BioGecko

Vol 12 Issue 02 2023
ISSN NO: 2230-5807

An Astute Text Converter for Visually Impaired People Using Morse Code and Atmega Microcontroller

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Abstract **—** Communication for blind people with others is a very difficult task. A universally recognized language that can be translated into any language is morse code. In Morse code, each letter and number has a matching pattern of dots and dashes, with the more frequent letters utilizing fewer symbols. The Samsung Good vibes app is the currently available morse code text translator for visually challenged individuals. The app is presented only accessible on Samsung smartphones; users of other devices cannot use it. By turning text into Morse code, the technology helps blind individuals communicate. The suggested work promotes communication between blind people and normal people. A Morse code message entered by a blind person is translated into English by an Atmega microcontroller and forwarded to the recipient. With the use of a GSM module, this gadget enables message sending by blindpeople.

Key Words: Morse code, Text conversion, Atmega microcontroller, embedded systems

I. INTRODUCTION

Blind people live normal lives and onormal things. They face trouble for communication. Vision loss leads to loneliness, social Blind individuals can lead normal lives, but they often face challenges such as loneliness, social isolation, anxiety, and fear due to their vision loss. Independence is crucial for disabled individuals, and specially designed items can help them achieve it [1]. However, adaptive equipment for the blind is not readily available on the market. The RefreshableBrailleDisplayisonesuchdevicethatcan assist the blind in living independently. Blind individuals require an effort to obtain equipment that canhelpthembecomemoreindependent.MorseCode is a language that use "dots" and "dashes," or "dits" and"dahs,"which are short and Despite using only two states (on and off), Morse Code is not technically binary [2] since pause lengths are necessary todecode theinformation.

Morse Code can be considered an early form of digital code due to its use of two states, but it differs from binary due to its use of pause lengths. Morsecode was the primary means, used through telegraph lines, undersea cables, and radio circuits. However, the variable length of Morse code characters made it challenging to adapt to automated circuits, leading to its replacement with more machine-readable formats such as Baudot code and ASCII for electronic communication [3]. Despite this, revolutionized international communication, and its ability transmit visual signals made it a valuable tool in indicating distress and the need for assistance, such as inlifeboat situations where the location is isolated or inaccessible.

Morse code was widely used and is areliable mode of communication[4]. Thus, this method of communication provides an efficient means of exchanginginformationbetweenblindpeopleandalso between blind people and normal people. Many existing applications for blind people will help [5] them communicate in their day-to-day lives. But present solutions are not accurate and effective for blind people. The suggested work make the blind person self-sufficient and to provide a proper and effective means ofcommunication.

II. LITERATURESURVEY

This section discusses research related to the analysis of morse code. MorseNet is able to achieve better performance in both detection and recognition of Morse code signals, while also reducing the computational workload and model size. By wearing Morse Glasses, individuals with disabilities can become more independent, live a normal life, and increase their productivity in the workplace. The only requirement is for the participant on the other end of the communication to have a phone or Android- supported device. [6]

WiMorse method is reliable even when the user changes position, the environment changes, or there is user diversity. By abbreviating Morse code, it is possible to achieve a reasonable speed of textinput.

InMorsecode,theRLLs(RunLengthsofLuminance) of adjacent links have a strong correlation, and ignoring this correlation. To verify this model, simulations were conducted. The researchers developed a formulation for the statistical properties of link lifetimes in MANETs (Mobile Ad-hoc Networks) while taking into account the dependence between adjacent links. These results can help to create more effective and efficient path selection protocols in MANET, which would lead to an improved quality of service in the network. Technologies that read brain activity are essentially capable of reading a person's mind. These neuro technologies rely on collecting and analyzing brain data, which can reveal sensitive information such as personal and health-relateddetails.[9].

