

Two way Communication System for Blind using Morse Code

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Abstract—It is a very difficult task for the blind people to communicate with others. Our project enables a two way communication for blind using morse code technique. Morse code consists of two symbols dot and dash(. & -). Each alphabet and each digit is having a corresponding morse code. Commonly used alphabets are represented by using minimum number of symbols. There is a time interval between each symbols of a word and also between different words. Morse code is an internationally accepted language and can be converted into any other languages. The two way communication device enables the blind people to communicate between them and also with other persons. The message in morse code entered by blind person is converted into english and is send to the receiver. Conversion is done using arduino uno. The converted message is received at the other end and the response of receiver is converted into morse code and is received by the blind user. Thus this device allows the blind user to send and receive messages. Received message is indicated by a buzzer sound and vibrations. The sound and vibration frequency will be corresponding to dot and dash duration time. Thus the user can identify the received message by simply touching or by listening the buzzer sound. The message is send to the receiver using a GSM module. Vibration motors allows the user to sense by touching.

Index Terms—Arduino, Morse Code

I. INTRODUCTION

The main issue experienced by the blind people is the difficulty in communicating with the outside world. It is pretty difficult for a blind person to communicate with a person who is far from him. Sending voice messages or converting their voice into text messages were used recently to provide a solution for this issue. Behalf of this, they are also able to send text messages directly to other persons using some code language. Braille language is one of the common language used by the blind people to communicate with others.

In our project, we are using some other code language which is also fine and simple for the blind people to learn and communicate. The code language we introduced here is known as 'Morse Code' and it is basically a combination of dots and dashes[2]. Morse code is an internationally accepted

language and also it can be converted to other languages. Every English alphabet will be having a corresponding Morse code comprised of dots and dashes. A unique series of dots and dashes represent a text letter or numeral in Morse code which is a symbol. The duration of dash is three times the duration of dot. A small amount of time is taken by dot duration for each dot or dash. The letters of a word are segregated by a space equal to three dots (one dash), and the words are segregated by a space equal to seven dots. Dot duration is the basic unit of time measurement in code transmission.

One of the most interesting things about Morse code is the resemblance to binary en- coding, that it has used two different symbols in their representation. In fact, Morse code offers a slow but reliable means of transmitting and receiving wireless text messages through conditions involving noise, fading, or interference. This is primary because it is simply binary code (key down or key up) allowing for an extremely narrow bandwidths. Among different applications, morse code transmission is one of the most commonly used modulation types to incorporate information in shortwave signals. By encoding in-formation into dashes and dots, morse codes could be efficiently transmitted in a small bandwidth without using special equipment. Morse code was widely used worldwide and Morse invention revolutionised long-distance communication. Morse code provides reliable communication for Military, overseas shipping and the railroad rely. After the invention of radio in the year of 1900 s Communication became more spread and predictable. Industries rely on it to send simple and fast messages to their distant clients and employees. The frequent use of internet information flow and ease of contact in distinct ways. Morse code is a old technology, simple, relatively low cost and does not depend on modern technology and used in dire emergencies, grid negligence or war. The duration of the dash is three times the duration of a dot. Each dash or dot is followed by a short silence, equal to the dash duration[1]. The word is segregated by a space equal to three dots (one dash), and the words are segregated by a space equal to seven dots. In code transmission dot duration is the basic unit of time measurement. Making Morse code effortless and most

versatile telecommunication we use easily for keypad on and off function for emergency signals.

The two way communication system for blind enables the users to enter the messages to be send using morse code which is already familiar to them. The morse code entered by the blind user will be converted into the normal text message which is readable by normal people using Arduino UNO[1]. Arduino UNO converts the Morse code into text message and also vice versa. This device uses a GSM module to receive the text messages into our mobile phones[4]. It is used to connect our mobile phones with this device. As this is a bidirectional communication device, the blind user can also read the text messages sent by the normal users with the help of vibrations produced by the dots and dashes. This enables the blind user to recognize and thus receive the message. As this method make use of morse code, it is simple and of low cost. Knowledge of morse code is not necessary, thus it can be used by anyone. Morse code is world wide used and is a reliable mode of communication. Thus this method of communication provides an efficient means to exchange information between blind people and also between blind persons and normal people.

