) header using Arduino ISP or similar; see these instructions for details. The ATmega16U2 (or 8U2 in the rev1 and rev2 boards) firmware source code is available in the Arduino repository. The ATmega16U2/8U2 is loaded with a DFU boot loader, which can be activated by:

- ◻ On Rev1 boards: connecting the solder jumper on the back of the board (near the map of Italy) and then rese ing the 8U2.
- ◻ On Rev2 or later boards: there is a resistor that pulling the 8U2/16U2 HWB line to ground, making it easier to put into DFU mode.

WARNINGS

The Arduino/Genuino Uno has a resettable polyfuse that protects your computer's USB ports from shorts and overcurrent. Although most computers provide their own internal protection, the fuse provides an extra layer of protection. If more than 500 mA is applied to the USB port, the fuse will automatically break the connection until the short or overload is removed.

DIFFERENCES WITH OTHER BOARDS

The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serial converter.

APPLICATION

- ◻ It mainly used for disable people

IX.   SUMMARY AND CONCLUSIONS

In this paper we have proposed the basic approach of the system we named as SHAROJAN BRIDGE which can be a useful tool in banishing the barrier of disabilities in communication of the people suffering from any of the possible combination of Blindness, Deafness and Dumbness among themselves as well as normal people. We have taken into consideration that can arrive in case of the three types of disabilities and facilitate every disabled person and the normal person to communicate with the disabled ones. The person can communicate and transfer the message as per his ability and desire. The dumb can use their Sign language to transmit the message while those who are unable to understand the Sign Language can make use of the device to get the output in the audio form for normal or blind people and in the form of Braille Language [10] for Blind and Deaf person. Moreover the message can also be displayed in the form of text on the LCD screen for Deaf people and even the transmission of the message can be made over large distances by the use GSM Wireless Networks. Thus this approach can tackle to any type of difficulty that can come across the process of communication among differently abled people and the normal world

X.   FUTURE ENHANCEMENT

We are using the latest and trending wearable technology which makes it possible to carry the device easily anywhere and everywhere by the disabled person which makes our device portable. Moreover we have not came across any such technology so far that can help to all the people who are suffering from any combination of disabilities of Blindness, Deafness and Dumbness. Thus we have followed a general approach due to which it is possible to productize a single gadget which can solve the problems of all the people with different type of disabilities. At present there is no such technology that can provide long distance communication facility to differently abled people but we are

giving the way by which it is possible for these people to communicate over long distances with many future scopes also.

REFFERENCES

[1] AnbarasiRajamohan, Hemavathy R., Dhanalakshmi M. "Deaf-Mute Communication Interpreter", International Journal of Scientific Engineering and Technology Volume 2 Issue 5, pp: 336-341 (ISSN: 2277-1581)

[2] Kuldeep Singh Rajput,
ShashankDeshpande, Uma Mudenagudi, "INTERACTIVE ACCELEROMETRIC GLOVE FOR HEARING IMPAIRED".

[3] NikolaosBourbakis, Anna Esposito, D. Kabraki, "Multimodal Interfaces for Interaction-Communication between Hearing and Visually Impaired Individuals: Problems &Issues", 19th IEEE International Conference on Tools with Artificial Intelligence.

[4] NetchanokTanyawiwat and SurapaThiemjarus, Design of an Assistive Communication Glove using Combined Sensory Channels, 2012, Ninth International Conference on Wearable and Implantable Body Sensor Networks.

[5] N.Bourbakis, An SPNG based method for image to NL text conversion, PR Journal.

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