A navigation device designed for blind people's daily walks has undergone testing on a group of individuals and has demonstrated its effectiveness in assisting with indoor navigation tasks. The device contains sensors that are affordable, compact, and easy to incorporate, making it a feasible option for use as a consumer wearable device.This device has significant potential in the electronic travel aid market and could be widely adopted by consumers. The SmartCane is equipped with low-cost sensors and can be easily integrated, making it a practical wearable device for blind individuals. An evaluation was conducted on 70 visually impaired individuals from the "school & home for the blind," where the NavGuide system was compared to the traditional white cane in controlled real-world environments.[11].

The research activity has made recent advancements in miniaturizing circuit boards and antennas, with a focus on noise tolerance. The effectiveness of the system has been demonstrated through obstacle detection. The selected components aimtocreateaportablesystem,andthefinalprototype is expected to offer benefits to the user. Individuals with visual impairments often experience difficulties in social interaction and communication with sighted individuals, which can impact their social abilities. A low-costandlow-powerprototypehasbeendeveloped for obstacle detection and identification, which can serve as an alternative to machine vision systems.The device can trigger priority alerts based on the user's behavior.Theattitudesandknowledgeofpeopleinthe environment are crucial factors that impact the social life of individuals. This device enhances obstacle-free navigation and outperforms traditional white canes. These techniques can create more accessible environments for people with disabilities by increasing awareness and challenging negative attitudes.[14]

The model can be applied to other forms of disabilities, enabling educators to modify existing content to make it accessible to students with varying abilities.Itcanbeimplementedinotherfields,suchas disciplines that present difficulties for students with specificlinguisticneeds,asthesecoursesoftenrequire more comprehensive modifications of the learning objects (LOs).The ability to operate with four- quadrant active and reactive power. It also offers a controlstrategythatremainseffectiveevenwhenthere are variations in the DFIG's speed. This makes the strategy suitable for practical applications where DFIG speed variation occurs frequently. A newvisual aid system has been developed specifically for people who are completely blind. This system makes iteasier for visually impaired individuals to navigate and access information with greater comfort and accessibility.[16].

Since we all know that people with disabilities are substantially dependent on others because of their lack of vision and hail senses, this has been proposed to replace the limitations of the conventional white club. This device can help impairedpeoplenavigatethemselveswithoutcounting onothersforbacking.Thisdevicealsohelpstohandle extremities like hijacking and importunity[18].

Themodelhasproposedthedesignofasmart eyeless adjunct using the medium of deep literacy bedded with IoT. This device can be salutary for people with a visual impairment. The"Morse-Comm" feature of the cap improves communication for individuals with visual or neuromuscular disabilities who can communicate by using gestures to draw sequences of dots and dashes, also known as Morse Code. This communication system provides a more private and effective means of communication for visually impaired individuals and those with neuromuscular diseases. [22].

The model can be utilized for various purposes,includingspeech-to-texttranslation.Itoffers several advantages, such as enabling communication in unknown places where the language is unfamiliar. The stick is equipped with an Arduino UNO controller and sensors that detect obstacles infront of the user. It is user-friendly, responsive, energy-efficient, lightweight, and easy to grip and fold. The smartstick allows blind people to stay connected with their surroundings and move safely without getting injured by obstacles or barriers. It enables them to navigate and explore the world more confidently and efficiently. [26].

The current requirement is for a real-time application that enables conversations betweenpeople who can communicate using sign language and those who cannot. The CNN algorithm is used to recognize the gestures made by the sign language user and convert them into text, which can then betransformed into speech. With this system, they can enjoy better support and increased independence in their daily lives. The system has several advantages, including the ability to measure a wide range of objects in the environment, enabling visually impaired individuals to lead comfortable lives while moving around in different settings. This system helps to bridge thatgap and ensures that visually impaired individuals can enjoy their daily activities with remarkable ease and independence. [32].

The system includes a social module that allows users to contact nearby helpers for assistance when needed. This feature can be useful in situations where the user is lost or requires additional support in navigating their surroundings. The algorithm proposed in this paper aims to automatically recognize Morse code by combining signal processing and machine learning. The Morse code signals are classified based on their characteristics and then decoded using a code table. [36].