This device based on the Morse code can spark again the communications revolution and can provide a new way of sending data to computers and mobile devices. Therefore, we decided to revitalize the almost forgotten Morse code by implementing it with an Arduino in order to lay again the foundations to this new revolution that is coming. There are many existing applications for blind person which will help them for communication in there day to day life. But all the current applications are not that precise and effective. Hence, the main aim of our application is to provide flexible way for bidirectional communication. The main feature about our application is to make the blind person self-dependent and to provide a proper and effective means of communication.

II. BLOCK DIAGRAM

The block diagram of the system is given in figure 1. The two way communication system for blind enables the user to send and receive messages. User can enter the message in morse code and this message is converted into english by arduino uno and send to the receiver using GSM module.

The receiver can send the reply back to user. It is converted back into morse code in the same system and received by the user. The system enables the user to receive message as vibrations using vibration motors which rotate in a frequency corresponding to the morse code symbols. The buzzer will also enable users to receive messages without physical contact but with sound.

III. COMPONENTS REQUIRED

The components in this section include both the hardware and software.

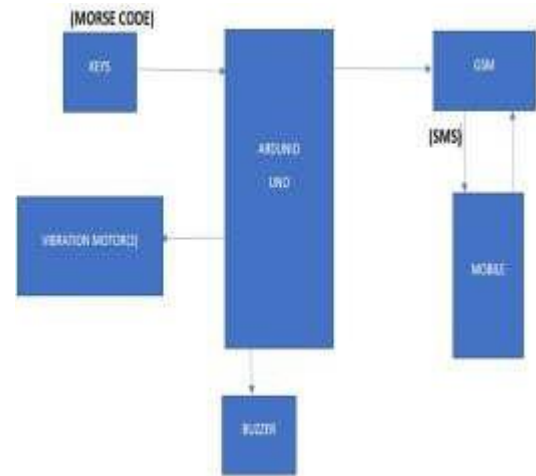


Fig. 1. Block Diagram

A. ARDUINO UNO

It is a microcontroller based on the ATmega328. It is having 14 digital I/O pins, 6 analog inputs, 16MHz local oscillator, a USB connection, a power jack, an ICSP header and a reset button. The board is equipped with sets of digital and analog input/output pins that may be interfaced to various expansion boards and other circuits. Arduino is a popular tool for IoT product development as well as one of the most successful tools for STEM/STEAM education[3]. Hundreds of thousands of designers, engineers, students, developers and makers around the world are using Arduino to innovate in music, games, toys, smart homes, farming, autonomous vehicles, and more.



Fig. 2. Arduino uno

The Arduino Uno can be powered by using the USB connection or with an external power supply. The power

source is selected automatically. External power can come either from an AC-to-DC adapter or battery. The adapter can be connected by plugging a 2.1mm center-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 of 6 to 20 volts. If supplied with less than 7V, however, the 5V pin may supply less than five volts and the board may be unstable. If using more than 12V, the voltage regulator may overheat and damage the board. The recommended range is 7 to 12 volts.

B. GSM - GLOBAL SYSTEM FOR MOBILE COMMUNICATIONS

GSM (Global System for Mobile communication) digital mobile telephony system which uses a variation of time division multiple access and is the most widely used of the three wireless telephony technologies (TDMA, GSM, and CDMA). GSM digitizes and compresses data, then sends it down a channel with two other streams of user data, each in its own time slot. It operates at either the 90MHz or 1800 MHz frequency band. GSM (Global System for Mobile Communications, originally Groupe Special Mobile), is a standard set developed by the European Telecommunication Standard Institutions (ETSI) to describe protocols for second generation cellular used by mobile phones.



Fig. 3. GSM

Mobile services based on GSM technology were first launched in Finland in 1991. Today, more than 690 mobile networks provide GSM services across 213 countries and GSM represents 82.4 percentage of all global mobile connections. The GSM standard was developed as a replacement for first generation analog cellular networks, and originally described a digital, circuit switched network optimized for full duplex voicetelephony. This was expanded over time to include data communications, first by circuit switched transport, then packet data transport via GPRS (General Packet Radio Services) and EDGE (Enhanced Data rates for GSM Evolution or EGPRS). Further improvements were made when the 3GPP developed third generation UPTS standards followed by fourth generation LTE

Advanced standards.

