

Communication System For Deafblind Persons

Raj S. Mamarde¹, Rasika A. Lodhi², Rahul D. Bhor³

Sinhgad Academy of Engineering B.E. E&TC, Pune University

Abstract

The telecommunication technology has become the integrated part of our day today life. It has completely revolutionaries the way we communicate, especially long distance communication. Despite of all these advancement in the telecommunication field, the physically impaired people have no access for these technologies. So as a step to bridge the gap between the blind people and the technological advancement in the telecommunication field we decided to design a SMS system for them by interfacing Braille pad with the cell phone so that dual impaired person can have the access to the SMS system. Here the user sends the SMS to the blind person's mobile number which is connected to the microcontroller which reads the SMS using GSM module through the AT commands and then converts the letters of the SMS into the Braille language using the lookup table in its memory. With the help of 6 relays Microcontroller vibrates the Braille pad on which the blind person can read the SMS. For sending a SMS, the μC converts the typed Braille letter on Braille pad to the English alphabets using the Lookup table. Loud speaker is also used for making the voice announcement. It is a low cost, Low latency, quick response time, fully automate system, robust system, low power requirement are some advantages of the system. However this system is a bit bulky and handy. As it reads the SMS character by character, so it's a slow process. Still it can become a great benefit to the blind persons. The system can be further modified to read the whole SMS in a string of words and also blind person can read an e-mail.

1. Introduction

The telecommunication technology has become the integrated part of our day to day life. It has completely revolutionaries the way we communicate, especially long distance communication. It began with the introduction of telegram, followed by telephones. Then it was overtaken by the advanced telephone systems. Then there

came the age of mobile communication which facilitates a great deal to communicate on a go. Mobile cell phones are the milestone in telecommunication technology.

Despite of all these advancement in the telecommunication field, the physically impaired people have limited access for these technologies.

So as a step to bridge the gap between the blind people and the technological advancement in the telecommunication field we decided to design a SMS system for them. We are designing a modular device which is accessible by blind person. For that we are using Braille language as the basis of the project. Blind people use the Braille language for reading and writing purpose. Till date they conventionally use Braille books. But it is not an economical way of communicating now a day. It has limitation on the maximum number of words per page and pages per book. So we are interfacing Braille pad with the cell phone so that impaired person can have the access to the SMS system. We are also providing voice announcement system with it as extra feature.

2. Description

2.1 SMS Read

Here the sender sends the SMS to the blind person's mobile connected to the controller. The microcontroller reads the SMS through the AT commands and then converts the letters of the SMS in to the Braille language using the lookup table stored in its memory. Then with the help of 6 relays the Microcontroller vibrates the Braille pad on which the blind person can read the SMS.

2.2 SMS Send

Here the blind person can type the SMS using the key pad interfaced to the μC . The μC then converts the Braille letter to the English alphabets using the Look table. After the message is translated into alphanumeric English letters the μC sends the typed SMS via the dedicated mobile using AT commands.

2.3 Braille System

Braille is writing system which enables blind and partially sighted people to read through touch. It was invented by Louis Braille (1809-1852), who was blind and became a teacher of the blind. It consists of patterns of raised dots arranged in cells of up to six dots in a 3 x 2 matrix configuration. Each cell represents a letter, numeral or punctuation mark. Some frequently used words and letter combinations also have their own single cell patterns. For e.g.

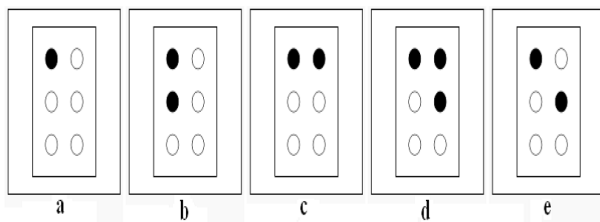


Fig. 1 Braille code for English characters

3. Literature survey

The Basic ideal to design a SMS system for blind person came in our mind after reading the following three IEEE papers:

- [1] Hardware-software complex "Dash point" for learning and communication of deaf blind people.
- [2] E-mail Client having Articulation and Braille Transcription of E-mails for the Blinds
- [3] Finger Braille Teaching System for People who communicate with Deaf blind People

4. Market Survey

Many Multinational companies have taken their initiative to fill in the gap between physically impaired people and technological advancements. Many electronics companies have produced devices that would help physically impaired people. Such companies include Nokia and Samsung.

Their initiative is remarkable but these devices are much expensive. They are beyond the affordable limit of a common man.

Intex Company launched mobile phone in India for blind persons which only had calling facility. It excluded all other multimedia facility.