The preceding works discuss the various methods and technologies that have been used to detect the problem and provide a suitable solution for it. These developments have been considered and implemented in many places, but they still have flaws that need to be addressed for improved system efficiency and future development. Taking into consideration all of the points raised in the preceding works, the proposed work was designed to overcome all flaws. In the following paragraph the proposed methodology can be observed.

III. PROPOSEDMETHODOLOGY

The recommended system, which also contains a GSM module, buzzer, and push button, employs an atmega-microcontroller as its main component to create a text converter for those who are visually impaired. This configuration makes it possible for people with visual impairments to send messages to people, giving this community a communication option that wasn't previously accessible.

The usual user's mobile message display is where this system's output is shown in Fig.1depicts the flow diagram for the proposedsystem.

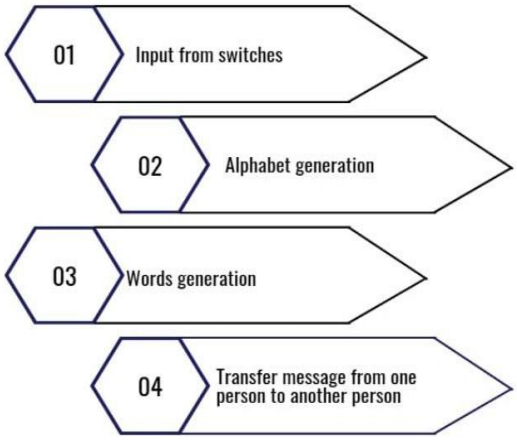

Fig. 1 Flow diagram for the Suggested System The text converter for blind persons has four switches to ensure efficient operation and ease of use. The first switch controls the dot, one of the elements needed to input morsecode. The morsecodeisentered with the dash, which is controlled by the second switch. The third switch lets the user know when an alphablet is finished, and the final switch is used to communicate with the regular people. The user can enter the alphabet they wish to produce by pressing the dot and dashes switch using these switches. The switch for suggested work is explained in Fig.2

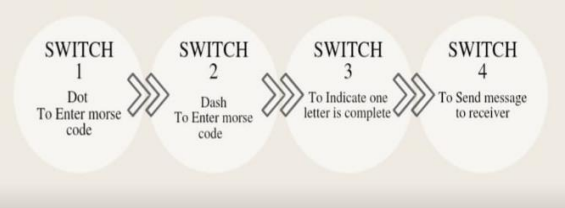

Fig. 2 Morse code Text Converter Switch Design for Visually Impaired Individuals.

The embedded C program code that is already loaded into the atmega microcontroller is used to produce the alphabet. The text converter may use switch to produce complete words, much like how it generates letters. A microcontroller is capable of processing information and producing the appropriate word. The Atmega 328 microcontroller which is used in the suggested work is a low-power, high- performance microcontroller that is widely used in various embedded systems and applications. It is based on the AVR RISC architecture and is manufacturedbyAtmelCorporation.TheAtmega328 has a clock speed of up to 20 MHz, providing ample processing power for most applications. The text converter for blind persons generates output by communicating with regularpeople.

The GSM (Global System for Mobile Communication) technology handles message delivery. GSM supports the transfer of data over circuit-switched connections, allowing for thetransfer of digital information such as text messages and multimedia messages. GSM includes a number of security features, such as encryption of voice anddata communications, to protect against unauthorized access andeavesdropping.

GSM uses a SIM card to store user information and net work credentials, allowing users to easily switch between different networks and devices. GSM supports roaming, allowing users to make and receive calls and access data services while traveling abroad. GSM supports MNP, allowing users to keep their phone number when switching between different networks or devices. Overall, GSM provides a reliable and secure mobile telecommunications system for voice and data communication, and has become a critical infrastructure for communication and commerce around the world. In the following paragraph the implementation and result for text converter for visually impaired people can be observed.