Since many GSM network operators have roaming agreements with foreign operators, users can often continue to use their mobile phones when they travel to other countries. SIM cards (Subscriber Identity Module) holding home network access configurations may be switched to those will metered local access, significantly reducing roaming costs while experiencing no reductions in service. GSM, together with other technologies, is part of the evolution of wireless mobile telecommunications that includes High-Speed Circuit- Switched Data (HSCSD), General Packet Radio System (GPRS), Enhanced Data GSM Environment (EDGE) and Universal Mobile Telecommunications Service (UMTS)

C. VIBRATION MOTOR

It is a small built-in vibration motor module. After inputting 5V power, you can control ON / OFF or vibration intensity of motor through digital signal.



Fig. 4. Vibration Motor

The module adopts a high quality mobile phone vibration motor, the vibration effect is evident, it is amplified and it works, and the vibration intensity of the motor can be controlled by PWM. The module can easily complete the conversion of the electrical signal to mechanical vibration.

Suitable for the production of interactive products sensitive to vibrations, the portable intelligent device vibrates to recall a small vibration motor suitable as a non-audible indicator. When the input is high, the engine vibrates, just like your phone in silent mode

D. ARDUINO IDE

The Arduino Integrated Development Environment is a cross-platform application that is written in functions from C and C++. The Arduino Integrated Development Environment or Arduino Software (IDE) - contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the

Arduino and Genuino hardware to upload programs and communicate with them.

Programs written using Arduino Software (IDE) are called sketches. These sketches are written in the text editor and are saved with the file extension .ino. The editor has features for cutting/pasting and for searching/replacing text. The message area gives feedback while saving and exporting and also displays errors. The console displays text output by the Arduino Software (IDE), including complete error messages and other information. The bottom righthand corner of the window displays the configured board and serial port. The toolbar buttons allow you to verify and upload programs, create, open, and save sketches, and open the serial monitor.



Fig. 5. ARDUINO UNO

It is used to write and upload programs to Arduino compatible boards, but also, with the help of 3rd party cores, other vendor development boards. The open source Arduino software(IDE) makes it easy to write code and upload it to the board. It . It turns on Windows, Mac OS and Linux. This can be used with any Arduino board.

IV. IMPLEMENTATION

This communication system has two sections, morse code to text conversion and text to morse code conversion. Embedded C is used to convert the information. The Fig 6 shows the hardware setup.



Fig. 6. Hardware Setup

First section consists of an Arduino, two switches for dot and dash, two vibration motors(Fig-7). The arduino is connected to computer. The two switches are connected to the arduino at pin numbers 2 and 7 and the other ends are grounded. vibrations motors are connected to the pin numbers 9 and 10 of arduino. The input can be entered by pressing the switches, while vibration motors rotate corresponding to the input code. The converted message is displayed.

Text to morse code conversion section includes Arduino, GSM Module, two vibration motors(Fig-8). The vibration



Fig. 7. Morse To Text Conversion

motors are connected to the pins 9 and 10 of Arduino. Second and third pins of arduino are connected to the receiver and transmitter pins of GSM module. Message from a second person to the user can be received by using GSM module. This is converted into morse code. The user can receive the message as vibrations of vibration motors corresponding to the frequency of dots and dashes in the code.

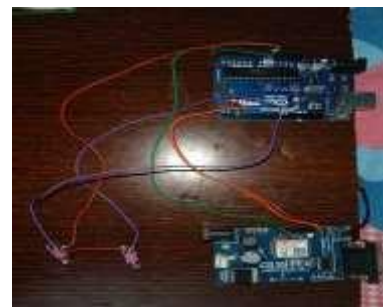


Fig. 8. Text To Morse Conversion

Embedded C programming is used for code conversion. It is set of language extensions for C programming, which includes features not available for normal C such as fixedpoint arithmetic, named address space etc.

The alphabets are represented as ASCII codes, which is a 7 bit character code. In ASCII, A is represented as 65, B as 66 and so on. Similarly, a as 97, b as 98 and so on. A delay is provided between codes of separate letters and codes separate words. This method of communication enable the

blind user to effectively communicate to a second person. This system can be used for advanced purposes such as ship to ship and plane to plane communication

V. RESULT

Finally, a device is made in which the two conversions, i.e. the Morse code to text and the text to Morse code conversion takes place. Here the message entered by the blind user in Morse code through the button is converted into normal text with the help of Arduino Uno. And the resulting text is displayed on the monitor or screen. Also the message sent by a normal user from his phone will reach the Arduino Uno with the help of GSM module. The Arduino Uno converts this normal message into Morse code which is readable by the blind user. The blind user will detect this message in Morse code by sensing the frequency of vibrations produced by the vibration motors that is used in this device. We have done the Morse code to text and text to Morse code conversions as two separate sections.

