Mobile Technology for Deaf Without Surgery using TMS320

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Abstract

In this paper, we propose the wireless system to send information on disasters to people with disabilities (especially deaf people) and to identify people, disabled their location at the refuge when they are evacuated. The gamma tone filter well expresses the performance of human auditory peripheral mechanism and has a potential of improving advanced speech communications systems, especially hearing assisting devices and noise robust speech recognition systems. The proposed system implements the GSM modem through which the deaf people can hear the voice from GSM speaker.

Keywords- *Gammatonegram, Cepstrum, mel frequency.*

1. INTRODUCTION

Mobile Technology is the technology used for cellular communication. Mobile Code Division multiple Access (CDMA) technology has evolved rapidly over the past few years. Since the start of this millennium, a standard mobile device has gone from being no more than a simple two-way Pager to being a mobile phone, GPS navigation device, an embedded web browser and instant messaging client, and a hand held gaming console.

Sound waves travel into the ear canal until they reach the eardrum. The eardrum passes the vibrations through the middle ear bones or ossicles into the inner ear. The inner ear is shaped like a snail and is also called the cochlea. Inside the cochlea, there are thousands of tiny hair cells. Hair cells change the vibrations into electrical signals that are sent to the brain through the hearing nerve. The brain tells you that you are hearing a sound and what that sound is.

2. PROPOSED SYSTEM

The proposed system explains about the deaf people using mobile phones. We are enabling GSM kit with mic and filtering for the deaf people to hear. Usually deaf people who use hearing aids found great difficulties accessing the voice services due to radio signal interference to their hearing aids. Our proposed system includes the benefit of calling through GSM which helps the deaf people to listen the accurate voice which we are implementing with the pre processor.

We enable a transducer which converts the transmitter side voice signal to vibration signal through which receiver side deaf can hear the voice signal. To boost the dynamic range, the gain-balancing techniques have been offered that split the original small gain to multiple larger gains. Making use of the gain-balancing techniques, the computation accuracy at gammotone filter is improved, leading to a high dynamic range.

3. BLOCK DIAGRAM

The block diagram of hearing aid is shown in fig1. It consists of GSM and LCD which is interfaced with AT89S52. A TMS320 DSP processor is used for voice processing.

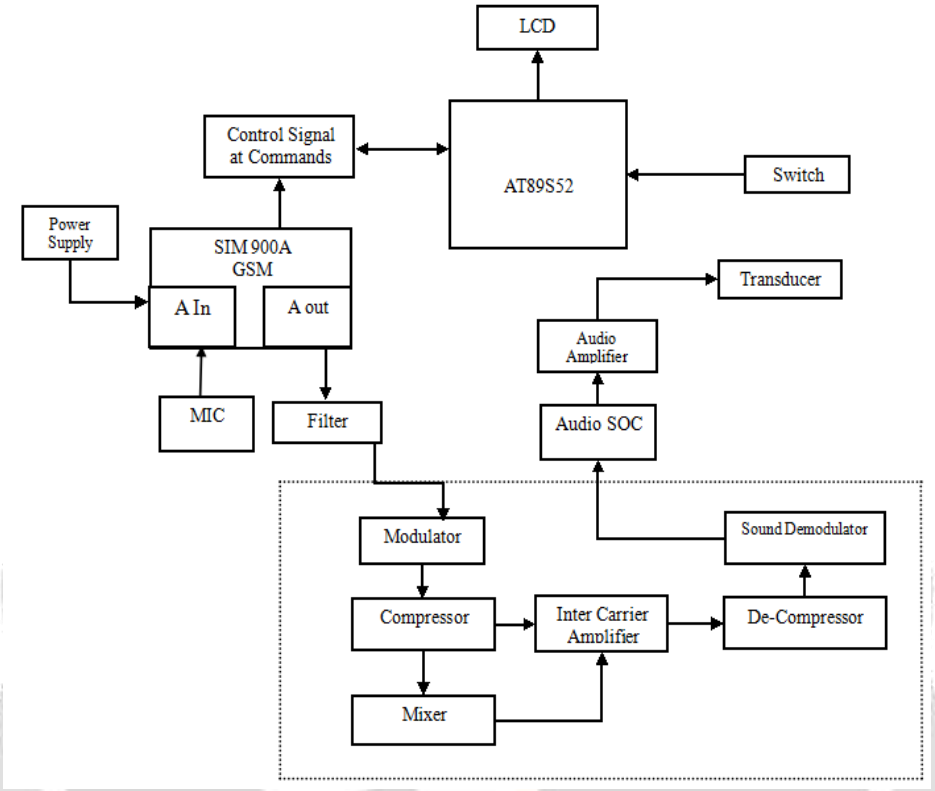

Fig -1: Block diagram of proposed system

Initially the call is received through the GSM modem which is controlled by means of AT commands. Information about the caller is displayed in the LCD. The port2 pins of ATMEL is interfaced with the data pins of LCD. The control pins of LCD is connected to the interrupt pins of ATMEL.