IV. IMPLEMENTATION ANDRESULT

The implementation of the text converter for visually impaired people using atmega 328 microcontroller and GSM is depicted in Fig. 3. A text converter for visually impaired people using Morse code, GSM, a buzzer, and a push-button can be implemented by the user inputting text using a push button.

The text is then converted to Morse code, which is a series of dots and dashes representing each letter and number. The converted Morse code is thenoutput using a buzzer, which produces a beep sound once it sends the message. There are two elements to the implementation. One section uses switches to receive input from the user, while another part uses gsm to broadcast output to the general public.

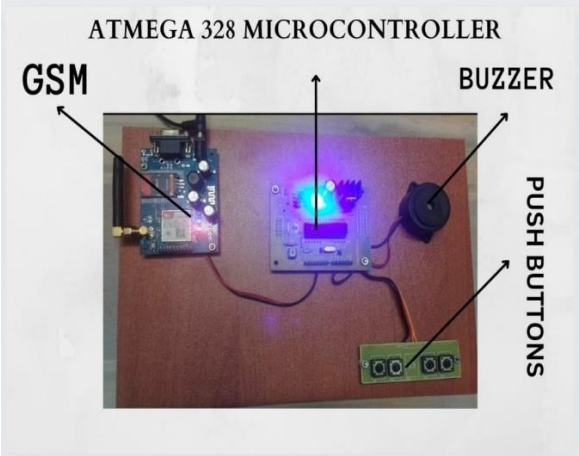

Fig. 3 Implementation of Text Converter for Visually Impaired People

1. Input fromUser:

The Morse Code table lists all the characters in the code along with their corresponding dots and dashes. Table 1 is arranged in alphabetical order with each letter listed alone with its corresponding codes. For the purpose of typing messages they wish to communicate to regular people, the user should get familiar with morse code. After learning morse code and using it for some time, it is rather simple. The input for a text convertor for visually challenged persons is getting from the switches.

Table 1 Morse Code with Respective Dots and Dashes

A	. -	**J**	. - - -	**S**	. . .
B	- . . .	**K**	- . -	**T**	-
C	- . - .	**L**	. - . .	**U**	. . -
D	- . .	**M**	- -	**V**	. . . -
E	.	**N**	- .	**W**	. - -
F	. . - .	**O**	- - -	**X**	- . . -
G	- - .	**P**	. - - .	**Y**	- . - -
H	. . . .	**Q**	- - . -	**Z**	- - . .
I	. .	**R**	. - .		

2. Output to normalpeople:

Themicrocontrollerwilldecodethemessageafter receiving input from switches. Here, material written in morse is converted to English. Following this, the decoded regular text is delivered to the regular folks overgsm. The normal

person will see their message on the standard message screen. Without the need of any extra programs, texting is done straight on the SMS message screen in this instance. With the use of a text converter for persons with visual impairments, communicationbetweenblindandsightedpeoplemay be carried out quickly and effectively. The output message screen image is shown in Fig.4.

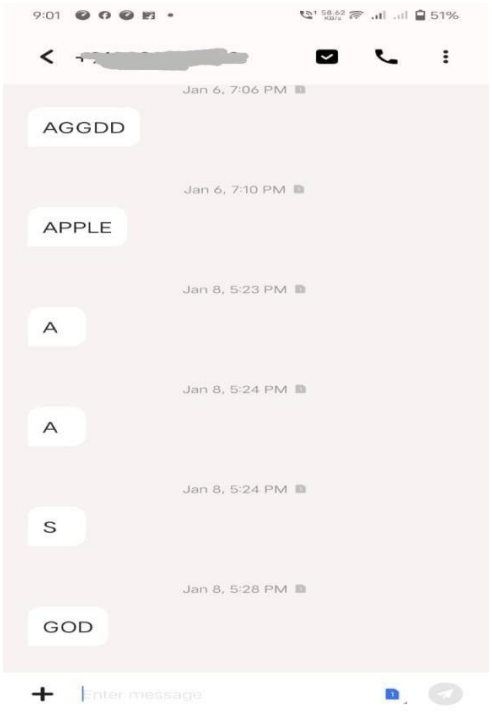

Fig. 4 Output Screen of Text Converter for Visually Impaired People

v. ANALYSIS OF THE TEXT CONVERTOR FORVISUALLY IMPARED PEOPLE USING MORSE CODE

In this portion, comparision of the existing system with the proposed framework. Here the graph shown in Fig. 5 explains the number of successfully entered promptsconcerningthetimetakentoentertheprompt.