A. Morse Code to Text Conversion

The conversion of Morse code to normal text is done to send a message from the blind user in Morse code and to receive the message by the normal users in normal text format. We have incorporated our device in such a way that the message entered by the blind user through the button is converted into normal text by Arduino UNO and the normal text will be displayed on the screen or the monitor.



Fig. 9. Output of Morse to Text

In this conversion, the device required an Arduino Uno, two buttons and two vibration motors. Arduino Uno is the main component used here for the conversion process of Morse code to normal text. Of the two buttons, one button is used to enter dot and the other button is used for entering the dash. The two vibration motors rotate while the blind user enters the dots and dashes through the buttons. The connection of the components is in such a way that the dot button is connected to the second pin of the Arduino Uno

and the dash button is connected to the seventh pin of the Arduino Uno. The other terminal of the dot and dash button is then connected to the ground pin of Arduino Uno. Two vibration motors are also connected here which rotate when the Morse code is entered. These vibration motors are connected to the ninth and tenth pin of the Arduino Uno. So, when a message in Morse code is entered, it will get converted and normal text will be shown on the screen. An example of such a normal text that is displayed on the screen when the input is given in Morse code is shown in the figure 9.

B. Text to Morse Code Conversion:

The conversion of normal text to Morse code is required when the message sent by a normal user is to be received by the blind user. The message from the mobile phone of the normal user is received by the device and then it converts this text into Morse code which is readable by the blind person. The components used in the conversion process of normal text to Morse code are an Arduino Uno, a GSM module and vibration motors. The SIM card of the blind user is inserted in the GSM module. The GSM module will capture and show the range by blinking a LED. When a message is sent by a normal user, the message reaches the GSM module and transfers the text to the Arduino Uno. The Arduino Uno converts this text into Morse code text and it will be received by the blind user in the form of vibrations that will be produced by the vibration motor. The blind user who already knows the Morse code could read it easily by sensing these vibrations.



Fig. 10. Output of Text to Morse

Here the connections are in such a way that the transmitter of the GSM module is connected to the second pin of Arduino Uno. And the receiver section of the GSM module is connected to the third pin of Arduino Uno. The ground pin of the GSM module is connected to the ground terminal of the Arduino Uno. The two vibration motors used here are

connected to the ninth and tenth pin of Arduino Uno. Their ground terminals are also connected to the ground pin of the Arduino Uno. So when a message is being sent by a normal person it will be converted as Morse code and it will be received by the blind user. The vibration motor rotates and produces vibrations and thus he could detect the message in Morse code easily. The output of text to morse converter is shown in figure 10.

VI. CONCLUSION

Morse code has been shown to be a simple, speedy, low cost, and efficient assistive technology in blind communications, long distance communications, ship to ship communications etc. The Morse code was widely used during the time of second world war for different communication purposes. The same Morse code was modified using different latest technologies and it is been used widely now-a-days also in different fields especially in the communication field. The use of Morse code can be found extensively in the communication of differently abled people. Morse code can be found as alternative method for communication for the blind and deaf people also. In our project, we made use of Morse code in order to create an effective method for blind communication. Since it is a two way communication method, a blind user can send the message as well as read the message from other people too. Since, Morse code is comprised of only two symbols i.e. dot and dash, it definitely reduces the complexity and so that learning Morse code is not a big deal. Our project points out to a simple and effective method which would help the blind people for their communication with the outside world. Moreover, it is designed in a way that everyone could own such a device without big effort as it does not cost much. The other major scopes or uses of Morse code mainly lies in ship to ship communications, plane to plane communications etc. The major use of this device and Morse code could be found in long distance communications. There is a wide variety of areas in which this Morse code could be effectively made use of. Our project has focused on the two way communication path for blind people and finally it is found that this device enables the blind users to send and receive the message without much effort. Though it is a little time consuming process, it is found to be an effective way for communication.

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