To cut a long story short, market contains devices which are helpful for physically challenged people but are costlier. There is a need for such devices that would be cheap, portable and include latest multimedia facilities.

5. Block Diagram

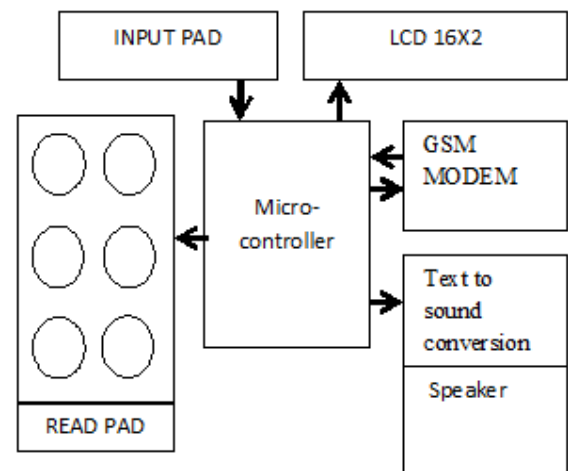


Fig. 2 Block Diagram

5.1 GSM Module

This is a plug and play GSM Modem with a simple to implement RS232 and TTL serial interface. It is used to send SMS, make and receive calls, and do other GSM operations by simple AT commands through a serial interface from microcontrollers and computers. It uses the SIM300 module for all its GSM operations.

Thus GSM Module is connected to the controller and transmits the incoming messages to the controller. It also receives the messages from controller.

5.1.1. Features of GSM Sim 300:

1. TTL UART interface for connection to μC .
2. RS232 interface for connection to PC/Laptop.
3. 12V power supply option.
4. 5V power supply option.
5. LED indicating network status.

5.2 Keypad

It consists of 9 keys arranged in 4x4 format i.e. 3 rows and 3 columns. These keys are connected to the I/O port of the controller.

5.3 Braille Pad

It consists of 6 relays connected to the I/O port of the controller via driver circuit. Relays are energized according to the input from controller. As per the received commands the relays are toggled up and down. Thus the blind person will be able to sense the letter.

5.4 ARM7 LPC2148

Controller reads the message coming from GSM module and converts it to the Braille format using lookup table. It sends the corresponding control signals to the Braille pad via I/O port. It also reads the keys connected to port and convert it to the alphanumeric form and transmits the entered message through the GSM Module. The messages are also displayed on the LCD and voice announcement is also made by the controller.

5.5 LOUD SPEAKER

Loud speaker is used for making the voice announcement.

5.6 AUDIO AMPLIFIER

An audio power amplifier is an electronic amplifier that amplifies low-power audio signals (signals composed primarily of frequencies between 20 - 20 000 Hz, the human range of hearing) to a level suitable for driving loudspeakers and is the final stage in a typical audio playback chain.

We are using LM 324 audio power amplifier in our project.

5.6.1. Features:

- Internally frequency compensated for unity gain
- Large DC voltage gain: 100dB
- Wide power supply range:
- Input common mode voltage range includes ground
- Large output voltage swing: 0V to VCC -1.5V
- Power drain suitable for battery operation

5.7 APR 9600

The APR9600 is used in text to voice conversion section and is a good standalone voice recorder or playback IC with non-volatile storage and playback capability for 32 to 60 seconds by changing the value of a single resistor. It can record and play multiple messages at random or in sequential mode. The user can select sample rates with consequent quality and recording time trade-off. Microphone amplifier, automatic gain control (AGC) circuits, internal anti-aliasing filter, integrated output amplifier and messages management are some of the features of the APR9600 chip. Recorded sound is retained even after power supply is removed from the

module. The replayed sound exhibits high quality with a low noise level.