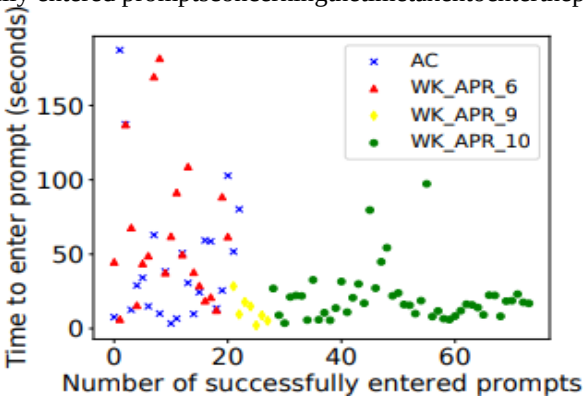

Fig. 5 Existing Sytem Output Graph[48]

The proposed work has experimented and the output is discussed below in Table 1. It explains the number of

attempts to enter an accurate message concerning the timetaken to enter a message. In Table 2, the highlighted row shows the inaccurate message. And the remaining row tells about the accurate message with the time taken. The AB1 denotes "hi how are you" and AB2 denotes "good morning have a nice day".

Table 2 Message Entry Time Comparison between Two People.

		TimeTaken		
Person No	Person AB1	Person AB1	Person AB2	Person AB2
1	134	129	163	142
2	136	126	166	132
3	128	133	173	130
4	130	128	163	134
5	102	122	142	89
6	106	62	130	90
7	70	66	120	93
8	67	56	118	88
9	71	58	124	97
10	68	54	120	87
11	72	59	121	86
12	70	62	101	87
13	79	61	100	85
14	66	57	105	86
15	70	59	104	87
16	69	60	100	89
17	67	58	97	87
18	71	55	102	87
19	68	48	106	88
20	72	50	102	89

The graph shown in fig. 6 explains the number of attempts taken to enter the message by two blind people concerning the time taken.

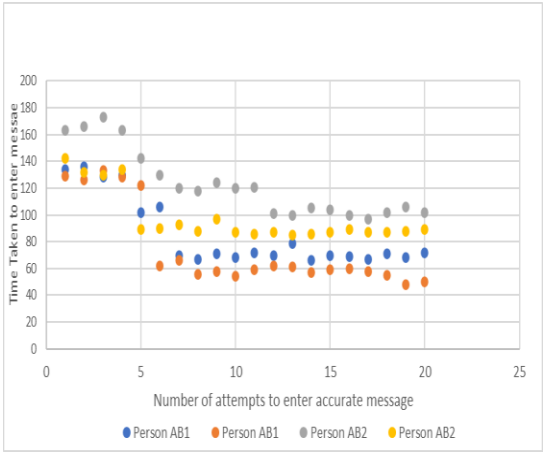

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Fig. 6 Number of Attempts vs Time Taken to Enter Message Graph

V. CONCLUSION AND FUTURESCOPE

Finally the text converter for visually impaired people device enables the blind users to send any preferred text message without much efforts though it is a time consuming process it is found to be an effective way for communication. It provides an effectivesolutionforcommunication,makingiteasier for the blind to connect with the outside world. The output message can be sent to the both smart phone and normal buttonphone.

One drawback of this approach is that it may be difficult for some visually impaired people to learn Morse code. Another potential issue is that the Atmega microcontroller may be expensive or difficult to obtain, making this solution less accessible to people with limited financial resources.

Overall, Morse code text converter using an Atmega micro controller has the potential to be a useful tool for visually impaired individuals.

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