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Two Way Communication System with Binary Code Medium for People with Multiple Disabilities

Mr. Lokesha[1], Ms. Ashwitha Shetty[2], Ms. Keerthi[3], Ms. Afsa[4], Prof. Rashmi p c[5]

[1,2,3,4] B.E Student, Dept. of ISE, YIT Moodbidri, Mangalore, Karnataka, India
[5] Professor, Dept. of ISE, YIT Moodbidri, Mangalore, Karnataka, India

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Abstract - *Communication is the driving force of mankind. In this modern era, Science and technology have made the human world so easy but still some physically and visually challenged people suffer from communication with others. It may be by birth or caused by any kind of accident. After losing communication, these people cannot do the normal functions or normal life. Majorly they cannot communicate with others. Various languages specifying sign language, Braille scripts, Morse codes were proposed by researchers to provide a specific communication medium. Even after such inventions, there is a clear visible gap between the communication of the normal person and a specially challenged person and communication between two specifically challenged people.*

Key Words: blind, deaf, dumb, communication, issues, text, speech, vibrator, sensor

1.INTRODUCTION

According to ministry of statistics and program implementation 2.68 crore of the current Indian population is specially challenged, of which 44% consist of people who suffer from neither hearing speech or visual impairment. We're going to propose a new system prototype in this project called communication among blind, deaf, and dumb persons. This will aid those with disabilities in overcoming their communication barriers with both those without disabilities and those who have disabilities.

Blind individuals will use the speakers to communicate, while the deaf and dumb will be able to see through it and respond by tapping the sensor. All of these have been developed as applications so that people with impairments can use them with comfort. A model has been developed which is focused on multi model approach can be able to convert speech to visual contexts and vibrations and similarly the contexts and vibrations can be converted to speech.

1.1 Binary Code

I. Binary code represents text, computer processor instructions or any other data using a two-symbol system. The two-symbol system used is often "0" and "1" representing "off" or "on" respectively from binary number system.

II. In today's digital world, binary code is one of the most important number systems.

III. Our goal for this project is to teach disabled people about binary number system and how it applies to the technologies. In this we convert 26 letters of English alphabet to 5-bit binary code.

1.2 ESP8266 WIFI Module

- The ESP8266 is a low-cost, Wi-Fi enabled microcontroller. It has a powerful 32-bit microcontroller and an integrated Wi-Fi transceiver.
- It can communicate wirelessly with other devices and it has a wide range of input and output pins for connecting sensors, actuators, and other components.
- It can be programmed using the Arduino IDE, MicroPython, Lua, and other languages and development environments.

2. LITERATURE REVIEW

[1] A two-way communication system with Morse code medium for people with multiple disabilities:

This paper was published in the year 2020. In this research, a wearable system with a wide network of Morse code recognition and transmission is proposed. It can be used to establish short- and long-distance communication between a person with a disability and a healthy person, as well as communication within themselves. Four user-selectable operating modes, 1. Morse to Speech (MTS), 2. Speech to Morse (STM), 3. Distance Morse to Text (DMTT) 4. Distance Text to Morse are used by the system (DTTM). Depending on the application, the user can access each mode by making particular gestures. Based on the machine learning model, the gesture is identified. The project employs the SVM algorithm, but it is not effective for large data sets and struggles with noisy data.

[2] A Chat Application for Communicating with Hearing Impaired Persons:

This paper is published in 2019 it proposes an assistive technology framework is presented that offers a chat application as a communication interface for hearing impaired and non-hearing-impaired people utilizing mobile phones. It converts regular people's voicemails into text messages. The framework combines a variety of specifically created chat acronyms out of the texts. Last but not least, it connects the combination to a series of tactile feedback for the deaf person. The feedback is sent using Morse code. Currently, the framework only supports English and simple text messages, but future work aims to incorporate more complex content, such as hyperlinks, emojis, and shapes, via MC Shorthand vibrations.

[3] Finger Braille: Tactile Communication for Differently Abled

Mobile devices are crucial for modern life, but visually challenged individuals face challenges in using them. Braille was created in 1824 for the blind. Braille has six raised dots and is a tactile system. This study demonstrates a wearable device with force-sensitive sensors simulating a six-finger virtual keyboard. Android devices receive input through Braille, making typing easy for the blind. Bluetooth sends input to the device, and the message is read aloud and displayed on the screen. Users can edit their messages. Future work may include controlling email, contacts, calls, and internet browsing via Braille input. Additionally, the hardware could be made smaller and portable.

3. PROPOSED WORK

In this project we proposed a system for multi disability people like blind deaf and dumb people.

Blind module: As a replacement for the braille system that was once used to communicate with the blind, we now employ the Voice Controller System. In this, blind persons can communicate with others by speaking through the voice controller.

Deaf module: Using a vibrator to receive messages and a keyboard to type messages to others, we can connect with deaf persons using this module. It is shown on the systems of other people.

Dumb module: With the help of this dumb module, users can send the messages by text and can receive the messages through voice and in textual form.