The voice output is taken from the audio out of the GSM modem and directed to the TMS320 section. The voice will be sampled and then the filtering operation is performed based on the gammatone gram(also called as gammatone filter).

After the filtering process further amplification is done with the help of audio soc and the output is given as input to the transducer which is nothing but a DC motor.

4. GAMMA TONE FILTER

The gamma tone filter resembles as how our ear amplifies the sound and our brain stimulates it. A gamma tone filter is a linear filter described by an impulse response that is the product of a gamma distribution and sinusoidal tone. It is a widely used model of auditory filters in the auditory system. The gamma tone impulse response is given by

$$g(t) = at^{n-1}e^{-2\pi bt}\cos(2\pi ft + \phi)$$

wheref (in Hz) is the center frequency, ϕ (in radians) is the phase of the carrier, a is the amplitude, n is the filter's order, b (in Hz) is the filter's bandwidth, and t (in seconds) is time. This is a sinusoid (a pure tone) with an amplitude envelope which is a scaled gamma distribution function.

The fig2 shows the gamma tone filter operation in a separate steps. The voice signal under goes series of operation to reduce the effects of noise and further human voice amplification.

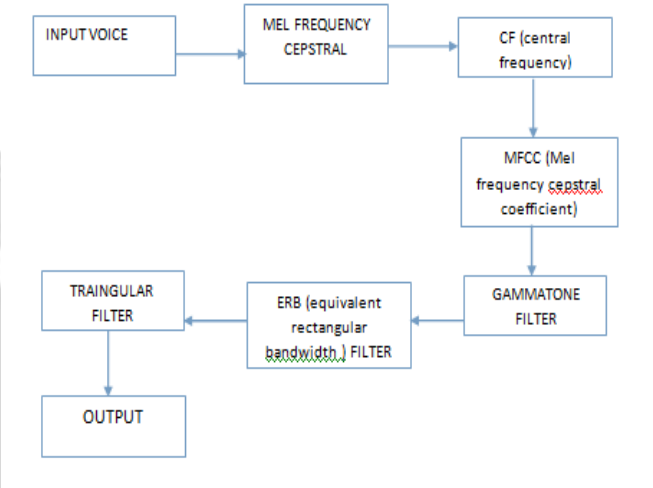

Fig -2: Gamma tone filter operation

ADVANTAGES

Reliable and no surgery is required. High dynamic range is achieved. The signal is accurate to the receiver side. Improved computation accuracy.

APPLICATIONS

Communication is carried by deaf people. Evaluating band limited signal models.Surveillance applications for sound classification. In multi-rate signal processing signal improvement.

RESULTS

A SIM is inserted in the GSM kit through which the call is received/made. The current status will be displayed in the LCD. A transducer converts the voice signal to vibration signal through which the deaf can hear the voice. The transducer should be bitten between the teeth in order to hear the voice.

A.Hardware prototype

The prototype of the proposed system is shown in the fig3 which is implemented using the TMS320C50PGEA57 DSP processor.

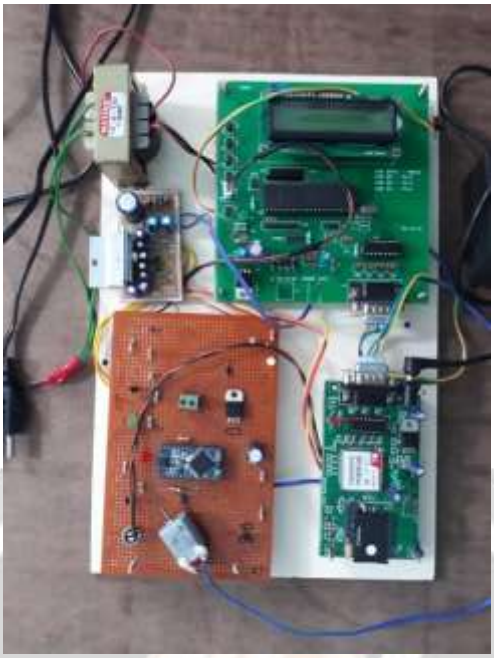

Fig -3. Prototype model

The motor should be bitten between the teeth in order to hear the voice. This will stimulate the auditory nerves which will be intercepted by the brain as sound. The differentiation can be heard by closing each ears one by one and both at the same time. This is not a problem for real deaf people. This model can also be enhanced by using a mobile instead of GSM kit

6. CONCLUSION AND FUTURE ENHANCEMENT

Thus the mobile technology for the deaf and hearing impaired people will prove to be a life saving device in case of disasters. Also they make the life easy and motivate the deaf people to use mobile phone without any surgery.

This prototype just has call receiving feature which can be enhanced to provide dial pad to even make the call and send SMS. The whole prototype can be miniaturized which could be handy and kept inside pocket . Hence the real time implementation becomes easy and handy if miniaturized.

Thus mobile technology for deaf and hearing impaired project will prove to be a immense importance through which they can cope up with normal people.

7. REFERENCES

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