6. Flowchart

A. SMS Receive

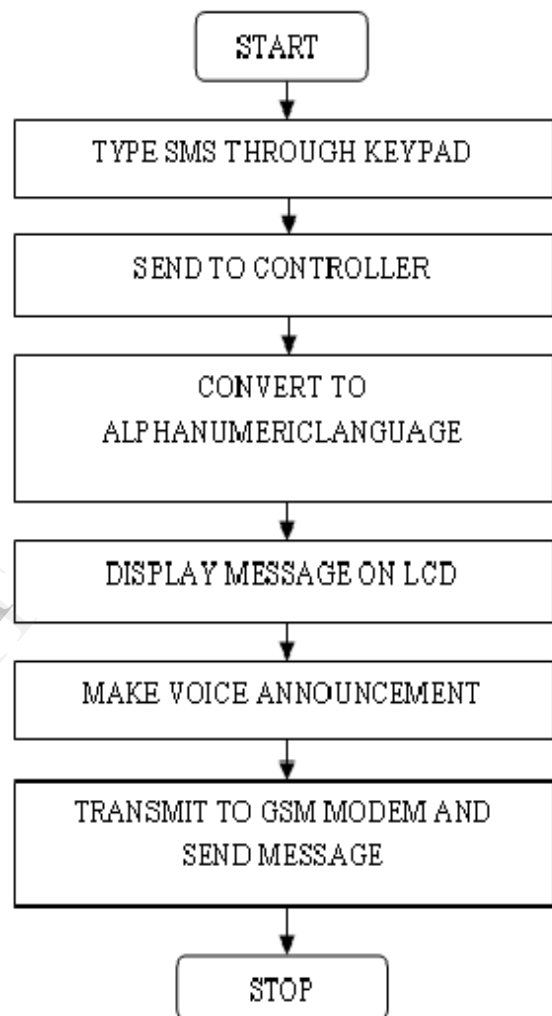


Fig. 3 Flowchart of SMS receive

B. SMS Send

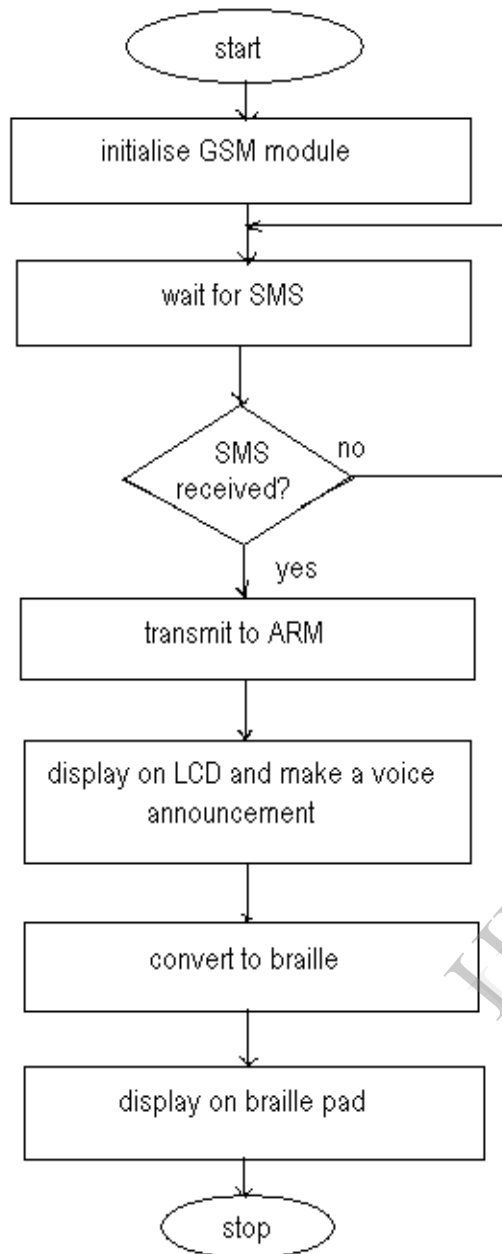


Fig. 4 Flowchart of SMS sends

7. Advantages

- i. *Efficient way voice dictionary*
- ii. *Less time delays*
- iii. *Quick response time*
- iv. *Fully automate system*
- v. *Robust system, low power requirement*

8. Disadvantages

- A. *System is a bit bulky and handy.*
- B. *As it reads the SMS character by character, so it's a slow process.*

9. Future Scope

The system can be further modified to read the whole SMS in a string of words and also blind person can read an e-mail.

10. Conclusion

Thus we conclude from above study that with some modifications in conventional communicating device, we can include large no. of physically challenged people in communication system.

References

- [1] *MikroElektronika EasyARM v6 user manual*
- [2] *MikroElektronika EasyARM v7 user manual*
- [3] <http://www.datasheetarchive.com>
- [4] *Keil RK-1159 development Board for LPC2148*
- [5] D. Gorodnitsky, V. Kalashnikoff, E. Pavliy, E. Pinchuk, A. Tumanoff, O. Tumanova, N. Ustyan, "Hardware-software complex "Dashpoint" for learning and communication of deaf blind people". ICETA 2011 • 9th IEEE International Conference on Emerging eLearning Technologies and Applications • October 27-28, 2011, Stará Lesná, The High Tatras, Slovakia
- [6] Deepak Kumar, Himank Singh Muktawat, Saiful Islam Aligarh Muslim University, ZHCET. "E-mail Client having Articulation and Braille Transcription of E-mails for the Blinds". Special Issue of IJCTT Vol. 2 Issue 2, 3, 4; 2010 for International Conference [ICCT-2010], 3rd-5th December 2010.