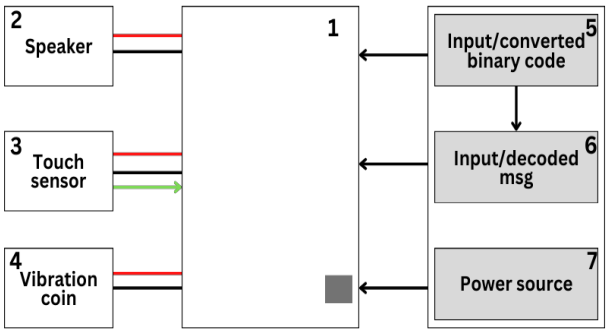


Fig:1 -Block Diagram of Proposed System

The model is designed to assist people with multiple disabilities to communicate effectively. It consists of four main components: the tap sensor, vibration coin, ESP8266, and lithium-ion battery.

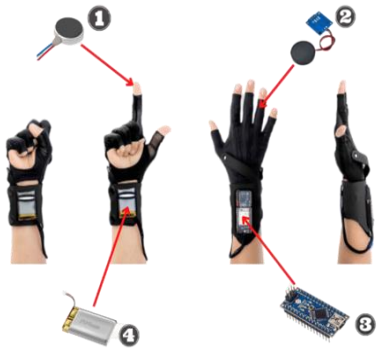


Fig:2 -Components of Proposed System

1. The tap sensor is a small device that can be worn on the user's finger. It detects finger taps and sends the signal to the ESP8266 for processing.

2. The vibration coin is a small vibrating motor that produces vibration patterns to convey messages to the user.

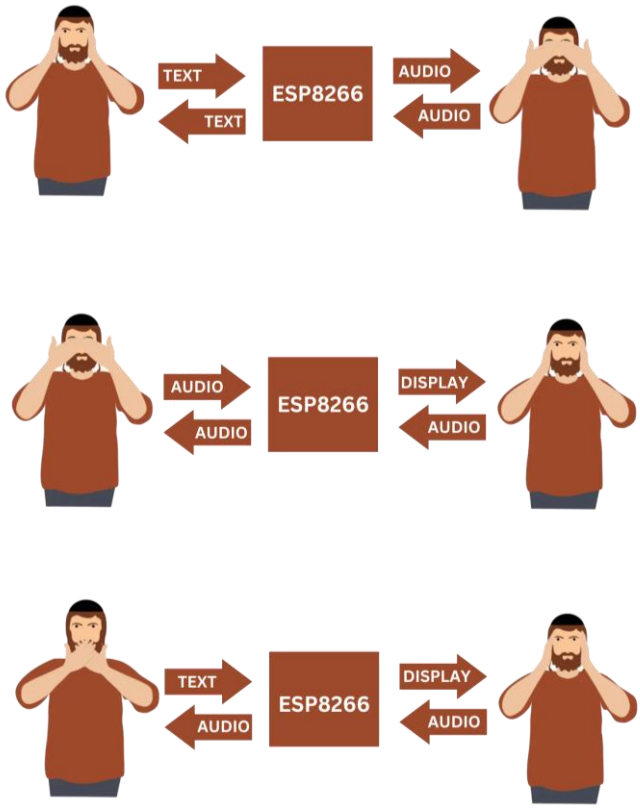
3. The ESP8266 is a microcontroller that receives input from the tap sensor and translates it into messages. It is connected to the vibration coin and controls its vibrations to create patterns that represent the input. The ESP8266 is also equipped with Wi-Fi capabilities, allowing it to connect to the internet and communicate with other devices.

4. The lithium-ion battery provides power to the entire system, allowing it to be portable and used on-the-go. It is rechargeable and can be easily replaced when needed.

When the user taps the sensor, the ESP8266 processes the input and generates a corresponding vibration pattern on the vibration coin. The user can feel the vibration and interpret it as a message. Additionally, the ESP8266 can be programmed to communicate with other devices, allowing the user to send and receive messages wirelessly.

4. IMPLEMENTATION

There are two ESP8266, both are connected with the same network. Touch sensor TTP223 are connected to ESP8266's digital pin D2 AND D3. Vibration motor connected to D12 and D13. ESP8266 Wi-Fi module is connected to D9 and D10 of Arduino. Speaker is connected to D10. SPA, SCL of Display connected to A4 and A5. A1 RX and TX are connected TX and RX of A2. All the VCC are connected to 5V.



The figure represents a communication system that aims to facilitate communication between deaf and blind individuals. The system involves two modes of communication: text-to-speech and speech-to-text.

In the text-to-speech mode, the text messages entered by the deaf person are converted into audio output that can be heard by the blind person. This is accomplished through the use of a text-to-speech software or application.

In the speech-to-text mode, the audio messages spoken by the blind person are converted into text output that can be read by the deaf person. This is done using a speech recognition software or application.

The system also includes a feature where the blind person can send voice messages to the deaf person, which will be transcribed into text and displayed for the deaf person to read. The deaf person can then reply by sending an audio message, which will be converted into text for the blind person to read.

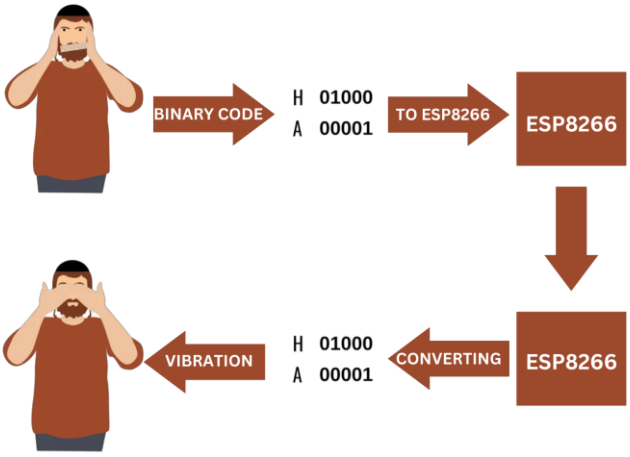


Fig:3 -Different Types of Communication

The figure depicts a communication system for multiple disabled persons. The sender uses binary code input in an ESP8266 module to send messages. The ESP8266 modules transmit wirelessly to each other.

The receiver's ESP8266 module converts the binary code into a vibration pattern sent to a vibration motor. The receiver interprets the vibration pattern to determine the message.

This technology is a creative solution that enables communication for individuals with multiple disabilities.

The system is low-cost and wireless. It provides an innovative way to overcome communication barriers.

This system demonstrates how technology can benefit people with disabilities. It showcases the potential of binary code, wireless communication, and vibration motors.

4.1 Binary Code 5 Bit Reference

A 5-bit binary code is a sequence of 5 digits (0 or 1) used to represent a character. With 5 bits, we can represent up to 2^5 = 32 different characters, including letters, numbers, and symbols.

To represent alphabetical characters using 5-bit binary code, we can assign a unique code to each letter.

To represent the letter "A" in 5-bit binary code, we use the code assigned to it, which is 00001. Therefore, we can write

"A-00001" to indicate that "A" is represented by the 5-bit binary code 00001.

Similarly, we can represent other letters using their corresponding codes. For example, we can represent the letter "B" as "B-00010", the letter "C" as "C-00011", and so on.

BINARY CODE ALPHABET REFERENCE

1	A	00001	14	N	01110
2	B	00010	15	O	01111
3	C	00011	16	P	10000
4	D	00100	17	Q	10001
5	E	00101	18	R	10010
6	F	00110	19	S	10011
7	G	00111	20	T	10100
8	H	01000	21	U	10101
9	I	01001	22	V	10110
10	J	01010	23	W	10111
11	K	01011	24	X	11000
12	L	01100	25	Y	11001
13	M	01101	26	Z	11010

Fig:4 -Binary Code Alphabetic Reference

A 5-bit binary code can be easier than other encoding schemes in some situations because it requires less memory and is simpler to encode and decode.

Compared to the more common 8-bit or 7-bit ASCII code, which requires more memory to store each character and more processing power to encode and decode, a 5-bit binary code is simpler and more efficient way.

5. WORKING

The system is particularly useful for people with limited mobility, vision, or hearing impairments. It enables communication in situations where verbal or written communication may not be possible or practical. The proposed communication model offers a user-friendly and accessible way for individuals with disabilities to effectively communicate with others.

Fig:5 -Working Model

Figure 5 shows the working model, Individuals with disabilities such as deafness, muteness, and blindness have access to a communication system that involves a vibration coin for message reception, a tap sensor for message sending via physical tapping, and an OLED display for message viewing. Furthermore, a voice controller is included for blind individuals to send messages via voice input, while deaf individuals can utilize text, tap, or voice to send messages, and mute individuals can send messages via text or tap. Normal person can send the message through the app created; the disabled person can see the message via display. To facilitate communication between multiple individuals with different disabilities, binary code is utilized to transmit messages, which can be received by the receiver through vibration. This system is designed to enable effective communication among individuals with various disabilities by providing a comprehensive range of input and output options that cater to their specific needs.

6. CONCLUSIONS

The paper highlights the challenges faced by people with disabilities like blindness, deafness, and dumbness, which often lead to difficulties in communication and limit their ability to navigate their surroundings and connect with

others socially. The lack of communication can result in poor health outcomes, making it crucial to find effective solutions to overcome these barriers.

The proposed solution is a compact device that aims to minimize the communication gap between people with disabilities and the normal world. The device converts text to voice for the blind, allowing them to send messages through voice or tap. For the deaf, the device converts tap to text, enabling them to communicate via text. For the dumb, the device converts tap to text, allowing them to send messages through either text or tap.

The device's operation involves converting messages from tap to text and text to vibration for people with multiple disabilities, creating a simple model for the blind, deaf, and dumb people in a single device. The language-independent feature of the device makes it a smart assistant for specially-abled individuals to communicate with others effectively. The lightweight and compact design of the device make it easy to carry, enhancing its convenience and portability.

The proposed solution is a significant step towards minimizing the communication gap between people with disabilities and the rest of the world, promoting inclusivity and accessibility.

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